



Research Paper

Interpersonal functioning in hoarding: An investigation of the link between hoarding symptoms and social support, social anhedonia, and social rewards

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ABSTRACT

Background: One of the key areas of functional impairment in hoarding is interpersonal difficulties, with burgeoning evidence suggesting that these social difficulties are a component of the psychopathology observed in hoarding. The specific nature of these interpersonal difficulties, however, has yet to be fully elucidated. The aim of the current study was to investigate the contribution of social support and motivation to socialise, specifically social anhedonia and rewards from social stimuli, to hoarding symptom severity.

Method: A total of 278 participants recruited via the crowd-sourcing website MTurk completed questionnaires assessing hoarding symptoms, social support, social anhedonia, and response to social rewards.

Results: Results for social reward processing indicated that hoarding symptoms were associated with finding both negative and positive behaviours towards others more rewarding. Social anhedonia also positively predicted hoarding symptoms. Furthermore, social integration, a component of social support, was inversely associated with hoarding symptoms. These associations remained significant when controlling for depressive symptoms. These results suggest that hoarding may be linked to decreased social support and reduced social motivation, particularly, dysregulated reward processing of social stimuli, and greater social anhedonia.

Limitations: Limitations of the current study include utilising an unselected sample, use of self-report measures, and analyses being correlational in nature. Future research utilising longitudinal or experimental research methods in a clinical population may further delineate the clinical conceptualisation of social difficulties in hoarding disorder.

Conclusions: Current findings may inform interpersonal conceptualisations for hoarding disorder and suggest additional treatment avenues.

1. Introduction

Hoarding disorder (HD) is characterised by excessive collecting of possessions and difficulty discarding those items, resulting in excessive clutter and leading to significant impairment and distress (Frost and Hartl, 1996). HD affects approximately 2.5% of the population (Postlethwaite et al., 2019) and has a detrimental impact on physical health, psychosocial health, and wellbeing (Frost et al., 2002; Grisham and Norberg, 2010). Individuals with HD report a quality of life and level of impairment similar to those with schizophrenia (Saxena et al., 2011). The accumulation of clutter also means that individuals are living in homes with high levels of health risk, including greater structural and fire risks, with hoarding accounting for approximately one quarter of

preventable fire fatalities (Harris, 2010; Lucini et al., 2009). Indeed, individuals with HD are at greater risk of serious medical illnesses such as being at 11-fold greater risk of stroke, and two-fold risk of ulcer (Tolin et al., 2008).

A key area of functional impairment found to be associated with hoarding is interpersonal difficulty (Archer et al., 2019). Growing evidence suggests that individuals with HD have impoverished social relationships, including lower levels of marriage, higher rates of being single or divorced, and greater social isolation (Frost et al., 2000; Grisham et al., 2008; Steketee and Frost, 2003; Tolin et al., 2008). Family members of individuals who hoard report high levels of frustration, hostility, and rejection towards the hoarding family member (Tolin et al., 2008). Beyond this, HD is often comorbid with other disorders that

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are characterised by dysfunctional social processing, such as avoidant personality disorder, borderline personality disorder, social anxiety disorder, and autism spectrum disorder (Frost et al., 2015; Pertusa et al., 2012).

The dominant cognitive-behavioural model of hoarding implicates the role of dysfunctional attachments (Frost and Hartl, 1996), which manifest in strong emotional attachments to objects and thwarted attachments with people (David et al., 2021; Mathes et al., 2020; Yap et al., 2020; Yap and Grisham, 2020). Early theories suggested that individuals with HD have intense attachment to their objects to replace lack of meaningful relationships with people (Fromm, 1947; Grisham and Barlow, 2005). Hoarding behaviours are also significantly positively associated with anthropomorphising, that is, attributing human-like qualities to objects (Burgess et al., 2018; Timpano and Shaw, 2013), further suggesting that interpersonal needs are obtained through objects in HD. Conversely, recent research has suggested that the ability to connect with others may be impacted in hoarding, with hoarding being positively associated with more atypical empathic reactions to others (David et al., 2021; Chen et al., 2021). Given this burgeoning evidence that social dysfunction is implicated in hoarding, it is critical to understand the specific cognitive and emotional factors that underpin these interpersonal difficulties.

One unstudied explanation for the social difficulties experienced in hoarding disorder is reduced social motivation. Disruption in motivation to socialise have been shown to lead to social difficulties in other disorders (Dawson et al., 1998; Barkus and Badcock, 2019). This reduced social motivation may present as social anhedonia, which is a reduced ability to experience pleasure from relationships with other people (Bleuler, 1911; Kraepelin, 1913), or reduced social rewards, which refers to reduced reward experienced from social stimuli (Dawson et al., 1998). The first aim of this study was to investigate the relationship between hoarding and social motivation, as measured through social anhedonia and social rewards.

Few studies have investigated the association between anhedonia and hoarding symptoms, and none have examined a potential link between social anhedonia and clinical hoarding status. Pushkarskaya et al. (2019) found that symptom severity in hoarding disorder was not significantly related to anhedonia, defined as reduced ability to experience pleasure overall (Snaith, 1993), beyond the effects of depression. However, the authors did not specifically examine social anhedonia. Social anhedonia has been proposed to explain social deficits in various disorders that are comorbid with hoarding such as schizophrenia, depression, and autism spectrum disorder (Blanchard et al., 2001; Chevallier et al., 2012). Moreover, social anhedonia in these disorders has been found to lead to withdrawal and poor social functioning (Barkus and Badcock, 2019). Given that individuals with HD have also reported being socially isolated and having poor social functioning (Frost et al., 2000; Grisham et al., 2008), it was speculated that they may also experience heightened levels of social anhedonia.

Furthermore, reduced social motivation may also present as dysfunctional reward processing. The social motivation hypothesis, a theory that originated from autism spectrum disorder, suggests that interpersonal difficulties arise because of a deficit in the ability to assign reward to social material and a subsequent reduced motivation towards seeking social interactions and maintaining social bonds (Chevallier et al., 2012; Dawson et al., 1998). Reward processing has been proposed as an explanation for interpersonal difficulties across a variety of psychological disorders, including psychopathy, autism spectrum disorder, depression, social anxiety disorder, and anorexia nervosa (Ait Oumeziane, Jones, and Foti, 2019; Foulkes et al., 2014; Richey et al., 2014; Watson et al., 2010). For example, the reward system in psychopathy is said to be "inverted" as there is reduced enjoyment of positive social interactions and greater enjoyment of cruel and callous behaviours to others (Foulkes et al., 2014). This pattern of social rewards is consistent with self-focused and antisocial behaviours associated with psychopathy (Blair, 2005), but is also expressed in autism spectrum disorder. Foulkes

et al. (2015) found that autistic traits in adults were related to less enjoyment of admiration from others, sociability, positive social interactions, and sexual relationships, and greater enjoyment of passivity and being cruel to others. The speculative explanation for the unexpected results in individuals with autism was that acting cruel and callous may elicit a predictable and explicit emotional reaction, which may be experienced as rewarding, given the difficulty in interpreting social cues associated with the disorder (Baron-Cohen, 1991).

Although there has been minimal research suggesting a connection between dysfunctional rewards processing of social stimuli and hoarding symptoms, some evidence suggests that HD could be associated with impulsivity and abnormal reward processing generally (Rasmussen et al., 2013). In one study, Tolin et al. (2008) asked individuals with HD to make discarding decisions. During these discarding decisions, there was excessive hemodynamic activity in the lateral orbitofrontal cortex, a region associated with processing reward value and particularly in evaluating punishing stimuli (Kringelbach, 2005). Furthermore, similarly to the pattern of reward processing seen in autism spectrum disorder, some theories suggest that social situations are experienced as threatening or uncertain in hoarding disorder due to negative early developmental experiences (Kyrios et al., 2018). Despite the growing literature on social difficulties in HD, little is known on whether individuals who hoard experience reduced social motivation, i.e., reduced pleasure or abnormal reward processing from social situations. We therefore hypothesised in the current study that assigning appropriate reward to social stimuli may be impaired for individuals with high hoarding symptoms, such that there is reduced enjoyment of positive social rewards, as well as greater enjoyment of negative social rewards.

Furthermore, if social motivation is reduced, this may impact social functioning amongst individuals with hoarding disorder, including reduced social support. Recent research suggests that hoarding is related to lower levels of perceived social support (Yap et al., 2020; Medard and Kellett, 2014). Moreover, Medard and Kellett (2014) showed that individuals with clinical levels of hoarding symptoms, i.e., scores > 41 on the Savings Inventory Revised (SIR; Frost et al., 2004), reported poorer social support than student or community controls. Barton et al. (2021) also found that social support was a particularly heightened concern for individuals with hoarding disorder, compared to those with OCD. Family conflict also has been found to be associated with increased clutter and hoarding symptoms (Davidson et al., 2020). Importantly, increased social support can lead to greater treatment retention for CBT in hoarding populations (Weiss et al., 2020). As such, social support may be important for understanding the impact of reduced social motivation on overall wellbeing and an important target for improving treatment outcomes in hoarding.

The overall aim of the current study was to investigate associations between hoarding and social motivation, as measured through social anhedonia and social reward, as well as the relationship between hoarding and social support. We utilised an unselected sample, as collecting and saving ranges on a dimension, present in varying degrees in all individuals (Timpano and Schmidt, 2013). We expected that higher hoarding symptoms would be related to poorer social support, greater social anhedonia, increased enjoyment of negative social behaviours, and reduced enjoyment of positive social behaviours. Because depression has been found to be associated with poor perceived social support, social anhedonia, and dysregulated social rewards (Blanchard et al., 2001; Ait Oumeziane, Jones, and Foti, 2019; Stice et al., 2004) and is highly comorbid in hoarding disorder (Frost et al., 2015; Hall et al., 2013; Woody et al., 2014), we statistically controlled for depression severity to examine the unique associations between our social variables of interest and hoarding symptoms.

2. Method

2.1. Participants

Data were obtained through the online crowdsourcing website Amazon Mechanical Turk (MTurk). Participants were 18 years or older and were reimbursed \$3–4 USD for their participation, based on the standard rate of \$6USD per hour for MTurk studies, and were transferred credit into their MTurk accounts upon completion of the study. Data were collected from 353 participants, in which participants were included if they had 95%+ approval rating and had completed 1000 surveys or more. Following data collection, participants were excluded if they did not complete the entire study, were outliers in completion time (i.e., completed the survey in less than half or more than ten times the mean completion time, suggesting sporadic or disengaged responding), wrote answers during written components of the survey that did not adhere to task instructions, or had zero variance in scores for measures with reverse scored items. The remaining sample included 278 participants. In this sample, the mean age was 39.49 (SD = 12.26), 145 identified as male (131 as female, 2 as other), and the average years of education was 14.69 (SD = 2.3). The majority of participants identified as White/Caucasian ($n = 201$; 72%), followed by African American ($n = 30$; 11%), Hispanic/Latino ($n = 23$; 8%), Asian ($n = 11$; 4%), Multiracial ($n = 8$; 3%) and lastly Native American/Alaskan Native ($n = 5$; 2%).

2.2. Materials

Savings Inventory-Revised (SI-R; Frost et al., 2004). The SI-R is a 23-item self-report questionnaire of hoarding behaviours. It includes three subscales based on factor analysis of hoarding domains, specifically, difficulty discarding, excessive clutter, and compulsive acquisition. The SI-R demonstrates good internal consistency, construct validity and test-retest reliability (Frost et al., 2004). This measure also had very high internal reliability in the current study, $\alpha = 0.97$.

Social Provisions Scale (SPS; Cutrona and Russell, 1987). The SPS is a self-report measure of social support, providing a total full-scale measure as well as six subscales of *attachment*, e.g., “I feel a strong emotional bond with at least one other person”, *social integration*, e.g., “There are people who enjoy the same social activities as I do”, *reassurance of worth*, e.g., “I have relationships where my competence and skill are recognised”, *reliable alliance*, e.g., “There are people I can depend on to help me if I really need it”, *guidance*, e.g., “There is someone I could talk to about the important decisions in my life”, and *opportunity for nurturance*, e.g., “There are people who depend on me for help”. Participants are asked to rate items on a scale from 1 (strongly disagree) to 4 (strongly agree). The SPS has showed good discriminant validity, predictive validity, and test-retest validity (Cutrona and Russell, 1987; Perera, 2016). In the current study, Cronbach’s α was 0.95 for the SPS, demonstrating excellent internal reliability.

Social Rewards Questionnaire (SRQ; Foulkes et al., 2014). The SRQ is a 23-item measure of individual differences in the value of social rewards, with higher scores indicating greater enjoyment or experience of reward towards the social experience. The questionnaire consists of six factors, defined as follows: *admiration*, which is enjoying being flattered, liked and gaining positive attention (e.g., “I enjoy achieving recognition from others”), *negative social potency*, which is enjoying being cruel and callous to others (e.g., “I enjoy making others angry”), *passivity*, which is enjoying giving others control and allowing others to make decisions (e.g., “I enjoy following someone else’s rules), *prosocial interactions*, involving having kind and reciprocal relationships (e.g., “I enjoy treating others fairly”), *sexual relationships*, which is enjoying having frequent sexual experiences (e.g., “I enjoy having an active sex life”), and *socialability*, which is enjoying engaging in group interactions (e.g., “I enjoy going to parties”). The SRQ and its subscales have shown good construct validity, test-retest reliability and internal consistency (Foulkes et al., 2014). In the current study, Cronbach’s α for the SRQ was 0.83,

demonstrating good internal reliability.

Social Anhedonia Scale – Revised (RSAS; Eckblad et al., 1982). The RSAS is 40-item measure of social anhedonia, defined as the reduced ability to experience pleasure with social activities. Participants are asked to answer true or false to various questions indexing anhedonia in socialising. The RSAS shows adequate convergent validity and good discriminant validity (Bailey et al., 1993). Cronbach’s α was 0.93 for the RSAS, demonstrating high internal reliability.

Depression Anxiety Stress Scale – 21 (DASS-21; Lovibond and Lovibond, 1995). The DASS-21 assesses current symptoms of depression, anxiety, and stress through self-report. Participants are asked to rate on a scale from 0 (never) to 3 (almost always) on the extent to which each item applied to them over the past week. The DASS has high internal consistency and good convergent validity (Henry and Crawford, 2005). Grisham et al. (2008) found specifically that mood was a greater predictor of interpersonal difficulties than hoarding-related beliefs. We therefore utilised the scores on the depression subscale of the DASS-21 to examine whether hoarding symptoms were uniquely associated with poorer social functioning. Cronbach’s α was 0.97 for the DASS-21 in this study, demonstrating excellent internal reliability.

2.3. Procedure

All procedures were approved by the Human Research Ethics Committee at the University of New South Wales. After providing informed consent, participants were asked to complete a brief demographic questionnaire and the study questionnaires, which took approximately 30 min. Participants were debriefed at the end of the study with a standard message on MTurk, which included a thanks for participating, a brief description of the purpose of the study, and contact details for the research team and other crisis support services.

2.4. Analyses

The relationship between hoarding symptoms and social impairment measures were first analysed through zero-order correlations. Subsequently, two separate hierarchical multiple regressions were conducted to identify whether social motivation (including social reward and social anhedonia) and social support uniquely predicted hoarding, holding depression symptoms constant. For each hierarchical regression, hoarding severity (SIR total score) was entered as the dependant variable and depression (DASS-Dep scores) was entered in the first step of the model. For the first social motivation hierarchical regression, the total score on the RSAS and all the subscales of the SRQ were entered in the second step. For the second hierarchical regression on social support, all subscales of the SPS were entered into the second step. Preliminary analyses were conducted amongst social functioning variables to test for assumptions. Analyses showed that the attachment and guidance subscales on the SPS had Variance Inflation Factor (VIF) values > 5 , indicating multicollinearity (Yu et al., 2015). These subscales were subsequently removed from the regression model. Significance was held at $p < 0.05$ and data was analysed using Statistical Package for the Social Sciences (SPSS) version 25.

3. Results

We conducted correlational analyses between hoarding symptoms and facets of self-reported social support, as measured by total score and subscales of the Social Provisions Scale (Cutrona and Russell, 1987). For correlational analyses, hoarding symptom scores were negatively correlated with total social support ($r = -0.412, p < 0.001$) and with all subscales of social support, including guidance ($r = -0.346, p < 0.001$), reassurance of worth ($r = -0.393, p < 0.001$), social integration ($r = -0.461, p < 0.001$), attachment ($r = -0.325, p < 0.001$), nurturance ($r = -0.239, p < 0.001$), and reliable alliance ($r = -0.408, p < 0.001$). As expected, hoarding was also positively correlated with social anhedonia

($r = 0.345, p < 0.001$) on the Social Anhedonia Scale – Revised (Mishlove and Chapman, 1985).

From the full sample, nine participants did not complete the social rewards questionnaire and were removed from subsequent analyses, leading to a sample size of 269 for analyses examining associations between hoarding symptoms and social rewards. Examination of the social rewards questionnaire revealed that hoarding symptoms were positively associated with two subscales, being negative social potency ($r = 0.436, p < 0.001$) and passivity ($r = 0.287, p < 0.001$).

Next, we ran two hierarchical regressions to clarify the unique contribution of social motivation and social support to hoarding severity, beyond the effects of depression. In terms of the results from the social motivation hierarchical regression (see Table 1), the variance in hoarding symptom scores was significantly predicted by social motivation variables above and beyond the effects of depression, $\Delta R^2 = 0.112, \Delta F(7, 260) = 7.308, p < 0.001$. Beyond this, there were four unique individual social motivation predictors of hoarding symptoms. Hoarding was predicted positively by social anhedonia ($\beta = 0.276, t(260) = -2.322, p = 0.021$). Amongst the social rewards subscales, hoarding was positively and uniquely predicted by negative social potency ($\beta = 0.736, t(260) = 4.386, p < 0.001$), prosocial emotions ($\beta = 0.492, t(260) = 2.358, p = 0.019$), and sociability ($\beta = 0.729, t(260) = 2.412, p = 0.017$).

In the second hierarchical regression assessing social support (see Table 2), the variance in hoarding symptom scores was also significantly predicted by social support variables beyond the effects of depression, $\Delta R^2 = 0.043, \Delta F(4, 272) = 4.502, p = 0.002$. Of the social support variables, social integration uniquely and negatively predicted hoarding symptoms ($\beta = -1.981, t(272) = -3.040, p = 0.030$), beyond the effects of depression. Means and standard deviations for all scales are presented in Table 3.

4. Discussion

The aim of the current study was to investigate the relationship between aspects of social functioning and hoarding symptoms in an unselected community sample. Two areas of social functioning that were indexed in this study were reduced motivation to socialise, which was measured through social anhedonia and/or dysfunctional reward processing of social stimuli (Chapman et al., 1976; Dawson et al., 1998), as well as perceived level of social support. Of the social motivation variables, social anhedonia as well as both positive and negative social rewards, including prosocial emotions, sociability, and negative social potency positively predicted hoarding above and beyond the effects of depression. Furthermore, social support negatively predicted hoarding, specifically, the social integration aspect of social support. These results

Table 1
Summary of hierarchical regression analysis for social motivation variables predicting hoarding severity, controlling for depression severity.

	Predictor variable		
	B	SE B	T
Step 1			
DASS_Dep	1.71	.15	11.11***
Step 2			
DASS_Dep	1.12	.19	5.88***
RSAS_TotalScore	.28	.12	2.32*
SRQ_Admiration	-0.29	.23	-1.23
SRQ_NegSocialPotency	.74	.17	4.39***
SRQ_Passivity	.11	.23	.48
SRQ_ProsocialEmo	.49	.21	2.36*
SRQ_SexualRelationships	-0.31	.20	-1.57
SRQ_Sociability	.73	.30	2.41*

Note: $R^2 = 0.32$ for Step 1; $\Delta R^2 = 0.11$ for Step 2 ($ps < 0.001$). DASS_Dep = Depression scores on the DASS-21. RSAS = Social Anhedonia Scale – Revised, SRQ = Social Rewards Questionnaire.
* $p < 0.05$, *** $p < 0.001$.

Table 2

Summary of hierarchical regression analysis for social support variables predicting hoarding severity, controlling for depression severity.

	Predictor variable		
	B	SE B	T
Step 1			
DASS_Dep	1.68	.15	10.94***
Step 2			
DASS_Dep	1.32	.19	7.00***
SPS_Reassurance	.29	.59	.49
SPS_SocialIntegration	-1.98	.65	-3.04**
SPS_Nurturance	.55	.39	1.43
SPS_ReliableAlliance	-0.39	.51	-0.77

Note: $R^2 = 0.32$ for Step 1; $\Delta R^2 = 0.11$ for Step 2 ($ps < 0.001$). DASS_Dep = Depression scores on the DASS-21. SPS = Social Provisions Scale
** $p < 0.01$, *** $p < 0.001$.

Table 3

Means and standard deviations for all scales.

Scale	N	M	SD
DASS_Dep	278	4.84	5.86
RSAS_Total Score	278	13.49	9.38
SPS_Guidance	278	12.61	2.93
SPS_Reassurance	278	12.56	2.55
SPS_SocialIntegration	278	12.78	2.37
SPS_Attachment	278	12.38	2.92
SPS_Nurturance	278	12.25	2.87
SPS_ReliableAlliance	278	12.65	2.75
SRQ_Admiration	269	19.35	5.06
SRQ_NegativeSocialPotency	269	12.86	8.21
SRQ_Passivity	269	9.41	4.65
SRQ_ProsocialEmotions	269	28.53	6.45
SRQ_SexualRelationships	269	12.06	4.89
SRQ_Sociability	269	13.59	4.15

Note: DASS_Dep = Depression scores on the DASS-21. RSAS = Social Anhedonia Scale – Revised, SPS = Social Provisions Scale, SRQ = Social Rewards Questionnaire.

suggest that there may be greater social anhedonia, dysfunctional rewards processing, and poorer social support related to hoarding, with each variable to be discussed in further detail below.

Hoarding symptoms were significantly and uniquely predicted by social anhedonia in the regression analyses, after controlling for depression. This suggests that greater hoarding symptoms may be associated with disinterest in social contact or reduced ability to experience pleasure from social situations. This was inconsistent with the findings by Pushkarskaya et al. (2019) in which hoarding was not significantly associated with general anhedonia beyond the effects of depression, suggesting that experiences of anhedonia may be specific to social situations. This finding is in keeping with “compensation” theories of hoarding, in which individuals may experience uncertainty from social situations and compensate for these feelings by deriving comfort from objects (Kyrrios et al., 2018). In terms of the social rewards variables, regression analyses showed that hoarding was positively predicted by negative social potency.

Consistent with previous results on autism spectrum disorder (Foulkes et al., 2015), acting cruel to others can allow for a predictable explicit emotional response. Moreover, these results were consistent with recent research suggesting that individuals with higher hoarding symptoms experience greater hostility, i.e., sensitivity to real or perceived social threats, and greater aggression, which is the tendency to experience and express hostility and anger (Mathes et al., 2018; Mathes et al., 2019). As such, another possible explanation of these results is that individuals with elevated hoarding symptoms may react in cruel and callous or aggressive ways as a maladaptive but common response to anger or social threat (Beames et al., 2019). This maladaptive responding is consistent with the global emotion regulation

difficulties observed in hoarding disorder (Taylor et al., 2019; Tolin et al., 2018). Furthermore, taking these results on social anhedonia and negative social potency together, another tentative explanation may be that individuals with greater hoarding symptoms experience greater pleasure from cruel and callous behaviours as a way of experiencing some reward or excitement from otherwise unrewarding stimuli.

On the other hand, hoarding was also predicted by increased enjoyment of sociability, that is, engaging in group interactions, and prosocial emotions after controlling for depression. The relationship between positive social reward and higher severity hoarding symptoms was unexpected. One potential explanation for this finding is that as greater hoarding symptom severity is related to a greater desire for connection, and those with higher hoarding symptoms reported that they would enjoy sociability and prosocial emotions more, perhaps because they were not fulfilled in those social needs. Indeed, the instructions for the social rewards questionnaire included a note that participants should imagine how much they would enjoy the social reward if it is something they have not experienced. Overall, as hoarding was predicted by both positive and negative social rewards, a cautious interpretation would be individuals with higher hoarding symptoms were more reactive to both negative and positive rewards experienced from social stimuli.

Of the social reward variables, correlational analyses also showed that hoarding symptoms was positively associated with enjoying passivity in social situations. Passivity may serve as a form of avoidance in social situations, which relieves anxiety in the short-term and is therefore viewed as useful (Lovibond, 2006). However, avoidance of fear-provoking situations is a maintaining factor for many psychological disorders, including HD, as it reinforces distorted cognitions in the long-term (Ayers et al., 2014; Fernández-Rodríguez et al., 2018). Consistently, HD has been found to be associated with antisocial personality traits, with the most common personality disorder in a HD sample being avoidant personality disorder (Frost et al., 2015, 2000; Samuels et al., 2008). Therefore, although these results suggested that passivity may not be unique to hoarding, passivity may represent a way of avoiding social distress amongst individuals with hoarding symptoms.

Taking together the results from the social motivation variables, it is unclear whether individuals with greater hoarding symptoms experience reduced pleasure from social situations overall and/or if they experience dysfunctional reward processing from social situations, i.e., experiencing pleasure from both positive and negative social rewards. One tentative explanation may be that dysfunctional reward processing could lead to poor social outcomes, such as withdrawal, which could reduce pleasure experienced from social situations over time. However, further research is needed to clarify potential differences in social motivational processing associated with hoarding.

Regression analyses also revealed that hoarding was negatively and uniquely predicted by social support, specifically social integration. Social integration refers to the sense of belonging in a group that shares similar interests (Cutrona and Russell, 1987). This extends the results of Medard and Kellett (2014), in which the total social support score on the SPS (but not individual variables) uniquely predicted variance in hoarding symptoms. Weiss (1974) argued that different types of relationships provided different kinds of social support, with social integration being achieved from friend relationships. Reduced sense of support from friendships may be related to hoarding severity. This pattern has also been shown in psychosis; as symptom severity increased, connection to family was sustained, whereas relationships with friends decreased (Gayer-Anderson and Morgan, 2013). If loss of connection with friends drives the loss of social integration for people who hoard this may be a specific target area for improving social functioning in hoarding. Furthermore, correlational analyses showed all types of social support were negatively correlated with hoarding symptoms. This finding was compelling yet unsurprising, given that individuals who hoard report greater loneliness, social isolation, and reduced social support overall (Burgess et al., 2018; Medard and Kellett,

2014; Yap et al., 2020).

One limitation of the current study was that this study utilised an unselected community sample from MTurk. MTurk utilises a convenience sample, which has been shown to be comparable to the general population (Goodman et al. 2013). These samples have been found to produce data of high quality, especially on clinical and subclinical populations (Arditte et al., 2016; Shapiro et al., 2013). However, to delineate the clinical utility of these results, this study should be extended by comparing a clinical sample of individuals diagnosed with hoarding disorder with clinical and healthy control groups. This study was also limited by its use of self-report measures as aspects of social functioning have been shown to differ in more ecologically valid situations (Schilbach et al., 2013). Future studies are needed to replicate and extend these preliminary results on social motivation and social support in hoarding by utilising psychophysiological and behavioural measures.

Finally, as current research on interpersonal difficulties is largely correlational, it is unclear whether these social difficulties underlie the maintenance of hoarding, if hoarding behaviours lead to social impairment, or if the relationship between hoarding and social impairment are bidirectional. Although the assumption may be that hoarding disorder leads to interpersonal difficulties, more recent research has suggested that difficulty connecting with others drive hoarding symptoms. For example, Kyrios et al. (2018) suggested that negative early family environments lead to the development of hoarding behaviours to compensate for perceived sense of uncertainty from self and others. Growing empirical evidence has substantiated this association between negative early family experiences and hoarding symptomatology (Alonso et al., 2004; Kellett et al., 2010; Kings et al., 2020; Mathes et al., 2018). In line with these previous findings, this study may indicate other social vulnerability factors for hoarding disorder, although any causal implications are tentative due to the cross-sectional nature of the data. Also, future studies may be able to utilise longitudinal and/or experimental study designs to identify the causal relationships between these factors.

Despite these limitations, this study advanced knowledge on the link between hoarding and impaired interpersonal functioning, specifically in the domains of social motivation and social support. Although there has been limited evidence on the interpersonal difficulties associated with hoarding (Grisham et al., 2008, 2018; Pertusa et al., 2012), this study added to burgeoning evidence that hoarding is associated with interpersonal difficulties even after controlling for depression. Current findings were also novel in suggesting that hoarding symptom severity may be associated with poorer social motivation, specifically greater social anhedonia and dysregulated reward processing, and social support. Despite interpersonal dysfunction indicated with hoarding, many treatments of HD currently focus on intrapersonal targets, such as emotions and thoughts associated with saving behaviour (Mathes et al., 2019; Steketee, and Frost, 2014). Current findings contribute to the growing literature that suggests potential interpersonal targets in HD treatment. For example, if hoarding is associated with hostile attributional biases and difficulties with social cognition, i.e., understanding other's perspectives (Chen et al., 2021; Mathes et al., 2018), these challenges may be targeted through adjunct treatment modules, such as Social Cognition Interaction Training (Roberts et al., 2015). Thus, following replication in a clinical sample, our findings may contribute to a more nuanced model of hoarding disorder and evaluation of additional treatment strategies targeting the psychosocial needs of those with HD.

Contributors

All authors made significant contributions to the conception and design of the study. Wenting Chen collected the data, conducted the analysis, interpreted the results, and wrote up the first draft of the manuscript. Jessica Grisham contributed to interpretation of results, writing of the manuscript, and provided the funding source. Skye McDonald and Travis Wearne contributed to the interpretation of results

and writing of the manuscript. All authors approved the final manuscript.

Role of funding source

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Declaration of Competing Interest

None.

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