

Object attachment: Humanness increases sentimental and instrumental values

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Background and aims: People who hoard form intense attachments to their possessions and save items for sentimental and instrumental reasons. Feeling socially excluded may encourage these individuals to anthropomorphize objects (i.e., perceive them as human-like) to fulfill unmet belonging needs, which may increase the sentimental and instrumental values of objects, and then lead to stronger object attachment. *Methods:* We randomly assigned 331 participants with excessive acquisition tendencies to be excluded, included, or overincluded in an online ball-tossing game before presenting them with five objects that had human characteristics. Participants then completed measures assessing anthropomorphism, sentimental and instrumental values, and object attachment. *Results:* Inconsistent with this study hypothesis, socially excluded participants did not rate unowned objects as more human-like than the included or overincluded participants; however, stronger anthropomorphism predicted greater instrumental and sentimental values, which then predicted greater object attachment. *Discussion and conclusions:* Sentimental and instrumental values may explain how stronger anthropomorphism may lead to greater object attachment. Learning that leads to anthropomorphism may help us better understand object attachment.

Keywords: anthropomorphism, hoarding, acquisition, object attachment, social exclusion, possessions

INTRODUCTION

Hoarding disorder (HD) is characterized by difficulty discarding possessions regardless of their actual value, which then results in excessive clutter that leads to significant distress and impairment for individuals who live within and nearby the affected home (American Psychiatric Association, 2013). Although more than two thirds of individuals with HD excessively acquire items, almost all research into hoarding has focused on discarding difficulties (Frost, Rosenfield, Steketee, & Tolin, 2013; Frost, Tolin, Steketee, Fitch, & Selbo-Bruns, 2009; Timpano et al., 2011). The limited research into excessive acquisition has shown that individuals with acquiring difficulties experience more severe hoarding problems and social impairment in comparison to non-acquirers (Frost et al., 2013; Norberg, Crone, Kwok, & Grisham, 2018; Timpano et al., 2011). These findings suggest that examining factors associated with excessive acquisition may be important in improving existing treatment for individuals with HD who also have acquiring difficulties.

The cognitive-behavioral model of hoarding posits that individuals who hoard demonstrate excessive object attachment to their possessions and save them due to elevated perceptions of an item's sentimental and/or instrumental values (Frost & Hartl, 1996). According to Frost and Steketee (2008), sentimental value refers to the symbolic meaning of an item and its ability to provide comfort and support, due to its association with an important person or

event. Instrumental value, on the other hand, refers to judgments about the potential use, function, or need for a possession (Frost & Steketee, 2008). Although the model specifies that individuals who hoard acquire and like objects due to their greatly perceived sentimental and instrumental values, it does not specify the process that leads to these extreme judgment values. Nor do compulsive buying theories, which focus on a preoccupation with buying and lack of impulse control (O'Guinn & Faber, 1989; Ridgway, Kukar-Kinney, & Monroe, 2008).

Examining belonging and self-esteem needs may help improve our understanding of why individuals with HD assign elevated judgment values to objects. Social psychologists posit that individuals have an innate need to maintain interpersonal relationships to achieve a sense of belongingness and to maintain positive self-evaluations, and thus, social exclusion motivates people to seek out positive social contact (Baumeister & Leary, 1995; Leary & Baumeister, 2000; Leary, Tambor, Terdal, & Downs, 1995; Park & Maner, 2009). In support of this, social psychological research has shown that socially excluded individuals report a diminished sense of belonging, control, and self-esteem, and express greater interest in turning to others to renew a

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sense of social connection in comparison to non-excluded individuals (Maner, DeWall, Baumeister, & Schaller, 2007; Williams & Zadro, 2001).

As individuals with HD often suffer from interpersonal problems and are socially isolated, their ability to gain guidance or support from loved ones when distressed may be limited (Grisham, Steketee, & Frost, 2008; Medard & Kellett, 2014; Nordsetten, de la Cruz, Billotti, & Mataix-Cols, 2013). As a result, individuals who hoard may form a strong attachment to objects due to recurrent unmet esteem and belonging needs (Fromm, 1947). This pattern of turning to objects to fulfill interpersonal needs begins in childhood when parents are unavailable, as children form an emotional bond to human-like objects as a parental replacement (Gjersoe, Hall, & Hood, 2015). In adulthood, research using non-clinical samples has shown that socially excluded individuals shop to fulfill unmet interpersonal needs (Lastovicka & Sirianni, 2011) and prefer products that represent their affiliation to a group (Mead, Baumeister, Stillman, Rawn, & Vohs, 2011). Moreover, research on social inclusion has also shown that undergraduates who are instructed to write about a time they felt supported assigned less value to owned and novel items in comparison to those who wrote about a positive restaurant experience (Clark et al., 2011). As many individuals with HD are socially isolated, deriving a sense of security in objects may help compensate for unmet social needs.

One explanation for the ability of objects to substitute for human connections is anthropomorphism. Anthropomorphism involves attributing human-like qualities to objects, such as free will or agency (Epley, Waytz, & Cacioppo, 2007). Research has found that undergraduate students attributed more human-like personality traits onto inanimate objects after being primed to recall a time they felt lonely compared to undergraduates who were not primed with loneliness (Bartz, Tchalova, & Fenerci, 2016; Eyssel & Reich, 2013). Chronically lonely individuals have also been shown to assign more human-like traits to inanimate objects than less lonely individuals (Epley, Akalis, Waytz, & Cacioppo, 2008). As research using non-clinical and subclinical hoarding populations has shown that greater anthropomorphic tendencies are positively associated with greater acquisition tendencies (Burgess, Graves, & Frost, 2018; Timpano & Shaw, 2013) and greater overall hoarding severity (Neave, Jackson, Saxton, & Hönekopp, 2015; Neave, Tyson, McInnes, & Hamilton, 2016), it is possible that anthropomorphism may increase the value of objects for those with HD. However, this has not yet been studied in the context of social exclusion.

Exploring general and situational-dependent determinants that influence anthropomorphism may provide a better understanding of how anthropomorphism may impact object value. In regard to general determinants, social and consumer psychological researchers have shown that people are more likely to anthropomorphize objects that share physical or schematic similarities to humans (e.g., Aggarwal & McGill, 2007) and that they are likely to evaluate humanized brands more positively than non-humanized brands (e.g., Delbaere, McQuarrie, & Phillips, 2011). Epley et al.'s (2007) three-factor theory of anthropomorphism highlights the possible role of situational-dependent determinants. Their sociality

motivation tenet proposes that social disconnection instills an unmet need for belonging, which prompts anthropomorphism, which then provides an individual with a sense of human connection, whereas their effectance motivation tenet proposes that human-like objects provide a mechanism for establishing control and understanding the world (e.g., My car didn't start because it wasn't in the mood to deal with traffic today). Consequently, socially disconnected individuals should be motivated to anthropomorphize objects around them to attain comfort and to establish control (Bartz et al., 2016; MacInnis & Folkes, 2017; Waytz et al., 2010), which should then increase the sentimental and instrumental values of objects. Prior research has provided some support for Epley et al.'s theoretical tenets. First, self-report studies have shown that greater anxious interpersonal attachment (chronic fear of abandonment) is associated with greater acquisition tendencies (Norberg et al., 2018) and hoarding severity (Medard & Kellett, 2014). Research also has shown that acute social exclusion leads to greater anthropomorphism (Epley et al., 2008), and stronger anthropomorphic tendencies are associated with greater object attachment and acquiring difficulties (Burgess et al., 2018; Keefer, 2016; Norberg et al., 2018; Timpano & Shaw, 2013). However, prior research has not experimentally examined if social disconnection leads to greater object attachment through anthropomorphism's effects on instrumental and sentimental values.

The present study

This study used an experimental manipulation of social exclusion to test the hypothesis that individuals are more likely to anthropomorphize unowned items after being socially rejected, as opposed to being included, and that anthropomorphizing objects would lead to stronger sentimental and instrumental values, which would lead to greater object attachment. We incorporated an overinclusion condition to provide a direct recommendation on how treatment for HD might be tailored to reduce anthropomorphism and ultimately excessive object attachment. We examined individuals with acquiring problems and unowned items to fill a rather large gap in the literature.

METHODS

Participants and procedure

Individuals were recruited for a study on "why people like gifts" using flyers disseminated on and around campus, online, and during talks on HD from October 2016 to August 2017. These individuals completed the Saving Inventory – Revised (SI-R; Frost, Steketee, & Grisham, 2004) online to determine their eligibility for the study. Participants were eligible if they scored above the clinical cut-off on the excessive acquisition subscale of the SI-R (9+; Frost et al., 2004). Three hundred and sixty-one participants above the age of 18 years eventually completed this study. The majority of these participants scored above other SI-R clinical cut-offs: 62.9% exceeded the discarding difficulties clinical cut-off (SI-R \geq 14), 32.6% exceeded the

excessive clutter clinical cut-off (SI-R ≥ 17), and 55.9% exceeded the SI-R total score clinical cut-off (SI-R ≥ 41 ; Frost & Hristova, 2011; Frost et al., 2004). After providing informed consent, participants were randomly assigned to be excluded, included, or overincluded in a ball-throwing task (Cyberball; Williams, Cheung, & Choi, 2000). Immediately after the task, participants completed the Need Threat Questionnaire (Zadro, Williams, & Richardson, 2004), which measured their sense of belonging, control, self-esteem, and meaningful existence.

Following this, participants were presented with five potential “gifts” individually and in a randomized order (adapted from Mead et al., 2011). As people are more likely to anthropomorphize objects with physical human-like characteristics (Aggarwal & McGill, 2007), we replicated previous studies’ procedures using items with distinct human-like features (e.g., eyes and mouth; Bartz et al., 2016; Epley et al., 2008). These items included an M&M’s on A Couch M&M Dispenser, a clay plant pot with a painted face, a tea man infuser, a wine holder in the form of a waiter, and robot salt/pepper shakers (Appendix A). We used unowned items as we aimed to examine what factors underlie object acquisition. After viewing each object, participants completed questionnaires assessing its attributes and likeability. Participants completed a manipulation check after viewing all gifts to identify if they were aware of the purpose of the study before being debriefed. All participants were reimbursed with course credit or cash for participation in the study.

Social exclusion manipulation

Cyberball is a validated virtual ball-throwing task widely used to study social exclusion (Williams et al., 2000). As with previous Cyberball studies (e.g., Zadro et al., 2004), participants were informed that the Cyberball task was a mental visualization task to prepare them for the experiment. During the Cyberball task (version 4; <https://cyberball.wikispaces.com/>), participants imagined themselves playing a ball-tossing game with two confederates named Sarah and Matthew, whom the participant was led to believe were participants from another university. This fallacy was strengthened by the experimenter making a staged phone call to ensure participants at the other university were ready to begin (Zadro, Boland, & Richardson, 2006). Each player was depicted as an animated digital avatar within the task. Participants were instructed to throw the ball to one of the other players after receiving it. Following procedures used in previous studies (e.g., Van Beest & Williams, 2006; Zadro et al., 2006), Cyberball was truncated to 30 throws to avoid fatigue. Participants who were randomly assigned to the overinclusion condition received the ball half of the time (roughly 15 times), participants who were randomly assigned to the inclusion condition received the ball one third of the time (roughly 10 times), and participants who were in the exclusion condition received the ball twice before being excluded thereafter (e.g., Stillman et al., 2009).

Measures

Hoarding behaviors. The SI-R (Frost et al., 2004) is a self-reported measure that assesses excessive acquisition, clutter,

and difficulty discarding. Participants responded to 23 items on a scale ranging from 0 (*none/not at all*) to 4 (*almost all/extreme*). The SI-R has demonstrated good reliability for all three subscales in non-clinical and clinical samples (Moulding, Nedeljkovic, Kyrios, Osborne, & Mogan, 2017; Norberg, Keyan, & Grisham, 2015). The discarding and clutter subscales demonstrated good reliability in this study ($\alpha = .82$ and $.89$, respectively), but the acquisition subscale demonstrated poor reliability ($\alpha = .55$) likely due to the restricted range of scores on this subscale (Cortina, 1993).

Social exclusion manipulation check. Participants were asked to complete the Need Threat Questionnaire (Zadro et al., 2004) and the manipulation check question, “To what extent were you included by other participants during the game?” Responses could range from 1 (*not at all*) to 9 (*very much so*) and “excluded” participants had to score from 1 to 3, “included” participants had to score over 4, and “overincluded” participants had to score over 7 for their data to be included in study analyses. The 12 items from the Need Threat Questionnaire (Zadro et al., 2004) required participants to assess their levels of four fundamental psychological needs (belonging, control, meaningful existence, and self-esteem) on 9-point scales, from 1 (*not at all*) to 9 (*very much*). Items for each need were averaged to obtain subscale scores and higher scores referred to less belonging, less control, lower self-esteem, and less meaningfulness. In this study, items for belongingness ($\alpha = .79$), control ($\alpha = .82$), self-esteem ($\alpha = .83$), and meaningful existence ($\alpha = .72$) demonstrated adequate reliability.

Anthropomorphism. Participants rated the degree to which the inanimate objects possessed human-like characteristics using the Anthropomorphic Mental State ratings scale (AMS; Epley et al., 2008). Using five items, the AMS (Epley et al., 2008) assessed the extent to which each potential “gift” had a mind of its own, intentions, free will, consciousness, and emotions, on a scale from 1 (*not at all*) to 7 (*very much*). Responses for each object were individually summed. These object totals were then averaged to derive a total AMS score, with higher scores demonstrating stronger anthropomorphism. The AMS has demonstrated adequate internal consistency (Epley et al., 2008) and in the current sample, it demonstrated good internal consistency for each individual gift (ranged from $\alpha = .89$ – $.90$).

Object value. To assess sentimental and instrumental values, we used nine items derived from Mead et al.’s (2011) study on social exclusion and consumer behavior, and Richins’ (1994) study on object value. Two authors categorized these items into two categories separately using the definitions of sentimental and instrumental values provided by Frost and Steketee (2008). The two authors resolved discrepancies through discussion. The final sentimental value subscale consisted of six items addressing the emotional meaning of an object and the association between the object to a particular social connection (“it would provide comfort and emotional security,” “it would remind me of my relationship with a particular person,” “it would express what is unique about me, different from others,” “it would remind me of my family or a group of people I belong to,” “it would remind me of particular events or places,” and “it would be a record of my personal history”) using a 7-point scale from 1 (*not at all*) to 7 (*very much so*). In the

current sample, interitem correlations were medium to large for each individual gift (correlation coefficients ranged from $r = .33-.65$) (Hemphill, 2003). The sentimental subscale demonstrated good internal consistency for each individual gift (ranged from $\alpha = .83-.85$). The final instrumental value subscale consisted of three items addressing general perceptions of the potential utility or function of an object (“it would make me socially desirable, it would impress others,” “it would be practically useful,” “it would provide an opportunity to improve my life”) on the same 7-point scale. In the current sample, interitem correlations were small to medium for each individual gift (correlation coefficients ranged from $r = .27-.48$). The instrumental subscale demonstrated poor to adequate internal consistency for each gift (ranged from $\alpha = .60-.70$). This low Cronbach’s α coefficient is possibly due to the small number of items on the instrumental value subscale (Cortina, 1993) or the variability in instrumental value items on the scale.

Object attachment. Participants were asked three questions to assess object attachment: “How much do you like the object?,” “How much do you desire to own the object?,” and “How much would you like to receive the object as a gift?” These questions were created specifically for this study and were scored on a 7-point scale from 1 (*not at all*) to 7 (*very much so*) and then averaged. The questions demonstrated excellent reliability for each individual gift (ranged from $\alpha = .92-.93$).

Demographics. Participants were asked to complete a brief demographic questionnaire indicating their gender, age, ethnicity, whether they were currently studying at university, and the amount of tertiary education they had completed.

Statistical analysis

All statistical analyses were performed using SPSS 24.0 (IBM Cooperation, New York, USA). Before testing study hypotheses, we checked the data for statistical assumptions and usability. We then examined the effect of our social exclusion manipulation on variables of interest before running correlational analyses to examine bivariate relationships between our variables of interest.

In our final model, we used Model 4 of the PROCESS v 2.16 macro (Hayes, 2013) to test a parallel mediation model between X and Y through M_1 and M_2 . PROCESS utilizes bias-corrected bootstrapping to assess the indirect and direct effects of the variables by examining approximations of the estimated product of coefficients in the indirect paths (Hayes, 2013). To determine the significance of the indirect effect, 95% confidence intervals (CIs) were used, with confidence intervals resampled 10,000 times for each analysis (Hayes, 2013; Preacher & Hayes, 2008). To improve our confidence in the proposed model, we also ran models that reversed our mediators with our dependent variable (Sheets & Braver, 1999).

Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The institutional review board at Macquarie University approved the study. All

participants were informed about the study and provided informed consent prior to initiating the study. They were also provided with an opportunity to consent for the use of their data in research when debriefed about the use of deception at the end of the experimental session.

RESULTS

Social exclusion manipulation check

Of the 361 participants who completed the study, five Cyberball “excluded” participants were excluded from the study, because they did not report low feelings of inclusion after Cyberball. Five “included” and six “overincluded” participants were also excluded for not feeling included enough. A further 14 participants were excluded as they reported being fully aware of the aims of the study before being debriefed. Cut-off criteria were derived from mean manipulation check scores reported in previous studies (e.g., Williams et al., 2000; Zadro et al., 2004). Descriptive characteristics and group comparisons on variables of interest for the final sample ($N = 331$) are presented in Table 1. Of the 331 participants, 107 participants were randomly allocated to the exclusion condition, 111 to the inclusion condition, and 113 to the overinclusion condition.

As shown in Table 1, the groups differed in their four need threats and perceptions of inclusion after Cyberball, $p < .001$. Contrast analyses demonstrated that excluded participants reported feeling less included than included participants, $t(328) = -28.03$, $p < .001$, and that included participants felt less included than overincluded participants, $t(328) = 11.77$, $p < .001$. As for threats to the four fundamental psychological needs, excluded participants reported lower feelings of belongingness, $t(328) = 21.87$, $p < .001$; having less control, $t(328) = 20.76$, $p < .001$; less meaningful existence, $t(328) = 18.38$, $p < .001$; and lower self-esteem, $t(328) = 14.64$, $p < .001$ than included participants, whereas included participants reported lower feelings of belongingness, $t(328) = -4.56$, $p < .001$; having less control, $t(328) = -4.91$, $p < .001$; less meaningful existence, $t(328) = -3.00$, $p = .003$; and lower self-esteem, $t(328) = -2.98$, $p = .003$, than overincluded participants.

Social exclusion analyses

Before testing our hypothesized model, we ran preliminary tests to assess for statistically significant relationships between the study variables. Although all objects in this study had human-like qualities, people who compulsively acquire are known to view each object as infinitely unique (Kyrios, Frost, & Steketee, 2004). Thus, we first checked scores for anthropomorphism, object attachment, and value to understand, if the objects were perceived differently. Although the items differed slightly in anthropomorphism, sentimental and instrumental values, and object attachment (Appendix B), a mixed model analysis of variance revealed that anthropomorphism, sentimental value, and instrumental value scores for each individual gift did not differ as a function of our social exclusion manipulation (all $ps > .05$). Thus, we averaged the scores for each individual gift to create mean

Table 1. Means, standard deviations, count, and percentages for demographic characteristics and manipulation check

	All (N = 331)	Exclusion (n = 107)	Inclusion (n = 111)	Overinclusion (n = 113)	Statistics	p value
Sex (% female)	256 (77.3%)	76 (71.0%)	92 (82.9%)	88 (77.9%)	$\chi^2(2) = 4.40$.111
Age (years)	22.88 (7.75)	22.48 (7.73)	22.39 (6.61)	23.75 (8.74)	$F(2, 328) = 1.09$.339
Ethnicity					$\chi^2(8) = 5.20$.736
Caucasian	104 (31.4%)	37 (34.6%)	31 (27.9%)	36 (31.9%)		
European	35 (10.6%)	11 (10.3%)	8 (7.2%)	16 (14.2%)		
Middle Eastern	19 (5.7%)	5 (4.7%)	8 (7.2%)	6 (5.3%)		
Asian	143 (43.2%)	44 (41.1%)	54 (48.6%)	45 (39.8%)		
Other	30 (9.1%)	10 (9.3%)	10 (9.0%)	10 (8.8%)		
Completed tertiary education (years)	2.07 (1.26)	1.96 (1.24)	2.05 (1.28)	2.18 (1.26)	$F(2, 327) = 0.80$.448
SI-R Total	43.42 (12.17)	43.22 (13.01)	43.71 (11.66)	43.33 (11.95)	$F(2, 328) = 0.05$.951
Acquisition	14.78 (3.40)	14.67 (3.42)	14.78 (3.44)	15.07 (3.35)	$F(2, 328) = 0.86$.422
Discarding	15.08 (4.84)	14.89 (5.03)	15.04 (4.82)	15.31 (4.72)	$F(2, 328) = 0.22$.805
Clutter	13.59 (6.82)	13.86 (7.80)	13.94 (6.25)	12.98 (6.37)	$F(2, 328) = 0.67$.510
Manipulation check ^a	–	2.41 (0.82) ^a	6.67 (1.48) ^b	8.43 (0.95) ^c	$F(2, 328) = 832.10$	<.001**
Need threat						
Belonging	–	7.38 (1.22) ^a	3.54 (1.32) ^b	2.76 (1.34) ^c	$F(2, 328) = 397.58$	<.001**
Control	–	7.30 (1.09) ^a	3.47 (1.50) ^b	2.58 (1.45) ^c	$F(2, 328) = 369.90$	<.001**
Self-esteem	–	5.93 (1.72) ^a	2.99 (1.55) ^b	2.40 (1.13) ^c	$F(2, 328) = 177.21$	<.001**
Meaningful existence	–	6.70 (1.55) ^a	3.18 (1.28) ^b	2.61 (1.41) ^c	$F(2, 328) = 266.78$	<.001**
Anthropomorphism	12.19 (6.47)	12.01 (6.23)	13.12 (7.00)	11.45 (6.06)	$F(2, 328) = 1.94$.146

Note. Parameter estimates in each row that share superscripts do not differ significantly. χ^2 : chi-square, F : F -statistic.

^aThe manipulation check score represents an average of two items on a 9-point scale (ranging from 1 = *not at all* to 9 = *very much so*): “To what extent were you included . . .” and “Rejected – Accepted” (bipolar scale). A higher score refers to greater inclusion.

anthropomorphism, sentimental value, instrumental value, and object attachment scores. Our social exclusion manipulation did not affect anthropomorphism, $F(2, 328) = 1.94$, $p = .146$; instrumental value, $F(2, 328) = 2.64$, $p = .073$; or object attachment, $F(2, 328) = 1.45$, $p = .237$; however, it affected sentimental value, such that overincluded and included participants reported greater sentimental attachment to the objects than excluded participants, $F(1, 328) = 6.28$, $p = .013$. As the magnitude of the effect was small, $\eta_p^2 = 0.02$, the social exclusion variable was dropped from further analyses.

Although the social exclusion manipulation did not meaningfully affect the value of objects or participants’ attachment to the objects, we conducted an unplanned multiple regression model to determine if threats to the four psychological needs were predictive of anthropomorphism. Threats to belongingness, control, and meaningful existence were not associated with greater anthropomorphism (all p ’s $\geq .331$); however, greater threat to one’s self-esteem was associated with greater anthropomorphism, $b = 0.14$, $SE = 0.055$, $\beta = 0.134$, $t(329) = 2.46$, $p = .014$.

Pearson’s correlation coefficients were then calculated for the whole sample to identify the size of bivariate relationships between anthropomorphism, instrumental value, sentimental value, and object attachment for the overall sample. Our main variables of interest did not differ depending on gender. In regard to ethnicity, Caucasian participants rated each individual item as less human-like than Asian participants, $F(1, 326) = 13.66$, $p < .001$. We did not complete further analyses by gender or ethnicity. As we identified positive bivariate relationships between our variables of interest (Table 2), we proceeded with running a parallel multiple mediation model (Hayes, 2013). Parallel multiple mediation tested the hypothesis that sentimental and instrumental value may contribute to object attachment.

Parallel mediation analyses

Figure 1 presents the results from the parallel mediation tests using ordinary least squares path analysis (Model 4; Hayes, 2013) to examine the relationship between anthropomorphism and object attachment through instrumental and

Table 2. Count, percentages, and zero-order correlations for measures of interest

	Mean (SD)	Anthropomorphism	Instrumental	Sentimental	Object attachment
1. Anthropomorphism	12.19 (6.47)	–			
2. Instrumental	3.26 (0.94)	.410**	–		
3. Sentimental	3.05 (1.13)	.441**	.656**	–	
4. Object attachment	4.52 (1.04)	.201**	.609**	.455**	–

Note. Pearson’s correlations are noted in the table. SD: standard deviation of the mean.

** $p < .01$.

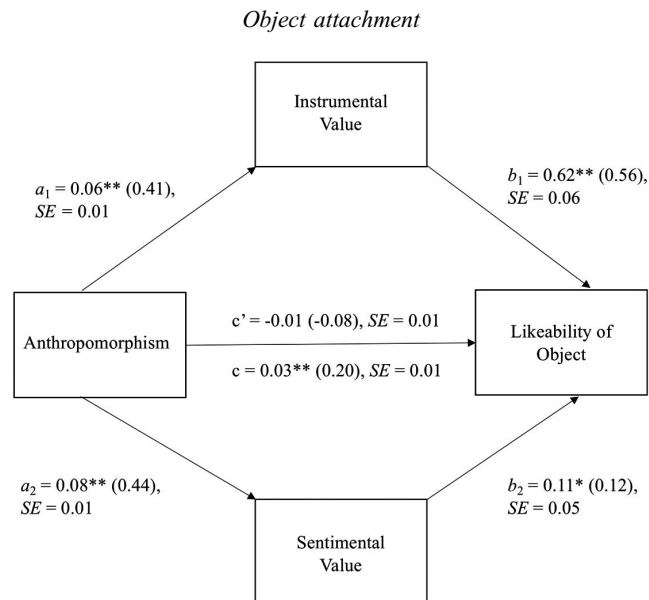


Figure 1. Multiple (parallel) mediation model of anthropomorphism (X) to object attachment (Y) through instrumental (M_1) and sentimental value (M_2). Unstandardized coefficients and standard errors of the mean (SE) are displayed in the figure. Standardized coefficients are displayed in parentheses next to the unstandardized coefficients

sentimental values. As shown in Figure 1, stronger anthropomorphism predicted greater instrumental value, $t(329) = 7.81, p < .001, 95\% \text{ CI } [0.04, 0.07]$ and greater sentimental value, $t(329) = 8.70, p < .001, 95\% \text{ CI } [0.06, 0.09]$. Greater instrumental value, $t(327) = 10.34, p < .001, 95\% \text{ CI } [0.51, 0.74]$ and greater sentimental value, $t(327) = 2.09, p = .037, 95\% \text{ CI } [0.01, 0.22]$ predicted greater object attachment. A bias-corrected bootstrap confidence interval for the indirect effect based on 10,000 bootstrap intervals was entirely above zero for instrumental value, $95\% \text{ CI } [0.03, 0.05]$ and sentimental value, $95\% \text{ CI } [0.00, 0.02]$. The strength of the indirect effects suggested that the indirect effect via instrumental value was greater than the indirect effect via sentimental value, $95\% \text{ CI } [0.01, 0.05]$. There was no evidence of a direct effect (c') between anthropomorphism and liking, $95\% \text{ CI } [-0.03, 0.00]$, though the total effect (c) was statistically significant, $95\% \text{ CI } [0.02, 0.05]$, which provides evidence for full mediation. In our reversed models with instrumental and sentimental values as the outcome variable, both models demonstrated partial mediation (direct effect/s: $c' = 0.22, SE = 0.01, 95\% \text{ CI } [0.01, 0.03]$; $c' = 0.04, SE = 0.01, 95\% \text{ CI } [0.02, 0.05]$, respectively), increasing our confidence for the proposed model.

DISCUSSION

This study aimed to test whether acute social exclusion increased object attachment via anthropomorphism's effects on an object's perceived instrumental and sentimental values. When including, excluding, or overincluding participants in an online ball-tossing game, we did not find a relationship between social exclusion and anthropomorphism. However, consistent with our hypotheses, greater instrumental and sentimental values mediated the relationship between anthropomorphism and greater liking of unowned objects.

Overall, this study adds to the body of research that inconsistently links social exclusion and loneliness with

anthropomorphism (Bartz et al., 2016; Claus & Warlop, 2011; Epley et al., 2008; Feng, 2016). There are a number of reasons why this study may have been unable to replicate previous findings that social exclusion leads to stronger anthropomorphic tendencies (Bartz et al., 2016; Epley et al., 2008). First, in regard to anthropomorphism, we showed participants five "gifts" that they were not allowed to keep. Anthropomorphizing and seeking comfort from an object that cannot be owned may be dangerous as it could lead to further social exclusion (Cacioppo, Norris, Decety, Monteleone, & Nusbaum, 2009; Feng, 2016; Park & Maner, 2009). Thus, socially excluded individuals may be more likely to anthropomorphize and seek comfort from objects that can be owned. Research on HD highlights the importance of ownership as individuals with HD only appear to have difficulty making decisions about personal items (Grisham, Norberg, Williams, Certoma, & Kadib, 2010; Tolin et al., 2012; Wincze, Steketee, & Frost, 2007). Second, the AMS (Epley et al., 2008) items are abstract and philosophical (e.g., "free will" and "consciousness"), which require complex deductive reasoning skills to answer (Neave et al., 2015). Dispositional measures have been revised in recent years to reduce this abstract nature (e.g., the Graves Anthropomorphic Task Scale, Burgess et al., 2018; Anthropomorphism Questionnaire, Neave et al., 2015), but this has yet to be done for situational measures. Based on measures from the dispositional literature, items such as "this object has a friendly personality" may be easier for individuals to comprehend and answer (Burgess et al., 2018; Neave et al., 2015).

Our social exclusion manipulation may also explain why we did not find a relationship between social exclusion and anthropomorphism. First, we studied acute social exclusion, whereas other studies have focused on chronic loneliness (Bartz et al., 2016; Epley et al., 2008). While both loneliness and social exclusion lead to deficits in belongingness (Baumeister & Leary, 1995), these two forms of low belonging may not motivate the same behavior

(Stillman et al., 2009). In addition, this study found that greater threats to one's self-esteem, but not threats to belongingness, led to greater anthropomorphism. This suggests that examining threats to self-esteem may help us better understand what leads to anthropomorphism, and ultimately object attachment (Park & Maner, 2009). Second, attachment theory predicts that social exclusion only results in negative consequences when it is done by significant others (Bowlby, 1969; Mikulincer & Shaver, 2016). As participants in this study were rejected by "strangers," our social exclusion manipulation may not have been sufficient to induce anthropomorphism. Manipulations that require participants to recall a time in which they were excluded or unsupported by a close friend or loved one (e.g., Keefer, Landau, Rothschild, & Sullivan, 2012; Mourey, Olson, & Yoon, 2017) may be more likely to induce anthropomorphism. Thus, future studies should allow participants to take home study items, use a measure of chronic loneliness, an anxious attachment priming manipulation, and a more concrete, contextual measure of anthropomorphism to clarify the relationship between social exclusion and anthropomorphism.

Our hypothesis that stronger anthropomorphism would predict greater sentimental and instrumental values, which would in turn lead to greater object attachment was supported. This finding is in line with theoretical models (Epley et al., 2007; Frost & Hartl, 1996), and with prior research documenting a link between anthropomorphism and comfort and security (Keefer, 2016; Neave et al., 2016). While the role of sentimental value in hoarding has been well-acknowledged within the literature (e.g., Frost & Hartl, 1996; Steketee, Frost, & Kyrios, 2003), a growing amount of research has demonstrated that individuals with HD acquire and save potentially useful items to avoid guilt associated with wasting useful objects (Frost, Steketee, Tolin, Sinopoli, & Ruby, 2015; Nordsletten et al., 2013). This suggests that examining an object's perceived instrumental value is as important as understanding how individuals with HD might derive comfort from an anthropomorphized item. However, before being able to effectively integrate Epley et al.'s (2007) tenets to Frost and Hartl's (1996) cognitive-behavioral model of HD, we need to better understand what mechanisms acutely lead to anthropomorphism. This should involve examining how threats to one's self-esteem may motivate individuals to anthropomorphize and acquire new items. Consumer and social psychologists have posited that people purchase consumer goods that represent their own values in order to enhance their self-esteem (Arndt, Solomon, Kasser, & Sheldon, 2004; Richins, 1994). These goods may in turn form part of one's extended self and reflect one's personal identity (Belk, 1988). While difficulties with self-concept appear to be related to hoarding and compulsive buying (Frost, Kyrios, McCarthy, & Matthews, 2007), few studies have experimentally examined how threats to one's self-esteem or self-concept may motivate individuals to seek social connection and attachment in objects. Exploring this may help us better understand what mechanisms lead to anthropomorphism and object attachment in HD.

Although cultural influences on anthropomorphism were not part of our main hypotheses, our finding that Asian participants had higher average anthropomorphism scores

than Caucasian participants contributes to the limited research on culture and anthropomorphism. In the three-factor theory of anthropomorphism, Epley et al. (2007) posited that people from collectivist cultures may anthropomorphize more than people from individualistic cultures due to the value placed on social affiliation in collectivist cultures (Markus & Kitayama, 1991). Similar to this study, Wang (2017) found that Asian undergraduates anthropomorphized their smartphones more than Caucasian participants, but found that cultural orientation, one's personal affiliation toward collectivism and individualism, did not affect anthropomorphism. This suggests that the relationship between culture and anthropomorphism is complex and perhaps cannot be reduced to a simple dichotomy between collectivism and individualism, particularly in predominantly westernized samples (Wang, 2017).

Limitations

The results of this study should be interpreted considering its limitations. First, in regard to measurement issues, although we followed Frost and Steketee's (2008) definitions for sentimental and instrumental values when categorizing items on our object value measure, our measure has not been validated. Our instrumental value subscale demonstrated α ratings of low reliability ($\alpha = .60-.70$), and although this could be explained by the limited number of items on the subscale (Cortina, 1993), it is also possible that our instrumental value subscale was too broad or multidimensional (e.g., a scale that measures practical utility, functional ability, etc.; Schmitt, 1996). For example, items such as "...it would be practically useful" and "...it would impress others" may not target the same type of utilitarian value. As individuals with HD may anthropomorphize their possessions due to a strong sense of responsibility to protect and control their items (Frost, Hartl, Christian, & Williams, 1995), it may be beneficial to include items that address the functional ability of an item in establishing control before using exploratory and confirmatory factor analyses to examine the psychometric properties of this measure. Second, in this study, the SI-R acquisition subscale had poor internal consistency ($\alpha = .57$). Although this could imply that the subscale is multidimensional (Schmitt, 1996), others have criticized the accuracy of Cronbach's α in capturing the internal consistency of a measure (Sijtsma, 2009). In order to address this, future studies may choose to utilize structural equation modeling to better assess correlations of latent variables underlying acquisition in hoarding.

Third, although we chose to look at items with human-like physical characteristics, because they are more likely to be anthropomorphized than objects without these features (Aggarwal & McGill, 2007; Epley et al., 2007), we may not have needed to do this, because individuals with HD assign human-like characteristics to possessions regardless of their resemblance to humans (Frost & Hartl, 1996). As people with HD save clothes, books, and letters more frequently than novelty items (Mogan, Kyrios, Schweitzer, Yap, & Moulding, 2012), future studies should utilize such objects. Finally, many participants in this study were university students with SI-R acquisition scores in the subclinical to clinical range. As we did not include a diagnostic interview,

we do not know how many participants met diagnostic criteria for HD. Thus, our findings may not be representative of a clinical hoarding population. Thus, caution should be made when drawing direct inferences of our findings to individuals with HD.

CONCLUSIONS

Despite these limitations, this study is the first experimental investigation that tests the tenets of Epley's theory of anthropomorphism and Frost and Hartl's (1996) cognitive-behavioral model of hoarding concurrently. Although we did not find a significant relationship between acute social exclusion and anthropomorphism, the study found cross-sectional empirical evidence that individuals with acquiring problems may like unowned objects they perceive as human-like as these items seem sentimental and useful. In order to obtain data necessary for expanding Frost and Hartl's (1996) cognitive-behavioral model of hoarding, future research should include an anxious attachment priming manipulation, psychometrically validated object attachment and anthropomorphism measures, and allow participants to keep the objects examined in order to mimic real-life to a greater degree.

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