



ARTICLE

The Effect of Self-Investment on Hoarding Tendency of Chinese College Students: Role of Psychological Connections

Xiangli Guan¹, Yue Zhang², Yang Li¹, Yaqi Zhang^{1,*}, Jingjing Wang¹, Xuejiao Li¹, Mary C. Jobe³, Md Zahir Ahmed⁴ and Oli Ahmed⁵

¹School of Teacher Education, Yuxi Normal University, Yuxi, 653100, China

²Faculty of Psychology, Southwest University, Chongqing, 400715, China

³Department of Psychological and Brain Sciences, The George Washington University, Washington DC, 20052, USA

⁴College of Teacher Education, Zhejiang Normal University, Jinhua, 321004, China

⁵Department of Psychology, University of Chittagong, Chattogram, 4331, Bangladesh

*Corresponding Author: Yaqi Zhang. Email: zhangyaqi@yxnu.edu.cn

Received: 13 October 2022 Accepted: 21 November 2022 Published: 05 May 2023

ABSTRACT

Because of factors such as energy and time one invests in an object, the stronger the connection, value, and reluctance to lose said object individual will have. Hoarding behavior arises when individuals incorporate a strong attachment with themselves to an object. The purpose of this study is to examine the effect of self-investment on hoarding tendency and the roles of possession-self link and liking level in this connection. A hypothetical model of the relationship between self-investment, possession-self link, liking level, and hoarding tendency was tested. A convenience sampling method was used to survey 450 college students in Yunnan Province on either a paper-based or online self-report scale. The data were collected using self-investment, possession-self link, and liking level questionnaires, as well as the Saving Inventory Revised. Results showed positive relationship between the study variables, ranging from 0.37 to 0.87. College students' self-investment had a direct positive predictive effect on hoarding tendency; self-investment, in turn, indirectly predicted hoarding tendency through the mediating effect of possession-self link; and individual liking level of items had a moderating effect for self-investment on the possession-self link. This study shows how self-investment affects the hoarding tendency of college students, and the results of this study also help demonstrate the value of self-investment and possession-self link in optimizing students' hoarding tendency and thus promoting good psychological status.

KEYWORDS

Hoarding tendency; self-investment; psychological connections; possession-self link; liking level

1 Introduction

In some fashion or another, we have all experienced some level of hoarding—when we keep something objectively useless but claim it has clearly affected our life and are unwilling to throw it away. Hoarding refers to the acquisition or inability to discard items that have no use or value. The most commonly hoarded items are clothes, newspapers, magazines, books, food, and packaging, while recent studies have



shown that hoarding can be extended even to animals [1] and digital files [2]. Although hoarding has a negative connotation, it is necessary for human survival. Hoarding behavior is essential for individuals to obtain food, clothing, adequate shelter, and other necessities of life. We need to save these gathered necessities when environmental conditions require them. For example, during a new crown epidemic, hoarding necessary living materials is particularly important for survival. In addition, hoarding can be important for our psychological and social functioning [3]. For example, in many cultures, the clothes and other items we acquire may be seen as representing our social status or our own self-definition. Shopping and other acquisition behaviors it is a part of our social and leisure patterns. For example, many people may go to the mall on weekends not only to shop, but also to see friends, have fun, and acquire information about our changing world. In those experiences, we retain these sentimental objects to remind us of our past and to connect us to people who own or collect similar items or share those purchasing experiences with us. In a world where people are becoming increasingly distant from each other, such tangible mementos are especially important in connecting us to our past and in expressing or helping provide a concrete connection to identity and others.

However, like most aspects of human behavior, hoarding behaviors range from normal and adaptive to excessive and even pathological. Studies have shown that the prevalence of hoarding behaviors in the general population is 2.3%–6% [4], suggesting that hoarding behaviors are not uncommon. More importantly, the emergence of hoarding behaviors in childhood or adolescence suggests that hoarding behaviors may require earlier intervention [3]. In addition, hoarding disorders have high co-morbidity rates. For example, obsessive-compulsive disorder, major depressive and anxiety disorders (including social phobia and generalized anxiety disorder), autism, major alcohol dependence, and Alzheimer's disease [4], as well as high co-morbidity rates with other psychiatric disorders complicate the diagnosis of hoarding disorders [3].

Why do individuals develop hoarding behaviors? A range of factors that contribute to hoarding behavior has been given, including memory, waste avoidance, and aesthetic reasons [4,5]. Hoarders experience strong negative emotions and even show extreme emotional reactions when discarding their possessions. This emotional attachment to the hoard is responsible for the difficulty when discarding and is an important trait of hoarders [6,7]. Two types of emotional attachment have been found to exist in studies of hoarders [5]. One of these is the perception of possessions as part of the self. Kellett et al. argue that “there is a sense of integration between hoarders and their possessions;” and they found that hoarders have difficulty defining the boundaries between the self vs. non-self and their possessions [7]. Hoarders also compare throwing away items to “feeling like a part of me is dying” or “throwing away a part of me” [8]. With this, hoarders often feel that their possessions are an extension or part of themselves. For example, the object is beautiful, and if I keep it, I will be beautiful too. Another is “possessions as security signals,” in which “possessions provide a source of comfort and security and may signify a safe environment” [4]. Hoarders derive more comfort from their possessions than non-hoarders and experience anxiety in the absence of their possessions. This type of attachment is consistent with the evolutionary model of hoarding biology, which views hoarding as an adaptive behavior to ensure adequate resources and a secure environment [9]. Finding comfort and security in storage may also be associated with a higher incidence of stressful or traumatic life events among hoarders. It is possible that “negative early developmental factors influence the perceptions of and associations with possessions for those with hoarding problems so that possessions help them experience a sense of security” [8]. When an individual incorporates an item into the self, they will not want to discard it—even if it is objectively of little use or value. Evidence from cognitive neuroscience suggests that the enhanced association between self and shape makes it difficult to later associate that shape with another individual [10]. Thus, demonstrating the integrative psychological challenges dispelling hoarding tendencies can present for someone.

However, not all hoarding tendencies reach a clinical diagnosis. For some, hoarding objects may not be done in such great quantity, but in quality. Although these tendencies—of collecting objectively useless things that have affected one's life enough to the point where they are unwilling to discard them—still

exist across people, the difference may lie in the value placed on the hoarded objects one has. Furby noted that the more attention an individual pays to an object, the more likely they are to relate to that object [11]. Kamleitner used the balloon metaphor to nicely demonstrate that the more time spent on an object, the more likely it is to be perceived as relevant, unique, and irreplaceable [12]. An individual's perceptions, attitudes, feelings, and commitment and care for their own body can improve their evaluation of not only themselves but possibly objects as well [13]. Hodder elaborated that the way an individual extends their appreciation for themselves through objects may be due to self-investment [14]. For example, a potted flower or a small ornament may slowly enter the individual's identity as they change the arrangement, clean it, and adjust it day after day. The self-extension theory also emphasizes that the most common method of establishing a connection between the self and an object is created, where the individual invests mental energy into the product of creation through labor; therefore, the increase in the value of labor may reflect the effort invested by the individual [15]. Many amateur painters hang their paintings of very average artistic value on the wall as if they were treasures, refusing to sell them or asking excessive prices for them. However, if they are given a similar painting by another amateur painter, they may not choose to buy it or are willing to pay only a small amount of money. The reason for this phenomenon may be that the individual has not only time, cognition, and energy invested in the creative process, but also self-projected spiritual energy, emotion, and meaning—which is what increases the psychological value of their own work. Perhaps the work objectively has a price, but the self-investment behind the work, especially the emotional investment, is priceless; and these products have become an expression of the self, just like our words, thoughts and emotions.

We have all had the experience that for two identical objects, people prefer the one they have worked harder to get. This is also the case even for objects they have participated in making, even if they are inferior, individuals will give them a higher value. Self-investment refers to the process by which individuals actively or passively invest their cognition, feelings, and energy in an object [16]. Self-investment indicates that there is a “self” flow between the individual and the object and that the individual is engaged in activities that direct cognitive, energetic, imaginative, and other aspects to the object. The self-investment in an object leads to the object becoming one with the self; because for the individual, the object's value emerges from the self-investment [17]. In the process of creating, shaping, or producing something, the individual is accustomed to attaching oneself to the object, such as, “I made it, mine” and “You made it, yours” [18]. Park et al. [19,20] studied brand-self relationships and found that brands and selves can vary from no relationship to a fully overlapping relationship depending on the degree of intimacy. It has also been shown that individuals have a higher possession-self link for objects within their sphere of self; rate their liking level and attractiveness higher, and negative emotions such as regret and frustration are more pronounced when losing this object [21]. Possession-self link also does not consist only of material entities themselves, but also of the individual's psychological possessiveness of these tangible objects. According to Ferraro et al., the most meaningful possessions are those that help gain/or strengthen one's self-identity and thus better construct and symbolize the self (i.e., establish stronger object-self links) [21]. Based on this, we can speculate that a possession-self link is created for an object due to an individual's self-investment, which in turn leads to the development of hoarding behavior.

It has been noted that individuals have different cognitive processing styles when confronted with different objects [22]. Specifically, when confronted with an object with a low level of motivation, there is a tendency to think intuitively, while when confronted with an object with a high level of motivation, there is a tendency to think rationally. Needs are internal factors that generate motivation, whereas triggers are external factors that generate motivation, and individual likes and preferences influence perceptions. When the object of self-investment is not something that one likes, because of the investment already put into the object one can still establish a connection with the self. And when self-investment is in an object that one likes, the object is incorporated into the self to a greater extent and a

stronger possession-self link is established. For example, when we particularly like an object of others, we invest more time and energy in the object by borrowing it, and then we rightfully forget to return it and take it for ourselves after a long time. In summary, this study aims to investigate how the hoarding tendency is formed from the perspective of self-investment and the roles of possession-self link and liking level in the formation process. Therefore, this study hypothesizes (H) the following:

H.1. Self-investment directly predicts hoarding tendency;

H.2. Self-investment indirectly predicts hoarding tendency through a possession-self link;

H.3. At different levels of liking (lower, moderate, and higher), the strength of the association between self-investment and possession-self link is different, in that the strength of the association is weaker at lower liking levels and stronger at higher liking levels (see Fig. 1).

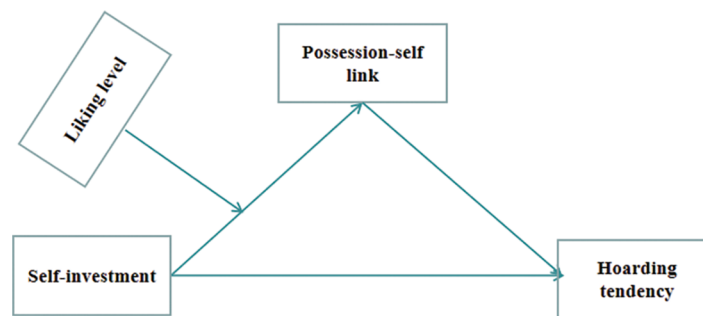


Figure 1: Hypothetical model of the role of self-investment and possession-self link on hoarding tendency

2 Method

2.1 Participants

The convenience sampling method was used to select the sample, and the surveyed participants included 450 college students from Yuxi Normal College (Yunnan, China) on March 2022. Among the participants, 90% of them were from different regions of the Yunnan Province and 10% were from other provinces. The response scale was rechecked at the end of the survey and 54 invalid questionnaires, including missing questions and routine questions, were removed, for a total of 396 valid questionnaires. The age of the participants ranged from 17 to 22 years ($M = 19.7$; $SD = 1.0$ years). Of these, 287 (72.5%) were female and 109 (27.5%) were male. Table 1 contains the demographic information of the respondents.

Table 1: Demographic information of the participants

| Variables | Groups | Frequency (%) |
|--------------------------|--------------------------------|---------------|
| Sex | Female | 287 (72.5%) |
| | Male | 109 (27.5%) |
| Age | Below 20 years old (18–19) | 204 (51.5%) |
| | 20 years old and above (20–24) | 192 (48.5%) |
| Monthly household income | 3000 RMB and below | 185 (46.7%) |
| | 3001 RMB to 7000 RMB | 152 (38.4%) |
| | Above 7000 RMB | 59 (14.9%) |
| Only child | Only child | 129 (32.6%) |
| | Not an only child | 267 (67.4%) |

2.2 Procedure

Psychology teachers went into the classroom to administer the anonymous field test, as well as trained classroom teachers to administer the online survey. Questionnaires were distributed to each class' Microsoft group. Participants were told not to participate again if they had already participated in the study in any mode (online or offline). The response scales were checked and 54 invalid questionnaires were excluded, yielding a total of 396 valid questionnaires with an 88% validity rate. Software such as SPSS 26.0 and PROCESS v.3.3 were used for data management and data analysis.

2.3 Measures

2.3.1 Saving Inventory Revised

This study used the Saving Inventory Revised, which was revised several times by Frost et al. based on numerous clinical studies and has been widely used for self-rating hoarding symptoms [4]. It contains 23 items with 3 subscales: excessive acquisition of purchased and free items (7 items, e.g., "To what extent do you control your urge to acquire things?"), preservation and hard-to-discard behaviors (7 items, e.g., "How painful do you feel throwing things away?"), and excessive clutter caused by these behaviors (9 items, e.g., "How often do you decide to keep things you do not need and do not have room for?). Participants responded to each question using a five-point scale, ranging from 0 (none) to 4 (completely, extremely, or extremely frequently). The total score ranged from 0 to 92. Diagnostic criteria: a total score of 41 or less is considered normal, a total score between 41 and 62 is considered non-clinical hoarding tendency, and a score of 62 or more is considered a clinical hoarding patient [23]. The questionnaire has been widely used [4] and in this study, Cronbach's alpha coefficient was .94.

2.3.2 Self-Investment Questionnaire

The self-investment questionnaire was adapted from the self-investment questionnaire developed by Brown et al. [24], and the word "Job" in the original questionnaire was changed to a "thing" with a referent according to the needs of the study. In the questionnaire's guiding phrase, subjects were asked first to recall an object they had recently obtained with difficulty but was not necessary. Then, they had to answer a self-investment questionnaire with 5 questions (e.g., "I have invested a major part of 'myself' into this item," "I have invested many of my ideas into this item") in the questionnaire. Participants responded to each item on a scale of seven-point Likert-type scale, ranging from 1 (does not fit at all) to 7 (very much fits). The total scores ranged between 5 and 35. The higher the score, the stronger the self-investment generated by the individual, measured in terms of the content of the investment as well as the overall investment, respectively. Since its development, the questionnaire has been widely used [25], and in this study, Cronbach's alpha coefficient was .97.

2.3.3 Possession-Self Link Scale

This study used Ferraro et al.'s Possession-self link scale [21] with 6 items (e.g., "This possession and I had a lot in common," "I derived some of my identity from this possession"). Participants responded on each item using a seven-point Likert-type scale, ranging between 1 (doesn't fit at all) and 7 (very much fits). The total scores ranged between 6 and 42. The higher the score, the stronger the degree of the object-ego relationship produced by the individual. Since its development, the questionnaire has been widely used [21,26], and in the present study, Cronbach's alpha coefficient was .91.

2.3.4 Liking Level Questionnaire

Referring to the study by Dohle et al. [27], we designed the liking level questionnaire, containing 3 items: "I like this object very much," "this is better, compared to the same object," and "this object meets some of my needs." Participants responded on each item using a seven-point Likert-type scale, ranging between 1 (does not fit at all) and 7 (very much fits). The total scores ranged between 3 and 21. The higher the score, the more the individual likes the object. The Cronbach's alpha coefficient in this study was .90.

2.4 Ethics

Human subjects were used in this study, so we followed the Declaration of Helsinki and it is all later amendments. The Ethical Committee of Yuxi Normal University, Yuxi, China has approved the study (ERB No. 2022005, dated: 18/3/2022). Prior to the start of the survey, students were informed of the intent of the survey, the costs and benefits, the time required to complete the survey, and the confidentiality of the data. To ensure that students understood the nature of the study, they were provided with an informed consent form to participate in this study.

3 Results

3.1 Common Methodological Deviations

This study used a self-assessment scale, which may result in common method bias (CMB). Therefore, the privacy of the subjects was protected during the testing process, some items were controlled by reverse scoring, and the common method bias in data processing was examined using Harman's one-way analysis of variance. The results showed that a total of six factors with eigenvalues greater than 1 explained 64.75% of the variance, and the first factor explained 30.79% of the variance, which was below the critical value of 40%, indicating that the effect of the common method bias was not significant.

3.2 Descriptive Statistical Analysis

Table 2 presents the descriptive statistics of the study variables. Kim suggested that data are non-normal when skewness values are greater than or equal to 2 and kurtosis values are greater than or equal to 7 [28]. In the present study, the data skewness of the variables ranged from 0.1 to 0.37, while the kurtosis ranged from -0.22 to 0.02, both of which are below the recommended threshold values for evaluating normality. The correlations between Self-investment, Possession-self link, Liking level, and Hoarding tendency were all positive. The correlations between the variables were statistically significant ($p < .01$).

Table 2: Descriptive statistics of study variables ($n = 396$)

| Variables | <i>M</i> | <i>SD</i> | Skewness | Kurtosis | 1 | 2 | 3 | 4 |
|-------------------------|----------|-----------|----------|----------|-------|-------|-------|---|
| 1. Self-investment | 3.66 | 0.05 | 0.14 | -0.10 | 1 | - | - | - |
| 2. Possession-self link | 3.76 | 0.05 | 0.10 | -0.22 | .77** | 1 | - | - |
| 3. Liking level | 3.89 | 0.06 | 0.23 | -0.02 | .72** | .87** | 1 | - |
| 4. Hoarding tendency | 1.54 | 0.03 | 0.37 | 0.02 | .40** | .39** | .37** | 1 |

Note: *M* = mean; *SD* = standard deviation. ** $p < .01$, *** $p < .001$.

3.3 Mediating Effect of Possession-Self Link, Moderating Effect of Object Liking Level

The SPSS macro process v3.3 program was used to test the mediated model with moderation. Analyses were conducted to determine whether the relationship between self-investment, possession-self link, and hoarding tendency was moderated by liking level. In all analyses, the bias-corrected percentile Bootstrap method test was used to estimate 95% confidence intervals for various effects using a replicate sample of 5000. The mediating model test with moderation entails estimating the parameters of three regression equations: first, to test the predictive effect between the independent variable (self-investment) and the dependent variable (hoarding tendency); second, to test the effect of the mediating variable (possession-self link) on the relationship between the independent variable (self-investment) and the dependent variable (hoarding tendency); and again, to test the moderating effect of the moderating variable (liking

level) on the relationship between the independent variable (self-investment) and the dependent variable (possession-self link).

A moderated mediating effect exists if the model satisfies the following conditions: (1) the predictive effect of self-investment on hoarding tendency is significant; (2) the predictive effect of self-investment on possession-self link is significant and the predictive effect of possession-self link had a significant predictive effect on hoarding tendency, and (3) the interaction effect of self-investment and object liking level on possession-self link was significant (see Fig. 2).

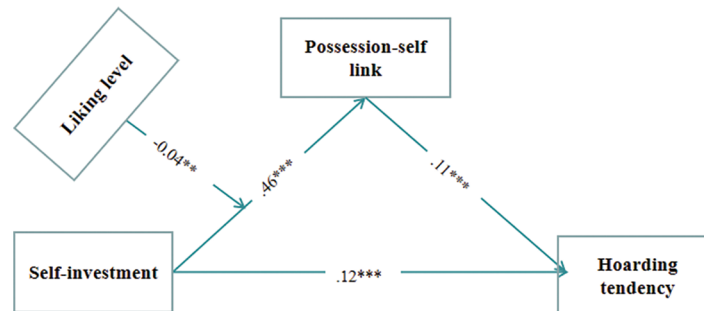


Figure 2: The path model of hoarding tendency

To test the mediating effect of the possession-self link and the moderating effect of liking level, the SPSS macro process model7 developed by Hayes [29] (which is consistent with the theoretical hypothesis model of this study) was used. The results of the regression analysis are shown in Table 3, where the mediating effect of the possession-self link and the moderating effect of the object-liking level is verified. First, the regression equation was established with self-investment as the independent variable and possession-self link and hoarding tendency as the dependent variables. Self-investment had a significant positive predictive effect on the possession-self link (Coeff=0.46, SE=0.07, $t=6.42$, $p < .001$); self-investment had a significant positive predictive effect on hoarding tendency (Coeff=0.12, SE=0.04, $t=3.32$, $p < .001$); and self-investment with liking level had a significant interaction effect on the possession-self link (Coeff = -0.04, SE = 0.02, $t = -2.69$, $p < .01$).

Table 3: Tests for mediating effects with moderation

| Variables | Possession-self link | | | Hoarding tendency | | |
|--------------------------------|----------------------|------|----------|-------------------|------|---------|
| | Coeff | SE | t | Coeff | SE | t |
| Self-investment | 0.46 | 0.07 | 6.42*** | 0.12 | 0.04 | 3.32*** |
| Possession-self link | | | | 0.11 | 0.04 | 2.85*** |
| Liking level | 0.74 | 0.06 | 11.51*** | | | |
| Self-investment x Liking level | -0.04 | 0.02 | -2.69** | | | |
| R^2 | 0.29 | | | 0.17 | | |
| F | 92.48*** | | | 41.30*** | | |

Note: Coeff = coefficient; SE = standard error.

Second, the regression analysis was conducted with the possession-self link as the independent variable and hoarding tendency as the dependent variable. The results showed that the possession-self link had a significant positive predictive effect on hoarding tendency (Coeff=0.11, SE=0.04, $t=2.85$, $p < .001$). In

addition, the 95% confidence intervals for both the direct effect of the self-investment on hoarding tendency and the mediating effect of possession-self link did not contain 0, indicating that self-investment not only directly predicted hoarding tendency but also through the mediating effect of possession-self link. Therefore, the effect of self-investment on hoarding tendency remains significant after adding the possession-self link, indicating that the possession-self link plays a mediating role between self-investment and hoarding tendency. And when the liking level enters the model, a moderating effect appears. Specifically, self-investment, possession-self link, and liking level all positively predict hoarding tendency—and the self-investment and liking level interaction term had a significant negative predictive effect on hoarding tendency (Coeff=0.04, SE=0.02, $t = -2.69$, $p < .01$), with a 95% confidence interval of $[-0.07, -0.01]$. Thus, the liking level moderates the effect of self-investment on the possession-self link, and the mediating model, with moderation, holds.

To more clearly reveal the interaction effect of self-investment and liking level, a simple effect analysis was conducted to group liking level by one standard deviation above and below the mean, with the mean plus one standard deviation for the high liking group and the mean minus one standard deviation for the low liking group. The direct effect values of the variable self-investment on the variable possession-self link and their 95% Bootstrap confidence intervals are shown in Table 4.

Table 4: Analysis of the mediating effect of self-investment on possession-self link at different liking levels

| Liking level | Coeff | Boot SE | <i>t</i> | Boot LLCI | Boot ULCI |
|----------------|-------|---------|----------|-----------|-----------|
| <i>M</i> – 1SD | 0.34 | 0.04 | 9.11*** | 0.27 | 0.41 |
| <i>M</i> | 0.29 | 0.03 | 9.29*** | 0.23 | 0.35 |
| <i>M</i> + 1SD | 0.24 | 0.04 | 6.84*** | 0.17 | 0.31 |

Note: M = Mean; SD = Standard deviation; Coeff = coefficient; SE = standard error; LLCI = Lower level confidence interval; ULCI = upper level confidence interval.

Meanwhile, this study also examined the role of liking level in the relationship of self-investment and possession-self link using simple slopes. The moderating effect is shown in Fig. 3. The positive predictive effect of self-investment on possession-self link was significant for subjects with lower liking levels, with a simple slope of 0.34 ($t = 9.11$, $p < .001$). For subjects with higher liking levels, the positive predictive effect of self-investment had a significant positive predictive effect on the possession-self link with a simple slope of 0.24 ($t = 6.84$, $p < .001$). This indicates that the predictive effect of self-investment on the possession-self link decreased with the increase in liking level; showing a weakening trend.

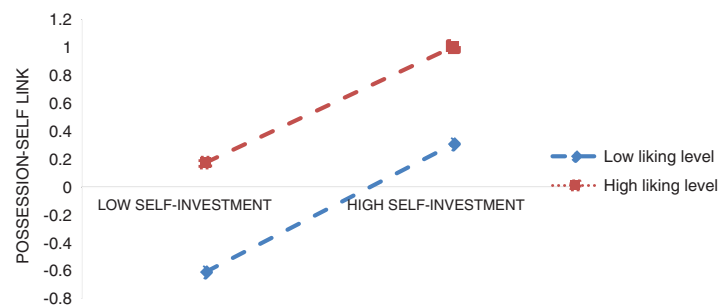


Figure 3: The moderating effect of liking level on self-investment and possession-self link

4 Discussion

The results of this study show that self-investment is positively and directly related to hoarding tendency. The higher an individual's self-investment, the higher the hoarding tendency. Conversely, the lower the self-investment, the lower the hoarding tendency. In addition, self-investment positively predicted the possessive-self link; the possessive-self link positively predicts the hoarding tendency, and self-investment indirectly predicted the hoarding tendency through the possessive-self link. Based on these results, higher self-investment will lead to a higher possession-self link, and a higher possession-self link will lead to a higher hoarding tendency, which is consistent with existing research [19,20]. Park et al. found that brand and self can vary from no relationship to a fully overlapping relationship depending on the level of intimacy [19]. It has also been shown that individuals who have a higher possession-self link to objects within their sphere of self, rate their liking level and attractiveness higher; and the negative emotions such as regret, and frustration are more pronounced when losing this object [21]. In a field study [30], researchers had kayak renters either think of a nickname for a local lake or not. The researchers thought that giving a nickname to the lake was an invitation to the self. After that, the researchers planted trash on the lake, anchored it to control the location of the trash, and situated it so that each kayak would have to pass close to a piece of trash either going out from the rental location or returning. Observing people's trash-picking behavior, it was found that those who gave the lake a nickname tried to pick up more trash than those who did not. The authors concluded that thinking of a nickname is an investment in the self, which increases the psychological link to the lake, and leads people to take better care of the lake by picking up trash [30]. Based on this, for hoarders, an intervention can be carried out by withdrawing self-investment. This approach involves spatially distancing the object from the self, such as placing the object in a garage, attic, or other invisible "transition location" prior to disposal [31]. Doing so reduces the individual's interaction and input with the object, thereby reducing control and knowledge of the object. Furthermore, "isolating possessions in invisible transitional places gradually shifts those possessions from the realm of 'I' to the realm of 'non-I'" [31], so physical distance may also help to reduce the ego's investment in objects. Although hoarders have strong psychological attachments to hoarded objects and withdrawal of inputs may be less popular with hoarders, withdrawal of inputs is still a valid approach.

The present study also found that self-investment predicted possession-self link, and possession-self link predicted hoarding tendency; therefore, self-investment could indirectly predict hoarding tendency through object self-association. The results of this study can be explained by the self-extension theory. Self-extension theory emphasizes that the most common method of establishing a connection between the self and an object is creation, where the individual invests mental energy into the product of creation through labor, and therefore the increase in the value of labor may reflect the effort invested by the individual [15]. Hodder illustrates the ways in which an individual's self-extension may involve self-investment [14]. In the process of creating, shaping, or producing something, individuals are accustomed to labeling objects by connecting themselves to them (e.g., it was made by me, so it is mine) [18]. Individuals gradually incorporate objects that are not related to them into the sphere of the self by investing (e.g., time, energy, money) to establish direct psychological connections with external material objects. In the literature this has been shown, such as with Park et al. who that found for brand-self relationships depending on the degree of intimacy, brands and selves can vary from no relationship at all to a fully overlapping relationship [19,20]. People with hoarding tendencies feel this too, seeing their possessions as an extension or part of themselves or may feel a sense of responsibility to look after them. They often anthropomorphize objects, giving them human qualities, and prefer the company of their possessions to that of others. In addition, they may keep possessions to maintain a connection to the past ('like my mum was always with me') or as compensation for a traumatic past. The reason for this may be that the individual invests not only time, cognition, and energy in the creative process, but also self-projected

mental energy, emotion, and meaning, which is what adds psychological value. Although there may be a psychological cost for this expended mental energy, to these individuals the time and emotion invested in the object are not seen as burdensome; as these objects have become as much an expression of the self as one's own words, thoughts and emotions.

The results of this study also showed that self-investment was positively related to liking level. The self-liking level was also positively related to possession-self link. And liking level for an object moderated the effect of self-investment on possession-self link. Overall, the stronger the possession-self link is for increasing self-investment; for a highly liked object, the stronger the possession-self link is with increasing self-investment; for a less liked object, self-investment increases and the stronger the possession-self link is as well. Perhaps, it is more likely for a favorite item to become a part of oneself as a satisfaction of heart expectation and motivation. While on the other hand, the time and energy invested by an individual in a low favorite item bring a stronger possession-self link, which is perhaps the feeling from not having much expectation at the beginning to the surprise coming later. Based on this, interventions for hoarders can be carried out by finding alternatives. Encourage subjects to take a picture or video of the item before disposing of it, allowing them to maintain mental ownership of the item even after it is discarded. Taking a photograph may represent a personal meaning associated with the item (e.g., a specific memory or emotion) being retained in the photograph, making it easier to discard the item itself [31,32]. Photographs may also help to preserve memories, thereby reducing the identity threat of abandoning the product [33]. Peck and Chu suggested that the practice of substitution may also help to maintain psychological ownership of the item [30]. Peck and Chu found that receiving a souvenir of the item increased consumers' willingness to abandon the item [30]. Thus, preserving a photograph of an item may reduce negative emotional reactions to disposing of the item by maintaining a psychological connection to the item when actual ownership has ended.

5 Research Limitations and Future Prospects

This study also has some limitations that need to be improved in future studies. First, the results of the cross-sectional study design cannot infer causality, so, future longitudinal designs or experimental studies should be used to explore the causal relationship between self-investment and hoarding tendency through convergent cross-sectional designs, multi-layer linear models, or manipulation of independent and mediating variables. Second, this study was conducted during the New Crown epidemic. The impact of the New Crown epidemic on individuals' habits and consumption habits was tremendous. People were more inclined to hoard some daily necessities. This study was a specific result for a specific period. Finally, the study was conducted in teacher training colleges in southwest China, where there are more female students. Therefore, the proportion of male students in the sample is low. In future studies, the data of college students should be more comprehensive and more in-depth to explore the gender differences in hoarding tendency in the new period of the new crown epidemic. In addition, this study found a significant correlation between self-investment and hoarding tendency, mediated by the possession-self link and moderated by liking level. Further studies can adopt experimental approaches and designs to continue to understand the role of self-investment and possibly the neural mechanisms behind the hoarding tendency.

6 Conclusions

In summary, this study is unique in distinguishing the relationship between self-investment and hoarding tendency among Chinese college students. In order to explore the existing literature, the results of this study embody hoarding tendency and other related factors, revealing the effects of self-investment, liking level, and possession-self link on college students' hoarding tendency. We found that college students' self-investment predicted hoarding tendency, the possession-self link played a mediating role, and liking level played a moderating role in this predictive relationship. Based on this, we suggest that a psychological intervention

based on self-investment can reduce their tendency to hoard. The present study also provided effective ways of handling items that were tested to help non-clinical hoarders improve hoarding behavior tendencies. The results of this study contribute to the improvement of hoarding tendency in college students.

Acknowledgement: We would like to express our sincere gratitude to the respondents for their time to complete the survey.

Funding Statement: This research was supported by Yunnan Provincial Philosophy and Social Science Planning Youth Project under Grant No. QN2018055.

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.

References

1. Ferreira, E. A., Paloski, L. H., Costa, D. B., Fiametti, V., De Oliveira, C. R. et al. (2017). Animal hoarding disorder: A new psychopathology? *Psychiatry Research*, 258, 221–225. <https://doi.org/10.1016/j.psychres.2017.08.030>
2. Sweeten, G., Sillence, E., Neave, N. (2018). Digital hoarding behaviours: Underlying motivations and potential negative consequences. *Computers in Human Behavior*, 85, 54–60. <https://doi.org/10.1016/j.chb.2018.03.031>
3. Kajitani, K., Tsuchimoto, R., Nagano, J., Nakao, T. (2019). Relevance of hoarding behavior and the traits of developmental disorders among university students: A self-reported assessment study. *BioPsychoSocial Medicine*, 13(1), 13. <https://doi.org/10.1186/s13030-019-0156-1>
4. Frost, R. O., Steketee, G. (2014). *The oxford handbook of hoarding and acquiring*. New York: Oxford University Press.
5. Kyrios, M., Mogan, C., Moulding, R., Frost, R. O., Yap, K. et al. (2018). The cognitive-behavioural model of hoarding disorder: Evidence from clinical and non-clinical cohorts. *Clinical Psychology & Psychotherapy*, 25(2), 311–321. <https://doi.org/10.1002/cpp.2164>
6. Haws, K. L., Walker Naylor, R. W., Coulter, R. A., Bearden, W. O. (2012). Keeping it all without being buried alive: Understanding product retention tendency. *Journal of Consumer Psychology*, 22, 224–236. <https://doi.org/10.1016/j.jcps.2011.05.003>
7. Kellett, S., Holden, K. (2014). Emotional attachment to objects in hoarding: A critical review of the evidence. In: Frost, R. O., Steketee, G. (Eds.), *The Oxford handbook of hoarding and acquiring*, pp. 120–138. New York: Oxford University Press.
8. Steketee, G., Frost, R. O. (2014). Phenomenology of hoarding. In: Frost, R. O., Steketee, G. (Eds.), *The Oxford handbook of hoarding and acquiring*, pp. 19–32. New York: Oxford University Press.
9. Kellett, S. (2007). Compulsive hoarding: A site-security model and associated psychological treatment strategies. *Clinical Psychology and Psychotherapy*, 14, 413–427. <https://doi.org/10.1002/cpp.550>
10. Wang, H., Humphreys, G., Sui, J. (2016). Expanding and retracting from the self: Gains and costs in switching self-associations. *Journal of Experimental Psychology: Human Perception and Performance*, 42(2), 247–256. <https://doi.org/10.1037/xhp0000125>
11. Furby, L. (1978). Possession in humans: An exploratory study of its meaning and motivation. *Social Behavior and Personality*, 6(1), 49–65. <https://doi.org/10.2224/sbp.1978.6.1.49>
12. Kamleitner, B. (2014). A metaphorical synthesis of the impact of ownership on consumer behavior. *Social Science Electronic Publishing*, 2770609. <https://doi.org/10.2139/ssrn.2770609>
13. Wang, J., Guan, X., Yin, S., Shen, S., Li, X. et al. (2022). The influence of body investment on depression in Chinese college students: A moderated mediating effect. *International Journal of Mental Health Promotion*, 24(1), 39–50. <https://doi.org/10.32604/ijmhp.2022.019635>
14. Hodder, I. (2012). *Entangled: An archaeology of the relationships between humans and things*, pp. 217–219. Malden, MA: Wiley-Blackwell, John Wiley & Sons.

15. Marsh, L. E., Kanngiesser, P., Hood, B. (2018). When and how does labor lead to love? The ontogeny and mechanisms of the IKEA effect. *Cognition*, 170, 245–253. <https://doi.org/10.1016/j.cognition.2017.10.012>
16. Norton, M. I., Mochon, D., Ariely, D. (2012). The IKEA effect: When labor leads to love. *Journal of Consumer Psychology*, 22(3), 453–460. <https://doi.org/10.2139/ssrn.1777100>
17. Lee, J., Suh, A. (2015). How do virtual community members develop psychological ownership and what are the effects of psychological ownership in virtual communities? *Computers in Human Behavior*, 45, 382–391. <https://doi.org/10.1016/j.chb.2014.12.002>
18. Ferguson, S. M., Olewnik, A. T., Cormier, P. (2014). A review of mass customization across marketing, engineering and distribution domains toward development of a process framework. *Research in Engineering Design*, 25(1), 11–30. <https://doi.org/10.1007/s00163-013-0162-4>
19. Park, C. W., Eisingerich, A. B., Park, J. W. (2013). Attachment-aversion (AA) model of customer-brand relationships. *Journal of Consumer Psychology*, 23(2), 229–248. <https://doi.org/10.1016/j.jcps.2013.01.002>
20. Macinnis, D. J., Folkes, V. S. (2017). Humanizing brands: When brands seem to be like me, part of me, and in a relationship with me. *Journal of Consumer Psychology*, 27(3), 355–374. <https://doi.org/10.1016/j.jcps.2016.12.003>
21. Ferraro, R., Escalas, J. E., Bettman, J. R. (2011). Our possessions, our selves: Domains of self-worth and the possession–self link. *Journal of Consumer Psychology*, 21(2), 169–177. <https://doi.org/10.1016/j.jcps.2010.08.007>
22. Faghihi, U., Estey, C., McCall, R., Franklin, S. (2015). A cognitive model fleshes out Kahneman’s fast and slow systems. *Biologically Inspired Cognitive Architectures*, 11, 38–52. <https://doi.org/10.1016/j.bica.2014.11.014>
23. Tolin, D. F., Frost, R. O., Steketee, G. (2010). A brief interview for assessing compulsive hoarding: The hoarding rating scale-interview. *Psychiatry Research*, 178(1), 147–152. <https://doi.org/10.1016/j.psychres.2009.05.001>
24. Brown, G., Pierce, J. L., Crossley, C. (2014). Toward an understanding of the development of ownership feelings. *Journal of Organizational Behavior*, 35(3), 318–338. <https://doi.org/10.1002/job.1869>
25. Kirk, C. P., McSherry, B., Swain, S. D. (2015). Investing the self: The effect of nonconscious goals on investor psychological ownership and word-of-mouth intentions. *Journal of Behavioral and Experimental Economics*, 58, 186–194. <https://doi.org/10.1016/j.socecon.2015.04.013>
26. Stander, M. W., Coxen, L. (2017). A review of the relationship between positive leadership styles and psychological ownership. In: Olckers, C., Van Zyl, L., van der Vaart, L. (Eds.). *Theoretical orientations and practical applications of psychological ownership*, pp. 37–60. Springer Nature: Cham. <https://doi.org/10.1007/978-3-319-70247-6>
27. Dohle, S., Rall, S., Siegrist, M. (2014). I cooked it myself: Preparing food increases liking and consumption. *Food Quality and Preference*, 33, 14–16. <https://doi.org/10.1016/j.foodqual.2013.11.001>
28. Kim, H. Y. (2013). Statistical notes for clinical researchers: Assessing normal distribution (2) using skewness and kurtosis. *Restorative Dentistry & Endodontics*, 38(1), 52–54. <https://doi.org/10.5395/rde.2013.38.1.52>
29. Hayes, A. F. (2015). An index and test of linear moderated mediation. *Multivariate Behavioral Research*, 50(1), 1–22. <https://doi.org/10.1080/00273171.2014.962683>
30. Peck, J., Luangrath, A. W. (2018). Looking ahead: Future research in psychological ownership. In: Peck, J., Shu, S. (Eds.). *Psychological ownership and consumer behavior*, pp. 239–258. Springer Nature: Cham. https://doi.org/10.1007/978-3-319-77158-8_15
31. Lastovicka, J. L., Fernandez, K. V. (2005). Three paths to disposition: The movement of meaningful possessions to strangers. *Journal of Consumer Research*, 31(4), 813–823. <https://doi.org/10.1086/426616>
32. Winterich, K. P., Reczek, R. W., Irwin, J. R. (2017). Keeping the memory but not the possession: Memory preservation mitigates identity loss from product disposition. *Journal of Market*, 81(5), 104–120. <https://doi.org/10.1509/jm.16.031>
33. Irwin, J. R., Winterich, K. P., Naylor, R. W. (2013). Identity preservation: If i can remember it, you can have it. In: Botti, S., Labroo, A. (Eds.), *Advances in consumer research*, pp. 279–279. Duluth, MN: Association for Consumer Research.