

# Psychological ownership and affective reaction: Emotional attachment process variables and the endowment effect

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## Abstract

This research proposes that the concept of emotional attachment, and specifically the independent constructs of psychological ownership and affective reaction, can help explain many of the endowment effect findings documented in the literature. We define these constructs and then test them across a set of nine studies in which we both replicate previous and generate new endowment effect findings, and then show that psychological ownership and affective reaction can mediate the effects. In doing so, we offer direct empirical support for the idea of emotional attachment as a driver of loss aversion while also providing practitioners and future endowment effect researchers with new insights about the psychological processes that underlie the endowment effect.

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The endowment effect, under which consumers' valuation of an object increases once they have taken ownership of it, has proven to be a highly robust finding in economics and marketing for almost thirty years (Kahneman, Knetsch, & Thaler, 1990; Knetsch & Sinden, 1984; Thaler, 1980). The effect has been replicated in a variety of settings and with multiple objects, including lottery tickets, mugs, pens, and chocolate bars. More recent research on the endowment effect has considered how other manipulations, such as emotion, object valence, ownership duration, and changes in cognitive perspective moderate the basic endowment finding (Brenner, Rottenstreich, Sood, & Bilgin, 2007; Carmon & Ariely, 2000; Lerner, Small, & Loewenstein, 2004; Strahilevitz & Loewenstein, 1998).

It has long been presumed that loss aversion is the primary driver of the endowment effect; sellers, whose reference point

has been changed due to receipt of the endowed object, feel stronger loss aversion than buyers (or choosers) who have not been endowed. The question of what underlies this loss aversion, particularly as measured through experiments on the endowment effect, is not clearly understood. A step forward was provided by Ariely, Huber, and Wertenbroch (2005), whose paper explored two proposed drivers of loss aversion: emotional attachment and cognitive perspective. Their survey of the endowment effect literature is organized around these two mechanisms for understanding the effect, and they encourage future researchers to provide a more robust psychological investigation into these constructs.

Our research supports the concept of emotional attachment as an explanation for many of the endowment effect findings documented in the literature and also integrates cognitive perspective as a moderator of such effects. While Ariely et al. (2005) suggested a single combined construct, emotional attachment, we propose and show empirically that this mechanism is actually two separate constructs: psychological ownership (attachment) and affective reaction (emotion). As described in Fig. 1, psychological ownership measures whether

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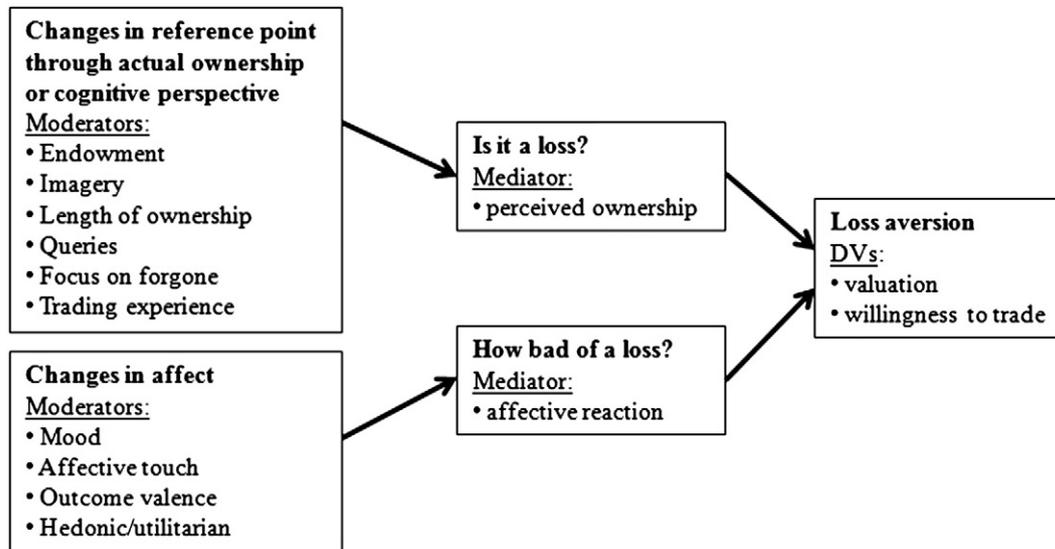


Fig. 1. Predicted mediation and moderation relationships.

or not a loss is perceived, and is moderated by both actual ownership and changes in cognitive perspective. Affective reaction measures the intensity of the loss and is moderated by affective variables such as mood, valence, or hedonic content. We review evidence from the literature for each of these constructs and describe the questions we use to operationalize them in our studies. We then test them across a set of nine studies in which we replicate previous endowment effect findings and show that psychological ownership and affective reaction can mediate these previous effects. In doing so, we offer empirical support for the idea of emotional attachment as a driver of loss aversion, while also providing practitioners with new insights for increasing endowment in retail settings and providing future endowment effect researchers with new measures that can be used to understand the psychological origins of their effects.

### Psychological ownership: Is it a loss?

The ownership that is typically manipulated in the endowment effect literature is legal ownership; in fact, the original Kahneman et al. (1990) paper was written as a critique of the Coase Theorem, which dealt directly with issues of legal ownership and property rights. Ownership is clearly an important aspect of loss aversion, as without ownership, there would not be loss. A key aspect of loss aversion is reference dependence; the object must be integrated into the individual's endowment so that not having it is seen as a loss. In other words, the individual must assess "is it a loss?" before loss aversion becomes relevant.

In the traditional endowment effect experiments, the reference point shifts through actual legal ownership. This shift has been shown to happen almost immediately with receipt of the object and continues to strengthen over time (Strahilevitz & Loewenstein, 1998). However, recent literature on the endowment effect has suggested that legal ownership may not be required to get the

effect. For example, anticipatory possession or pseudo-endowment can have similar psychological effects to legal ownership, even when the individual does not have legal possession of the object (Ariely & Simonson, 2003). Carmon, Wertenbroch, and Zeelenberg (2003) demonstrated through a comprehensive set of studies that option attachment, generated by "prefactual ownership" of an option, can be affected by amount of deliberation, physical proximity, and other manipulations. Psychological ownership has been explored in other domains as well. Pierce, Kostova, and Dirks (2001) define it as being characterized by the feeling that something is "mine". Employees in an organization may develop feelings of ownership towards the organization (Pierce et al., 2001) and young children may claim ownership of songs if they hear them first (Isaacs, 1933).

We propose that a measure of psychological (or perceived) ownership can be used to capture these feelings of ownership, and that this measure can then be used as a mediator for valuation. While we believe that legal ownership and psychological ownership are closely related (i.e., legal owners will have higher psychological ownership than legal non-owners), we also believe that psychological ownership and legal ownership can operate separately from each other. Specifically, psychological ownership can exist without legal ownership, as with prefactual ownership or through imagery, touch, or creative design (Fuchs, Prandelli, & Schreier, 2010; Peck & Shu, 2009; Reb & Connolly, 2007). In contrast, legal ownership can operate without psychological ownership when the reference point is shifted so that the object is no longer part of the endowment, such as through changes in cognitive perspective (Johnson, Häubl, & Keinan, 2007; List, 2003). In these situations, "not owning" becomes the reference point, and giving up the object is no longer seen as a loss. To measure psychological ownership, we use a three question scale derived from the psychological ownership measure used by Pierce et al. (2001). The three questions used to measure psychological ownership are, "I feel a very high degree of personal ownership

of [the item],” “I feel like I own [the item]” and “I feel like this is my [item],” each on a seven-point scale anchored by endpoints “strongly disagree” and “strongly agree”.

### Affective reaction: How bad of a loss?

The role of affect in prospect theory, and especially loss aversion, has attracted significant attention in recent years (see Rottenstreich & Shu, 2004 for a review). Whether defined as affect or emotion, an individual’s “gut feelings” toward an object have been shown to be an important aspect of how value is determined. Hsee and Rottenstreich (2004) showed that valuation of an object can be separated into two psychological processes, one based on calculation and another based on feeling. Valuation by feeling is also closely related to the affect heuristic (Finucane, Alhakami, Slovic, & Johnson, 2000) or feelings-as-information theories (Schwarz & Clore, 1983). Schwarz and Clore (1983) argue that people frequently value an object by asking, “How do I feel about this?” Such an approach implies that feelings not related to the object, such as overall mood, can also affect the resulting valuation. Loss aversion appears to increase as the emotional aspect of the decision increases, especially for strongly negative emotions (Baron, 1986; Luce, Payne, & Bettman, 1999). Together, these findings suggest that greater levels of emotion or affect in a decision have a significant effect on loss aversion. Specifically, higher affective content can increase the perceived size of a loss, as the individual asks “how bad of a loss is this?” Positive or negative affect associated with the object (Brenner et al., 2007; Dhar & Wertenbroch, 2000) as well as feelings not directly related to the object (Lerner et al., 2004) can thus moderate the size of the endowment effect by changing the amount of pain associated with the loss.

We propose that affective reaction toward an object is an important mediator of valuation in the endowment effect. For example, positive affective reaction toward an object has been found to mediate the relationship between physical touch and valuation (Peck & Shu, 2009). Our measurement of affective reaction toward an object is based on the PANAS scale (Watson, Clark, & Tellegen, 1988) and variants of this scale have been used by researchers in marketing (e.g., Murry & Dacin, 1996). Participants are told, “Here is a list of emotional reactions you may have experienced while evaluating the product. Please indicate how much you felt each of these emotional reactions.” Nine items on 5-point scales are used to measure positive affective reactions (interested, moved, captivated, inquiring, delighted, enthusiastic, appealed, satisfied, amused) and nine items measure negative affective reactions (puzzled, irritated, annoyed, fed up, bewildered, scared, nervous, resentful, furious) with endpoints of “not at all” and “a lot”. Since positive and negative affective reactions have been found to be independent in previous research, we keep them as separate measures throughout our studies, although we expect that positive affective reaction is the more powerful driver for the generally positive items (mugs, chocolate) used in most endowment effect experiments.

### Moderators of psychological ownership and affective reaction

We propose that many of the effects that have been documented in the endowment effect literature are effects of increased psychological ownership, increased affective reaction, or both. For example, Ariely et al. (2005) suggested that changes in cognitive perspective can moderate endowment effects—we agree with this perspective, and further predict that cognitive perspective has a significant effect on the psychological ownership measure. Manipulations that focus the individual’s cognitive attention on the positive qualities of the object will increase attachment as measured through psychological ownership. Instructions that ask a participant to take the perspective of an owner, even in the absence of legal ownership, will also have this effect. Carmon et al. (2003) measured post-decision discomfort rather than psychological ownership, but their findings demonstrate that such perspective-taking manipulations increase option attachment. Recent research has found that psychological ownership can be increased through touch for objects that are not legally owned (Peck & Shu, 2009; Reb & Connolly, 2007). Based on these prior findings, we expect that studies that manipulate length of ownership (Strahilevitz & Loewenstein, 1998), reasons for selling or keeping an object—including query theory (Johnson et al., 2007) and a focus on the forgone (Carmon & Ariely, 2000)—or market experience in buying and selling objects (List, 2003) will all affect psychological ownership.

We predict that increases in affective reaction toward an object, which increase the affective power of a loss, will also mediate many endowment effect findings. Affective reaction could be either a stronger emotional reaction to the object itself or a carryover of affect from other sources that change one’s feelings toward the object. We expect that studies that manipulate emotion (Lerner et al., 2004), valence of the possessed item (Brenner et al., 2007), hedonic vs utilitarian features (Dhar & Wertenbroch, 2000), and unpleasantness of touch will all affect affective reaction toward an object. Further, we expect that most effects will be driven by changes in positive affective reactions toward the object, but some studies (particularly those with unpleasant touch or negatively valenced items) may also have an effect on negative affective reactions. A summary of these moderators and the mediators through which they operate is provided in Fig. 1.

### Studies of mediators of the endowment effect

#### *A note on methodology*

An issue that has regularly come up in the endowment effect literature is a question of methodology—specifically, whether the Becker, DeGroot, and Marshak (1964) procedure (hereafter, BDM) is the best empirical method for measuring loss aversion for endowed items. We are agnostic on this particular issue, and we have taken the approach of using whichever methodology, BDM or binary choice, has been adopted in the original studies we are replicating and extending. As a result, both types of methodology will appear in this paper. Regardless of methodology

used, mediations are always performed using the same set of measured variables—psychological ownership and affective reaction—so that the underlying processes can be compared, even if the direct measures cannot.

Within each study's results section, results are reported using two sets of analyses. The first set of results analyzes the data using the same tests and reporting as in the original study, so that our results can easily be compared to previous findings. Once replication of the basic effect has been tested, the next portion of the results includes mediation analyses to see whether psychological ownership and affective reaction are successful at mediating the main effects.

### *Overview of studies*

The studies in this paper can be categorized into two methodological types. The majority of studies are traditional endowment effect studies, using BDM methodology. Besides testing a baseline condition of the original endowment effect (Kahneman et al., 1990), these studies include manipulations of time of ownership (Strahilevitz & Loewenstein, 1998), query theory (Johnson et al., 2007), emotions (Lerner et al., 2004), and unpleasant touch (Peck & Shu, 2009). All of our replications of these BDM experiments use the same item for buying and selling: a black Uni-ball Signo pen with a rubber grip, worth approximately \$1.50. All participants in these studies were drawn from the same large undergraduate subject pool and the experiments were run within the same two week timeframe so that differences between particular studies are minimized and results could be compared. Participants completed the studies in exchange for course extra credit. No individual participant was allowed to participate in more than one of these studies.

The second type of studies that we replicate uses binary choice instead of valuation, consistent with the original literature from which they were drawn. Most of these studies are paper and pencil studies with hypothetical outcomes, with the exception of choice of hedonic vs utilitarian options (Dhar & Wertenbroch, 2000), for which the actual products were used. The other binary choice studies include manipulations of possession loss aversion (Brenner et al., 2007), focus on the forgone (Carmon & Ariely, 2000), and market experience (List, 2003). For all studies, we use either real choice or hypothetical scenarios according to what was done in the original study; the only exception to this rule is the study on market experience (List, 2003), which uses hypothetical scenarios instead of actual experienced traders.

In addition to separating the studies according to their methodology, the studies can be grouped according to our predictions of which of the two proposed mediators is being affected by the original manipulation. Our initial study, Study 1, is a simple replication of the traditional endowment effect (Kahneman et al., 1990). In this study, we introduce the use of the new constructs and show that these two measures mediate the effect of ownership on valuation. Studies 2 through 5 focus on manipulations that are expected to affect the psychological ownership measure, including length of ownership, reasons for selling or keeping the object, and market experience. For these

studies, we expect that psychological ownership will mediate the effects on valuation. Finally, Studies 6 through 9 focus on manipulations that are expected to alter individuals' affective reaction toward the object. We expect that this will occur for studies that manipulate emotion, valence, hedonic vs utilitarian features, and unpleasant touch. We further expect that these changes in affective reaction, either positive or negative, will mediate valuation.

For each type of study, once the dependent variable of either price or choice (keep or switch) has been collected, participants proceeded to a set of questions designed to solicit measures of psychological ownership and current affective reaction for the target item.<sup>2</sup> As described earlier, psychological ownership was measured through a three-item scale and the affective reaction measure is an 18-item scale designed around the PANAS scale. In all studies, the three psychological ownership items were averaged to form one score, the nine positive affective reaction items were averaged, and the nine negative affective reaction items were averaged (all  $\alpha$ 's > .89). To ensure that these constructs were indeed independent measures, a factor analysis with varimax rotation was done with the full set of twenty-one items collected across all nine studies. The factor analysis confirms that the three psychological ownership items loaded highly on one factor, the nine positive affective reaction items loaded highly on the second factor, and the nine negative affective reaction items loaded highly on the third factor. Based on the results of this factor analysis, we treat psychological ownership, positive affective reaction, and negative affective reaction as independent measures for the remainder of the paper. These constructs will be the measures with which we test for mediation of the endowment effect in each of our nine studies.

### **Study 1: Baseline endowment effect for pens**

The purpose of this first study was to demonstrate the traditional endowment effect and its relationship between psychological ownership and affective reaction. We predicted that ownership would increase both psychological ownership and positive affective reaction toward the object, and that these two measures would mediate the effect of seller/chooser role on valuation. This study also provides a baseline measure of valuation for the pen used in several of the later studies.

### *Method*

Participants were 67 undergraduate students in a Midwest business school's introductory marketing classes and completed the exercise in groups of up to thirty at one time in exchange for

<sup>2</sup> As proposed mediators, the psychological ownership and affective reaction measures could have been collected prior to valuation or choice. They were collected second for two reasons. First, to keep participants actively engaged in the BDM buying/selling market, we maintained their focus on the valuation decision prior to moving on to other measures. Second, since some research has shown that collecting affect measures can reduce the impact of emotion on later choice (Keltner, Locke, & Audrain, 1993), we collected affective reaction measures only after all other questions were completed.

course extra credit. Consistent with traditional endowment effect studies (Kahneman et al., 1990), we divided participants into sellers and choosers. Participants were told that the decisions they made to buy and sell in this market would be completed for real money. The item to be traded, a rubber-grip pen, was introduced to the participants. Sellers were told that they own a pen and it is theirs to keep unless they choose to sell it, while choosers were told that they did not yet own a pen but would have the option to receive one. They then recorded their valuations by indicating their willingness to sell or buy the object at each possible price along a continuum of \$0 to \$6 (at \$.20 intervals). After completing the remaining questionnaire items, including the psychological ownership and affective reaction measures for the pen, final selling prices for the pens were determined by random draw. This valuation elicitation process is consistent with Becker et al. (1964) procedures and was designed to elicit true valuations from the participants. After the final price was established, all participants left the experiment with either the pen or cash according to the decisions they had made during the valuation process.

## Results

A summary of main results for this study and all other pen endowment studies is provided in Table 1. As expected, we find significantly greater willingness to accept prices among sellers than willingness to pay prices among choosers, replicating the basic endowment effect (\$2.3 vs \$1.67,  $F(1, 65) = 5.36, p = .02$ ). We also find that our mediating constructs, psychological ownership and positive affective reaction, were both greater for sellers than for choosers (4.69 vs 2.28,  $F(1, 65) = 45.99, p < .001$  for psychological ownership; 3.01 vs 2.40,  $F(1, 65) = 8.09, p = .006$  for positive affective reaction), as we expected. There was no significant difference in negative affective reaction between seller/chooser roles as would be expected for a generally positive item like the pen.

These results are consistent with an emotional attachment explanation for loss aversion, under which valuation of an endowed object increases due to increases in both psychological ownership and affect. To more convincingly assess this relationship, we ran a series of regressions to test for mediation.

First, the earlier findings were repeated for the main effect of the chooser/seller role on valuation ( $\beta_{\text{role}} = .64, t = 2.31, p = .02$ ). Next, consistent with the results reported earlier, the chooser/seller role was significantly related to psychological ownership ( $\beta_{\text{role}} = 2.4, t = 6.78, p < .001$ ), and the chooser/seller role was significantly related to positive affective reaction toward the object ( $\beta_{\text{role}} = .61, t = 2.85, p = .006$ ). Next, psychological ownership and positive affective reaction were both significantly related to valuation ( $\beta_{\text{po}} = .37, t = 6.0, p < .001$ ;  $\beta_{\text{aff}} = .51, t = 3.54, p = .001$ ). Finally, a regression was run with valuation as the dependent variable in which all three variables were included, and found that the relationship between valuation and the role conditions became non-significant in the presence of psychological ownership and affective reaction, suggesting full mediation ( $\beta_{\text{role}} = .45, t = 1.5, p = .14$ ). Sobel tests further indicated that psychological ownership ( $z = 4.58, p < .001$ ) and affective reaction ( $z = 2.21, p = .03$ ) were significant mediators of chooser/seller role condition on valuation. Reverse causality was also tested by using valuation as the mediator and affective reaction or psychological ownership as the dependent variable; the results show that role condition is still significant, so valuation is not mediating these other constructs. Regressions were also run in which only one of the two proposed mediating constructs were included; the ownership role condition remained marginally significant when either only psychological ownership or only affective reaction was included. Thus, neither psychological ownership nor affective reaction were sufficient on their own to fully mediate valuation; both constructs played an important role in determining how participants valued the object.

## Study 2: Length of ownership

Our second study was designed to replicate Study 2 of Strahilevitz and Loewenstein (1998), in which valuation is increased by increasing length of ownership. We predicted that an increased duration of ownership would allow the individual to become more attached to the object, increasing psychological ownership, and that this change in psychological ownership would mediate the effects of duration of ownership on valuation.

Table 1  
Summary results table—pen valuations.

Study, manipulation	Role	n	Price (\$)	Psychological ownership (1–7)	Positive affective reaction (1–5)	Negative affective reaction (1–5)
S1: Baseline	Chooser	34	1.67	2.28	2.40	1.42
S1: Baseline	Seller	33	2.30	4.69	3.01	1.48
S2: Short endowment	Seller	36	1.71	3.97	2.74	1.20
S2: Long endowment	Seller	35	2.34	4.87	2.75	1.19
S3: Value decreasing query	Chooser	30	1.44	2.17	2.68	1.24
S3: Value increasing query	Chooser	28	1.89	2.91	2.56	1.27
S6: Disgust	Chooser	30	1.67	2.80	2.57	1.56
S6: Disgust	Seller	30	1.90	4.32	2.76	1.43
S6: Sadness	Chooser	30	2.71	3.21	3.02	1.26
S6: Sadness	Seller	29	2.05	4.20	2.54	1.41
S8: Unpleasant touch	Chooser	31	.79	1.70	1.87	2.04
S8: Unpleasant touch	Sellers	29	.59	3.14	2.02	2.44

We did not expect longer duration of ownership to have an effect on affective reaction toward the object.

### Method

Participants were 71 undergraduate students in a Midwest business school's introductory marketing classes. Each participant was randomly assigned to either a short endowment or long endowment condition; all participants were sellers and were endowed with a pen at the start of the study. Those in the short condition were given valuation forms and related questions at the start of a packet of unrelated surveys that took approximately 30 min to complete. Those in the long condition saw the same forms and related questions at the end of the 30 min. Since all subjects remained in the room completing survey materials for the same amount of time, neither condition was aware of the other. Final selling prices for the pens were determined by a random draw, and all participants left the experiment with either the pen or cash according to the decisions they had made during the valuation process.

### Results

The average minimum selling price for short endowment participants was significantly lower than the average selling price for long endowment participants (\$1.71 vs \$2.34,  $F(1, 69) = 5.52, p = .02$ ), replicating the findings of Strahilevitz and Loewenstein (1998). As predicted, we also found that psychological ownership was less for short endowment than for long endowment (3.97 vs 4.87,  $F(1, 69) = 8.34, p = .005$ ) and that positive affective reaction toward the pen was unchanged by longer duration (2.74 vs 2.75,  $F(1, 69) = 0, p = .98$ ). These results are also seen in the regressions. We found main effects of duration length on both valuation ( $\beta_{\text{length}} = .63, t = 2.35, p = .02$ ) and psychological ownership ( $\beta_{\text{length}} = .89, t = 2.89, p = .005$ ), but not on positive affective reaction. Psychological ownership was significantly related to valuation ( $\beta_{\text{po}} = .39, t = 4.24, p < .001$ ), as was positive affective reaction ( $\beta_{\text{aff}} = .42, t = 2.73, p = .008$ ). Finally, a regression was run with valuation as the dependent variable in which all three variables were included. We found that the relationship between valuation and the role conditions became insignificant in the presence of psychological ownership and affective reaction, suggesting full mediation ( $\beta_{\text{length}} = .35, t = 1.40, p = .17$ ). Sobel tests further indicated that psychological ownership ( $z = 2.39, p = .02$ ) was a significant mediator of duration of ownership condition on valuation.

### Study 3: Query theory

This study was designed to replicate Johnson et al. (2007)'s Experiment 3, which induced changes in valuation for an object based on the order of queries that focused on either value-increasing or value-decreasing aspects of the object. We predicted that these queries, by focusing attention on different aspects of the exchange, would change levels of psychological ownership among the participants but have no effect on affective reaction toward the object. By showing that psycho-

logical ownership can change even in the absence of legal ownership, this study provides evidence that it is capturing an aspect of the psychological process underlying loss aversion rather than simply serving as a manipulation check for actual ownership.

### Method

Fifty-eight undergraduates participated in this study. All participants were choosers (i.e., not endowed with a pen), but all participants were given the opportunity to see and inspect the pen for as much time as they needed. Each participant was randomly assigned to one of two query order conditions: they were asked to either first generate value-increasing aspects about the pen followed by value-decreasing aspects, or to produce the two types of aspects in the reverse order. The instructions for creating value-increasing aspects were to "list all the reasons why you personally would want to have the pen rather than the money," while instructions for value-decreasing aspects were to "list all the reasons why you personally would want to have the money rather than the pen." After listing both types of aspects, participants recorded their valuation for the pen and answered the remaining questionnaire items. Final selling prices for the pens were determined by random draw, and all participants left the experiment with either the pen or cash according to the decisions they had made during the valuation process.

### Results

Johnson et al. (2007) found that choosers who first listed value-increasing aspects had higher valuations than those who first listed value-decreasing aspects, and we replicated those results: the mean difference in valuation between the value increasing and value decreasing conditions was \$.45, a 31% increase. A comparison of the mean price per condition reveals that the difference is statistically significant (\$1.89 vs \$1.44,  $F(1, 56) = 4.26, p = .04$ ).

We also expected that the query order would affect psychological ownership among choosers, with those who had thought first about their reasons for wanting the pen feeling more ownership than those who thought first about the money, but we did not expect that query order would affect the affective reaction measures. As predicted, we found that query order affected psychological ownership; individuals who started with value-increasing aspects displayed marginally higher psychological ownership than those in the reverse order (2.91 vs 2.17,  $F(1, 56) = 3.51, p = .07$ ). As expected, we did not find a significant difference in affective reaction toward the pen (2.56 vs 2.68,  $F(1, 56) = .34, p = .56$ ). In the regressions, we found a significant effect of query order on valuation ( $\beta_{\text{query}} = .45, t = 2.06, p = .04$ ) and psychological ownership ( $\beta_{\text{query}} = .80, t = 1.87, p = .07$ ) but not on positive affective reaction. We also found a significant effect of psychological ownership on valuation ( $\beta_{\text{po}} = .20, t = 3.20, p = .002$ ) and of positive affective reaction on valuation ( $\beta_{\text{aff}} = .42, t = 3.27, p = .002$ ). A regression with valuation as the dependent variable in which all three

variables were included found that the relationship between query order and valuation became less significant in the presence of psychological ownership and affective reaction, suggesting mediation ( $\beta_{\text{query}} = .39, t = 1.91, p = .06$ ); psychological ownership and positive affective reaction both remained significant. A Sobel test indicates that psychological ownership ( $z = 1.62, p = .10$ ) is a marginally significant mediator of query condition on valuation.

#### Study 4: Focus on the forgone

Our next study was designed to replicate Study 4 of Carmon and Ariely (2000). They found, in a study with NCAA basketball fans, that attention to the aspects to be forgone in a trade (either money or tickets) affected buying and selling prices in predictable ways. More specifically, they suggest that buyers naturally focus on aspects of expenditure (the money they will forgo) while sellers naturally focus on the object (the experience they will forgo), and that forcing each group to focus on the opposite set of aspects can cause either increased selling prices through attention to expenditure or increased buying prices through attention to benefits. We predicted that these changes in prices occurred through an emphasis on ownership, with psychological ownership for money (from a focus on expenditure) or psychological ownership for the tickets (from a focus on benefits) driving the effects.

#### Method

This study was run with 125 undergraduate students at a Midwest school whose basketball team has attended the NCAA tournament every year for the past ten years. Students were recruited through their courses and completed the study in exchange for course extra credit. The object in the study was a ticket book that provided entry to the three basketball games that made up the 2009 NCAA Final Four in Detroit; students were asked to imagine that their school had made it to the Final Four and they possessed a ticket book. We used a  $2 \times 2$  between subjects design which manipulated the degree to which participants attended to the expenditure (attend-\$) and/or to the benefits of possessing a ticket (attend-benefit). In the high-attention conditions we asked participants to think about and rate the importance of five reasons related to the experience (e.g., “going to these games would be a unique experience”) and/or five reasons related to the expenditure (e.g., “I have many other uses for this money”). Order of reasons was randomized. After considering these reasons and rating their agreement with each, participants were asked to indicate the highest buying price and lowest selling price for a ticket book. Participants then completed psychological ownership measures for both money and the tickets, and positive and negative affective reaction measures for the tickets.

#### Results

We expected that attention to the benefits of having a ticket would increase buying prices more than selling prices, and that

attention to the expenditure would increase selling prices more than buying prices, consistent with the previous findings. We analyzed the  $2$  (attend-\$)  $\times$   $2$  (attend-benefit) design with a simple ANOVA, once for buying prices and once for selling prices. As predicted, selling prices showed a greater effect for attend-\$ than attend-benefit (7.52 vs 1.60) and a main effect for attend-\$ ( $F(1, 122) = 7.52, p = .007$ ) but not for attend-benefit. For buying prices, we found a greater effect for attend-benefit than for attend-\$ (7.9 vs .4) and a main effect for attend-benefit ( $F(1, 122) = 7.9, p = .006$ ) but not for attend-\$. Thus, we replicate the results of Carmon and Ariely (2000).

We also expected that the attention manipulations would affect psychological ownership for either the money (through attend-\$) or the tickets themselves (through attend-benefit), and that these changes in psychological ownership would be able to mediate the changes in buying and selling prices. We did not expect the attention manipulations to affect the affective reaction measures. Using regressions, we first verified that attend-\$ had a significant effect on selling price ( $\beta_{\text{att\$}} = .81, t = 2.74, p = .007$ ) and that attend-benefit had a significant effect on buying prices ( $\beta_{\text{attb}} = .48, t = 2.81, p = .006$ ). Next, for psychological ownership of the money, we found that attend-\$ had a significant effect ( $\beta_{\text{att\$}} = .92, t = 3.05, p = .003$ ) but attend-benefit did not ( $\beta_{\text{attb}} = .06, t = .19, p = .85$ ). In contrast, for psychological ownership of the tickets, attend-\$ did not have a significant effect ( $\beta_{\text{att\$}} = .19, t = .58, p = .56$ ) but attend-benefit did ( $\beta_{\text{attb}} = .75, t = 2.35, p = .02$ ). Both of these patterns were as expected; a focus on expenditure strengthened feelings of ownership toward money, but a focus on benefits strengthened feelings of ownership toward the tickets. What was not expected, but found in the analysis, was that attend-benefit also had a significant effect on positive affective reaction towards the tickets ( $\beta_{\text{attb}} = .45, t = 2.27, p = .02$ ); no effect was found for attend-\$ ( $t = .84, p = .40$ ) and there were no significant differences between the conditions for negative affective reaction.

Continuing with the mediation analysis, we found a significant effect of psychological ownership for money on both selling prices ( $\beta_{\text{pos\$}} = 17.3, t = 2.00, p = .05$ ) and on buying prices ( $\beta_{\text{pos\$}} = 9.74, t = 1.93, p = .06$ ). We also found a significant effect of psychological ownership for the tickets on both selling prices ( $\beta_{\text{pot}} = 20.1, t = 2.45, p = .02$ ) and buying prices ( $\beta_{\text{pot}} = 23.1, t = 5.21, p < .001$ ). Positive affective reaction also significantly affected selling prices ( $\beta_{\text{aff}} = 50.8, t = 4.00, p < .001$ ) and buying prices ( $\beta_{\text{aff}} = 38.7, t = 5.47, p < .001$ ). A regression of selling prices with the condition variables (attend-\$ and attend-benefit), psychological ownership for money, psychological ownership for the tickets, and positive affective reaction for the tickets showed that the condition effect for attend-\$ was partially mediated ( $\beta_{\text{att\$}} = 63.8, t = 2.18, p = .03$ ) by positive affective reaction for the tickets ( $\beta_{\text{aff}} = 46.7, t = 3.46, p = .001$ ) but that psychological ownership for the money did not achieve significance, contrary to our predictions. This was surprising, given that attend-\$ had a significant effect on psychological ownership for money and that psychological ownership for money had a significant effect on selling prices. A regression of buying prices with the same set of variables found that the

condition effects (specifically, attend-benefit) were mediated ( $\beta_{\text{attb}}=23.8$ ,  $t=1.53$ ,  $p=.13$ ) by psychological ownership ( $\beta_{\text{pot}}=14.8$ ,  $t=2.98$ ,  $p=.004$ ) and positive affective reaction for the tickets ( $\beta_{\text{aff}}=28.6$ ,  $t=3.93$ ,  $p<.001$ ). Sobel tests further indicated that psychological ownership ( $z=2.14$ ,  $p=.03$ ) and affective reaction ( $z=2.08$ ,  $p=.04$ ) were significant mediators of the attend-benefit condition's effect on buying prices.

### Study 5: Market experience

Study 5 was designed to mirror the findings of List (2003), who documented weaker endowment effects for experienced traders of collectible goods such as sports memorabilia. In particular, he found that willingness to trade an endowed object was higher for individuals with more trading experience. We predicted that experienced traders, because they perceive the good as an object for exchange rather than a possession, would feel less ownership toward the object. In contrast, novice traders have not yet developed this strong exchange concept, and would be more likely to treat an exciting new good as an actual possession.

#### Method

Fifty-nine undergraduates completed a paper and pencil survey in exchange for course extra credit. List (2003) conducted his experiments with real traders at a sports card show, using actual goods (a game stub and a dated commemoration certificate); level of experience was measured per individual. In contrast, we manipulate level of experience by asking participants to imagine either that they are an “experienced trader of baseball cards” who has “been collecting cards and trading them for both fun and profit” for many years, or that they “have just recently started trading baseball cards” and that so far “you have mostly been collecting cards, but you hope to start trading them for both fun and profit.” Participants were then told to imagine that they were at a sport card show and had received a game stub (described to match the actual stub used in the original experiment) in exchange for completing a survey. They were then asked about psychological ownership and their willingness to trade the stub (measured on a 1 to 7 scale). While our manipulation of experience lacks the external validity of List's experiments, we anticipated that simply having participants adopt the mindset of either an experienced or novice trader would be enough to change their psychological ownership toward the object, and this change in psychological ownership could mediate the willingness to trade measure.

#### Results

Consistent with the findings of List (2003), we found that participants who were asked to imagine that they were experienced traders had a greater willingness to trade than participants who were asked to imagine that they were novices ( $4.8$  vs  $3.8$ ,  $F(1, 57)=5.77$ ,  $p=.02$ ). We also found, consistent with our predictions, that psychological ownership was lower for experienced traders than

for novices ( $3.15$  vs  $4.55$ ,  $F(1, 57)=13.92$ ,  $p<.001$ ). Using regressions to test mediation, we confirmed that experience had a significant effect on both willingness to trade ( $\beta_{\text{exp}}=-1.0$ ,  $t=-2.4$ ,  $p=.02$ ) and psychological ownership ( $\beta_{\text{exp}}=1.4$ ,  $t=3.73$ ,  $p<.001$ ), and that psychological ownership had a significant effect on willingness to trade ( $\beta_{\text{po}}=-.62$ ,  $t=-5.58$ ,  $p<.001$ ). When both psychological ownership and experience were included in the regression on willingness to trade, experience became non-significant ( $\beta_{\text{exp}}=-.17$ ,  $t=-.42$ ,  $p=.70$ ) while psychological ownership remained significant ( $\beta_{\text{po}}=-.60$ ,  $t=-4.78$ ,  $p<.001$ ), suggesting mediation. A Sobel test further confirms that psychological ownership ( $z=3.08$ ,  $p=.002$ ) was a significant mediator of the effect of experience on willingness to trade.

### Study 6: Emotion

Lerner et al. (2004) found that the specific emotions of sadness and disgust could affect buying and selling prices for endowed objects. Feelings of disgust generated by an unrelated task carried over to the endowment task, where they reduced valuation by both sellers and choosers. Sadness also carried over to valuation, but had a separate effect: it created a “reverse endowment” where sellers reduce their valuation but choosers increased their valuation in an apparent attempt to change circumstances by acquiring a new possession. We predicted that these emotion manipulations would also affect participants' affective reaction toward the objects, and that this could help explain changes in valuation. Specifically, we expected that the “expel” feelings generated by the disgust manipulation would increase negative affective reaction and/or decrease positive affective reaction toward the object, while the “change circumstance” feelings generated by the sadness manipulation would increase positive affective reaction toward the object among choosers but possibly reduce it among sellers.

#### Method

The original Lerner et al. (2004) study used three emotion manipulation conditions: neutral, disgust, and sadness. For our analysis, we use the baseline endowment study reported earlier as the neutral condition, as the participants were drawn from the same population and the studies were run concurrently. Sixty-seven participants were in the neutral condition, sixty in the disgust condition, and fifty-nine in the sadness condition. Participants were randomly assigned to the seller or chooser role. Sellers were given a pen and were told that it was theirs to keep unless they choose to sell it, while choosers were told that they did not yet own a pen but they would have the option to receive one. After completing the valuation task and remaining questionnaire items, including psychological ownership and affective reaction for the pen, final selling prices for the pens were determined by random draw. All participants left the experiment with either the pen or cash according to the decisions they had made during the valuation process.

To reduce potential demand effects, participants were told that two separate studies were being conducted. They received all materials as they entered the room, which included the pen

for individuals assigned to the seller role. The first study was described as a project on “recalling emotional events.” Participants first read a newspaper article chosen to be either disgusting (a man who found a mouse baked into a hot dog bun, complete with picture) or sad (a woman who died on her wedding day during her first dance with her new husband). To make the emotional experience more personally relevant, participants answered several questions about how they would feel if they had been one of the individuals in the news story. To further make the emotion more intense and meaningful, they were then asked to write about an experience of their own that had made them either disgusted or sad, with as much detail as possible. This type of self-reflective writing has been previously found to elicit target emotions (Lerner & Keltner, 2001). Once this task was completed, they were instructed to proceed to the second study on valuation, labeled “asset pricing research.” Note that no manipulation check of self-reported emotion was collected between the two tasks, since doing so has been found to reduce the impact of emotions on later judgment (Keltner, Locke, & Audrain, 1993).

## Results

Planned comparisons of participants’ valuations for the pens generally supported the findings of Lerner et al. (2004); Fig. 2 displays the mean price for each condition. Sadness increased choice prices relative to the neutral condition (\$2.71 vs \$1.67,  $t(62)=3.19$ ,  $p=.001$ , one-tailed), and reduced selling prices, although not significantly (\$2.05 vs \$2.30,  $t(60)=.95$ ,  $p=.17$ ). This pattern reversed the traditional endowment effect, showing greater valuation among choosers than among sellers (\$2.71 vs \$2.05,  $t(57)=2.04$ ,  $p=.02$ ). An ANOVA revealed the expected crossover interaction ( $F(1,122)=13.32$ ,  $p=.003$ ). We did not replicate the main effect of disgust on valuation for sellers or choosers, but we did find a marginally significant effect of disgust on selling prices (\$1.90 vs \$2.30,  $t(61)=1.39$ ,  $p=.08$ ). We also found that disgust removed the traditional endowment effect, with no significant difference in valuation between choosers and sellers (\$1.67 vs \$1.90,  $t(58)=.83$ ,  $p=.20$ ). In addition, we found that sad participants set higher choice prices

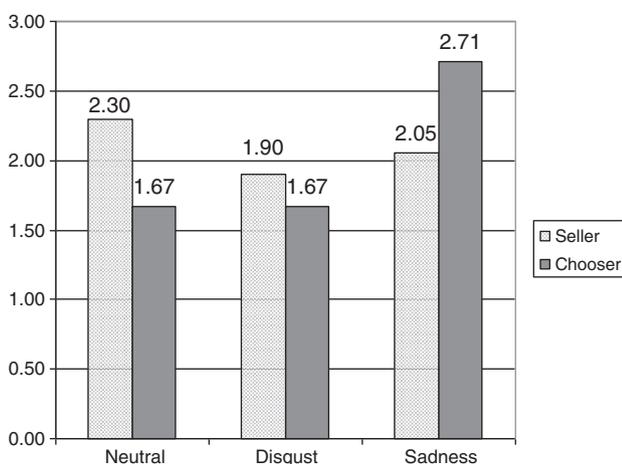


Fig. 2. Valuation (\$) results for Study 6.

than disgusted participants ( $t(58)=3.24$ ,  $p<.001$ ), but that the specific emotion did not affect selling prices ( $t(57)=.54$ ,  $p=.30$ ). ANOVA showed a significant interaction between emotion (disgust, sadness) and ownership role ( $F(1,115)=4.44$ ,  $p=.04$ ) as well as a main effect of emotion ( $F(1,115)=7.88$ ,  $p=.006$ ).

We expected that the decreased selling prices in the disgust condition would be due to increased negative affective reaction and/or decreased positive affective reaction toward the object, while the increased buying prices in the sadness manipulation would be due to increased positive affective reaction toward the object among choosers who were looking for a change in circumstances. Unfortunately, relative to the neutral condition, we did not find that disgust had a significant effect on either positive affective reaction or negative affective reaction toward the pen. Interestingly, a regression on valuation with both emotion and positive affective reaction revealed that the emotion condition became non-significant for valuation ( $t=.97$ ,  $p=.34$ ) but that positive affective reaction was significant ( $t=2.81$ ,  $p=.007$ ), suggesting that affect toward the pen was having an effect on valuation. Results for the sadness condition were more encouraging. We verified that the sad choosers had higher valuation for the pen than neutral choosers ( $\beta_{\text{emotion}}=.52$ ,  $t=3.2$ ,  $p=.002$ ). We also found that emotion (sad or neutral) had a significant effect on positive affective reaction toward the pen ( $\beta_{\text{emotion}}=.31$ ,  $t=2.58$ ,  $p=.012$ ) as expected, with greater positive affective reaction among the sad choosers. Emotion also had a significant effect on psychological ownership ( $\beta_{\text{emotion}}=.46$ ,  $t=2.50$ ,  $p=.015$ ) but not on negative affective reaction. Both psychological ownership ( $\beta_{\text{po}}=.31$ ,  $t=2.9$ ,  $p=.005$ ) and positive affective reaction ( $\beta_{\text{aff}}=.76$ ,  $t=5.14$ ,  $p<.001$ ) had a significant effect on valuation, as we expected. Finally, a regression of chooser valuation that included condition, psychological ownership, and positive affective reaction found that the emotion condition became non-significant in the presence of the other variables ( $\beta_{\text{emotion}}=.23$ ,  $t=1.44$ ,  $p=.16$ ), suggesting mediation. Sobel tests further confirm that psychological ownership ( $z=1.84$ ,  $p=.07$ ) and affective reaction ( $z=2.30$ ,  $p=.02$ ) were significant mediators of the effect of sadness on choosers’ valuations. A similar mediation analysis was done to see whether differences in positive affective reaction could also explain the difference in valuation between sad choosers and sad sellers (i.e., the reverse endowment effect); positive affective reaction was found to also be a significant mediator for those results.

## Study 7: Possession loss aversion

Study 7 was designed to replicate Brenner et al.’s (2007) Study 2. These authors showed that the positive or negative valence of an endowed option affected willingness to switch to a different option of similar valence. Specifically, individuals endowed with a positively valenced option were more likely to retain their choice, but individuals endowed with a negatively valenced option were more likely to switch. We predicted that the valence of the endowed option would change the affective

reaction toward the object, which then would mediate the willingness to stay with the endowed option.

### Method

We use an unpublished version of Brenner et al.'s (2007) Study 2 that included a positively valenced set of conditions in addition to a negatively valenced set. Participants were 138 undergraduates from a Midwest university randomly assigned to one of four conditions. One group of participants were told they had won a radio station promotion and would receive one of two attractive prizes, either \$100 cash or a ski package. The second group of participants were told that they had been caught speeding and received one of two unattractive penalties, either a \$100 fine or a visit to traffic school. All participants were then given the opportunity to switch to the other prize/penalty. After making their choice, participants completed psychological ownership and affective reaction measures for their initially endowed option.

### Results

Willingness to keep the endowed option replicated the findings of Brenner et al. (2007). Among participants endowed with the cash prize, 85.7% chose to keep it, while among those endowed with the ski package, 31.4% chose to keep it. The sum of these proportions (defined as "STAYSUM" in the original study) is 117.1%, significantly higher than 100% ( $z=3.62$ ,  $p<.001$ ) and consistent with the endowment effect. Among participants endowed with the fine penalty, 17.1% chose to keep it; among those endowed with the traffic school penalty, 72.7% chose to keep it. The sum of these proportions is 89.9%, significantly less than 100% ( $z=2.70$ ,  $p=.007$ ), which the authors call a "grass is greener" effect and is a reverse of the typical endowment effect.

We predicted that the difference in willingness to keep the endowed option would be the result of different levels of affective reaction toward the options in the two valence conditions. We test the effects with a series of logits, in which the decision to keep the endowed option was regressed against the other relevant variables. For this analysis, an endowment effect would appear as a positive and significant constant in the regression, indicating an overall preference to keep the endowed option. Starting with the attractive prize options, a logit on the choice to keep the endowed option found a significant endowment effect ( $\alpha=.78$ ,  $z=2.14$ ,  $p=.03$ ) as well as a significant effect for item ( $\beta_{\text{item}}=2.57$ ,  $z=4.25$ ,  $p<.001$ ), reflecting an overall preference for the cash prize. Additional logits of the choice to keep the option showed a significant effect for psychological ownership ( $\beta_{\text{po}}=.45$ ,  $z=2.77$ ,  $p=.006$ ) and for positive affective reaction toward the endowed object ( $\beta_{\text{aff}}=.95$ ,  $z=2.80$ ,  $p=.005$ ). A logit with all variables included continued to show significant effects for psychological ownership and positive affective reaction (both  $p$ 's  $<.05$ ), but the endowment effect itself became non-significant ( $\alpha=2.16$ ,  $z=1.28$ ,  $p=.20$ ).

Considering next the unattractive penalty options, a logit on the choice to keep the endowed option found a significant negative endowment effect ( $\alpha=-1.58$ ,  $z=-3.51$ ,  $p<.001$ ) as well as a significant effect for item ( $\beta_{\text{item}}=2.55$ ,  $z=4.30$ ,  $p<.001$ ), reflecting an overall preference for the traffic school penalty. Additional logits of the choice to keep the option showed no significant effect for psychological ownership or for positive affective reaction, but did show a significant effect for negative affective reaction toward the endowed object ( $\beta_{\text{neg}}=-.32$ ,  $z=-2.19$ ,  $p=.03$ ). A logit with all variables included revealed a significant effect for negative affective reaction ( $p<.05$ ), but the endowment effect itself became less significant ( $\alpha=-2.82$ ,  $z=-1.7$ ,  $p=.09$ ), suggesting partial mediation.

### Study 8: Unpleasant touch

The studies so far that have focused on how affective reaction changes valuation have primarily found effects through changes in positive affective reactions rather than negative ones, with the exception of the negative valence manipulation in the possession loss aversion study. We wished to show that negative affective reaction can play a more direct role in an individual's emotional attachment toward an object, so we developed an additional new study with a more explicitly unpleasant object. Recent research on the relationship between object touch and the endowment effect has suggested that psychological ownership is greater when individuals can touch an object, leading to higher valuation (Reb & Connolly, 2007; Wolf, Arkes and Muhanna, 2008); it has also been found that touch for unpleasant objects can simultaneously increase psychological ownership and decrease affective reaction (Peck & Shu, 2009; Peck & Wiggins, 2006). We test these relationships more fully in this study.

### Method

Participants were 60 undergraduate students in a Midwest business school's introductory marketing classes who completed the exercise in groups of up to thirty at one time in exchange for course extra credit. The methodology is identical to the baseline endowment study presented earlier, with one important difference. The same model of rubber-grip pen used in the previous study was changed from a pleasant-to-touch object to an unpleasant-to-touch object by applying spray-on adhesive and rolling it in fine black sand. Functionality and basic appearance of the pen remained unchanged. As before, participants were randomly assigned to a seller or chooser role, provided their valuation for the pen, and completed the remaining questionnaire items. After the final price was established by random draw, all participants left the experiment with either the pen or cash according to the decisions they had made during the valuation process.

### Results

Contrary to the typical endowment effect finding, choosers and sellers valued the pen similarly, with both groups valuing it very

low (\$.79 vs \$.59,  $F(1, 59)=1.92, p=.17$ ). As expected, however, sellers continued to show a greater level of psychological ownership than choosers (3.1 vs 1.7,  $F(1, 59)=13.67, p<.001$ ). Also as expected, there was a significant difference in negative affective reaction between the roles, with sellers having a stronger negative affective reaction toward the pen than choosers (2.4 vs 2.0,  $F(1, 59)=6.18, p=.02$ ). No significant difference between the roles was found for positive affective reaction.

Since we predicted that psychological ownership and affective reaction were mediators for valuation, we expected that the opposing changes in these measures by role could explain the lack of an endowment effect for this particular object. In other words, we expected that greater psychological ownership for sellers was having a positive effect on valuation, but that this was counteracted by their greater negative affective reaction, which would have a negative effect on valuation. We tested this with a series of regressions. As stated, seller/chooser role did not have a significant effect on valuation ( $\beta_{\text{role}}=-.19, t=-1.38, p=.17$ ) but it did have a significant effect on both psychological ownership ( $\beta_{\text{role}}=1.44, t=3.70, p<.001$ ) and negative affective reaction ( $\beta_{\text{role}}=.41, t=2.49, p=.02$ ). In addition, psychological ownership had a significant effect on valuation ( $\beta_{\text{po}}=.20, t=2.01, p=.05$ ) and negative affective reaction had a marginally significant negative effect on valuation ( $\beta_{\text{neg}}=-.19, t=-1.85, p=.07$ ). Finally, a regression of valuation with all three variables showed that psychological ownership ( $\beta_{\text{po}}=.10, t=2.22, p=.03$ ) and negative affective reaction ( $\beta_{\text{neg}}=-.17, t=-1.68, p=.09$ ) were both affecting valuation, but in opposite directions.

### Study 9: Hedonic vs utilitarian

Our final study is based on Experiment 2 of Dhar and Wertenbroch (2000), which demonstrated that loss aversion was stronger for hedonic items. Their experiment manipulated both ownership (by placing participants into either a forfeiture or acquisition condition) and elaboration (by asking participants to generate reasons for their choice). They found that a hedonic option was more popular under forfeiture, but that this effect was dampened when participants were asked to elaborate on the choice. We predicted that both affective reaction and psychological ownership would be affected in this study; specifically, we expected that the forfeiture condition would increase affective reaction for the more hedonic item, and that the forfeiture and reason conditions would increase psychological ownership.

#### Method

We use the same products as the original study, a glue stick and a small package of M&Ms. One-hundred and twenty-nine undergraduates were randomly assigned to one of four conditions in the 2 (forfeit or acquire)  $\times$  2 (reasons or no reasons) between subjects study. In the acquisition conditions, participants were shown both objects and told they would be allowed to select one at the end of the study. In the forfeiture condition, participants were given both objects but told that they would have to give one up at the end of the study. In the reason

conditions, participants were asked to write down the reasons why they would like to own M&Ms and glue sticks before making their final choice.

#### Results

We found a strong preference for the hedonic good, the M&Ms, across all conditions. In the no reason conditions, 80.6% of participants in the forfeiture condition and 84.4% of participants in the acquisition condition chose the M&Ms, while in the reason conditions, 87.9% of participants in the forfeiture condition and 84.8% of participants in the acquisition condition chose the M&Ms. Thus, we did not find significant effects on choice for either task or reasons.

While we are unable to replicate the main effects of the original study due to an overwhelming desire for chocolate among our undergraduates, we did find interesting effects for the psychological ownership and affective reaction measures. For psychological ownership of the M&Ms, we found a significant main effect for task, with those in the forfeiture condition expressing greater psychological ownership than those in the acquisition condition (4.17 vs 2.86,  $F(1, 125)=16.94, p<.001$ ), consistent with the ownership role effects reported in Studies 1 and 8. We also found a significant main effect of reasons on psychological ownership, consistent with our prediction that elaborating about the options would increase psychological ownership (3.89 vs 3.11,  $F(1, 125)=6.15, p=.01$ ). We also found a marginally significant interaction effect for task and reason on psychological ownership ( $F(1, 125)=3.64, p=.06$ ), a result consistent with the effects found for choices in the original study.

We had also predicted that the hedonic aspects of the item would be most relevant in the forfeiture condition and thus increase positive affective reaction for the hedonic item; we found this effect, with forfeiture participants reporting a marginally significant higher positive affective reaction than acquisition participants (3.26 vs 3.0,  $F(1, 124)=3.0, p=.09$ ). There was no significant effect on affective reaction from the reason conditions. Finally, we ran a logit model to test the relationship of preference for M&Ms against dummy variables for task, reason, and their interaction, along with psychological ownership and positive affective reaction for both the M&Ms and the glue stick. Task, reason, and the interaction term were all non-significant, but M&M psychological ownership ( $\beta_{\text{pom}}=.93, z=2.30, p=.02$ ) and M&M positive affective reaction ( $\beta_{\text{affm}}=1.3, z=2.12, p=.03$ ) both had significant positive effects on choice, while glue stick psychological ownership ( $\beta_{\text{pog}}=-1.76, z=-3.18, p=.001$ ) and glue stick positive affective reaction ( $\beta_{\text{affg}}=-2.6, z=-3.20, p=.001$ ) both had significant negative effects on choice. Even among participants with a strong preference for M&Ms, psychological ownership and affective reaction continued to operate as significant predictors of choice for endowed objects.

#### General discussion

Across nine different studies, we have tested the two psychological measures of psychological ownership and

affective reaction and shown their relationship to either object valuation or choice under a variety of manipulations. A summary of both the predicted mediators and the significant main findings for all nine studies is provided in Table 2. Study 1 replicated the basic endowment effect and provided evidence that both psychological ownership and affective reaction work together to mediate valuation. Studies 2 through 5 demonstrated that manipulations of longer ownership, attention, or experience in trading cause changes in psychological ownership, which affected both valuation and choice. Studies 6 through 9 focused on changes in positive and negative affective reactions toward the object, and showed that these affective reactions also play an important role in valuation and choice. While this paper is not the first to suggest that emotions and attachment are an important aspect of loss aversion, we believe we are the first to directly measure both constructs and show their ability to explain many of the findings in the literature.

One of the interesting effects to emerge from these studies is the countervailing effects of psychological ownership and *negative* affective reaction documented for the unpleasant to touch object in Study 8. While we do not do a direct comparison in the analysis of results, the results of this study can be compared to the results of Study 1, since the same object is used in both studies with only the valence of the touch experience being changed. In both Study 1 and Study 8, the effect of ownership role on the psychological ownership measure is the same; for both studies, participants in the seller role reported greater psychological ownership than those in the chooser role, even when the touch experience was unpleasant. Instead, it is the affective reaction toward the object that is most affected by the valence of touch. In Study 1, sellers report a more *positive* affective reaction than choosers, while in Study 8, sellers report a more *negative* affective reaction than choosers. These results add support to the idea that individuals are highly sensitive to

Table 2  
Summary of predictions for mediators psychological ownership (P.O.) and affective reaction (A.R.) and actual results per study.

Study number	Original research findings	Predicted mediators		Results of replications with process variables
		P.O.	A.R.	
Study 1	Kahneman et al. (1990): endowed sellers (choosers) value an object more than buyers	+	+	–Legal ownership (seller role) increases valuation, psychological ownership, and positive affective reaction. –Psychological ownership and positive affective reaction jointly mediate role's effect on valuation.
Study 2	Strahilevitz and Loewenstein (1998): valuation among sellers increases with duration of ownership	+		–Longer duration of ownership increases valuation and psychological ownership among sellers. –Psychological ownership mediates duration's effect on valuation.
Study 3	Johnson et al. (2007): chooser valuation depends on order of queries	+		–Starting with value-increasing queries increases valuation and psychological ownership among choosers. –Psychological ownership mediates query order effect on valuation.
Study 4	Carmon and Ariely (2000): attention to aspects foregone in a trade affects buying and selling prices	+ <sub>s</sub> + <sub>ix</sub>		–Attention to expenditure increases selling prices and psychological ownership for money. –Attention to benefit increases buying prices, psychological ownership for tickets, and positive affective reaction. –Psychological ownership for tickets and positive affective reaction mediate attention's effect on buying prices.
Study 5	List (2003): weaker endowment effects for experienced traders of collectable goods	–		–Market experience increases willingness to trade and decreases psychological ownership. –Psychological ownership mediates experience's effect on trade.
Study 6	Lerner et al. (2004): sadness and disgust affect buying and selling prices		– <sub>disg</sub> + <sub>sad</sub>	–Sadness increases valuation, psychological ownership, and positive affective reaction for choosers. –Psychological ownership and positive affective reaction mediate the effects of sadness on chooser valuation.
Study 7	Brenner et al. (2007): positive or negative valence of endowed option affects willingness to switch		– <sub>neg</sub> + <sub>pos</sub>	–Participants show lower willingness to trade for positive options and higher willingness to trade for negative options. –For positive options, psychological ownership and positive affective reaction mediate willingness to trade. –For negative options, negative affective reaction partially mediates willingness to trade.
Study 8	New study: investigation of endowment effect for unpleasant-to-touch objects	+	–	–Ownership role of seller for an unpleasant to touch item increases psychological ownership and negative affective reaction, but does not affect valuation. –Psychological ownership and negative affective reaction significantly affect valuation for sellers.
Study 9	Dhar and Wertenbroch (2000): loss aversion stronger for hedonic than for utilitarian items	+	+	–Forfeiture and providing reasons both increase psychological ownership; forfeiture also increases positive affective reaction. –Psychological ownership and positive affective reaction significantly affect choice of a hedonic vs utilitarian option.

the emotional aspect of losses, whether positive or negative (Brenner et al., 2007). They also clearly demonstrate how psychological ownership and affective reaction can have independent, countervailing effects on valuation.

We hope that the introduction of these two measures of psychological ownership and affective reaction will provide future endowment effect researchers with additional tools to understand the process by which their manipulations influence valuation and choice. We do not suppose that these two measures are enough to fully explain all effects; even within the studies presented here, some effects remain significant after mediation, such as the attention to expenditure effects in Study 4. These constructs are designed to work in support of the theories being tested by endowment effect researchers rather than to serve as replacements. Using them in conjunction with other measures, such as the post decision discomfort felt by participants in the Carmon et al. (2003) studies, can provide new insights on how emotional attachment for endowed objects relates to affect and thoughts about unchosen options. Other possible applications of these measures include examining how intentions to sell, such as in Simonson and Drolet (2004), influence psychological ownership (as in Study 5), or how a communal relationship norm, as in Aggarwal and Zhang (2006), influences affective reactions. We feel that these findings offer a significant first step in providing a deeper understanding of the processes that underlie the endowment effect, setting the stage for future research.

In addition to serving as useful constructs for future endowment effect research, an understanding of these two aspects of loss aversion may help provide marketing practitioners with better insights on how endowment effects can be triggered in retail environments where actual legal ownership has not yet occurred. An increase in psychological ownership without legal ownership was found in Study 3 by having choosers list their reasons for wanting the pen, and in Study 4 by having buyers attend to the benefits of having the tickets. Other research has found that psychological ownership can be increased through touch (Peck & Shu, 2009; Reb & Connolly, 2007), product imagery (Peck & Shu, 2009), or an active role in the design of a product (Fuchs et al., 2010). Work on anticipatory possession and prefactual ownership (Ariely & Simonson, 2003; Carmon et al., 2003) also provides insight on how buyers may perceive themselves as owners prior to taking full possession. Retailers who employ techniques of encouraging customers to imagine having the item in their homes, allowing trial periods or test drives, encouraging product customization, or simply offering higher levels of pre-purchase interaction with the product may be able to increase psychological ownership to a level that triggers loss aversion and an endowment effect. This would also suggest that consumers should be wary of retailers that use these techniques, as a consumer may unintentionally pay more for a product.

Similarly, marketing professionals can also find ways to increase the affective reaction toward their products such that the emotional bond is strengthened and loss aversion becomes more painful, thus increasing valuation. Our findings demonstrated increased positive affective reactions for products when

buyers pay attention to potential benefits (Study 4), feel sadness (Study 6), encounter positive or hedonic options (Studies 7 and 9), or consider forfeiture (Study 9). Products that feel good when touched also increase the positive affective reaction and the valuation of a product (Peck & Shu, 2009). Retailers can encourage interaction in stores with products that are pleasant to touch such as having samples sheets or towels available for consumers to feel. This strategy increases valuation through an increase in affective reaction due to pleasant sensory feedback and also through psychological ownership because of the pre-purchase interaction. By illuminating the processes underlying the endowment effect with the constructs of affective reaction and psychological ownership, we hope to have provided an organizing structure for the existing literature as well as ideas for practitioners to better increase the attachment and affect consumers feel toward their products.

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