The Effect of Ownership on Consumers' Disposal Decisions:

Research on Food Wastage and Recycling Behaviors

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ABSTRACT

Research in consumer behavior has focused predominantly on how consumers make purchase decisions. However, much less attention has been directed toward examining post-purchase behaviors. In this dissertation, I examine how *ownership* affects individuals' disposal decisions of their current possessions. In essay 1, I investigate how differences in *duration of ownership* affect consumers' food waste behaviors. I demonstrate that the same food products are more likely to be wasted as well as wasted more of when they are owned for a longer duration (vs. purchased more recently). I also delineate how this wastage can be reduced. In essay 2, I explore how a specific *post-ownership experience*, evaluations (positive vs. negative), influences consumers' recycling behaviors, even when these evaluations (e.g., taste of a drink) do not affect recyclability (e.g., of the bottle). I demonstrate that consumers will be more likely to recycle products associated with positive (vs. negative) evaluations, and, thus, will be more likely to recycle a drink's bottle when the taste is evaluated more positively.

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GENERAL AUDIENCE ABSTRACT

When thinking about the field of consumer behavior, most might believe it to involve studying how consumers evaluate products and make purchase decisions. Very few might believe that studying post-purchase behaviors also falls within the realm of consumer behavior. Unfortunately, these beliefs are quite common, and are not held by lay people alone. In fact, in the past, even researchers thought of consumer research as being synonymous with buyer behavior. However, researchers now recognize that consumer behavior is a dynamic ongoing process, which does not just start and end with product purchase. In this dissertation, I focus on one type of consumers' post-purchase behavior, disposal decisions. Specifically, I look at how *ownership* affects individuals' disposal decisions of their current possessions.

In essay 1, I focus on consumers' food waste behavior. I study how differences in how long they have owned a food product (duration-of-ownership) affect their food evaluations as well as food waste behavior. I find that even when two food products are otherwise identical (i.e., same manufacturing/expiration dates, not expired, previously unopened), consumers are more likely to waste as well as waste more of the one purchased earlier (a longer duration-of-ownership) than that purchased more recently (a shorter duration-of-ownership). I also suggest one strategy to help reduce this food wastage.

In essay 2, I focus on consumers' recycling behavior. I study how product evaluations affect consumers' recycling decisions. I find that even when these evaluations (e.g., taste of a drink) have nothing to do with the container (e.g., bottle of the drink), consumers are more likely to recycle the drink's bottle when they like the taste than when they do not like the taste of the drink.

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CHAPTER 1: INTRODUCTION

Research in consumer behavior has focused predominantly on how consumers make purchase decisions. However, much less attention has been directed toward examining post-purchase behaviors. While we are all grateful for the many innovations that the industrial age followed by the digital age has brought us, it has also unfortunately increased wastefulness. The U.S. Environmental Protection Agency (EPA) reported that, in the United States, the generation of municipal solid waste (MSW) was approximately 292.4 million tons in 2018, compared to only 88.1 in 1960 (EPA 2020). Trashing products means that not only did we not utilize the full potential of the raw material, but that we will be imposing further stress on our landfills and incineration facilities. What is more troubling is that much of this wastage is preventable. Thus, it is of critical importance to understand how consumers can be encouraged to reduce waste. In this dissertation, I examine how *ownership* affects individuals' disposal decisions of their current possessions.

Ownership

Ownership is generally recognized to have positive effects on evaluations and valuation. For example, the mere ownership effect (Beggan 1992) contends that people evaluate a target object more favorably when they own it relative to when they do not. Similarly, previous work on the endowment effect has demonstrated that ownership would affect object valuation–people would value an object more positively (e.g., be more reluctant to give up an object) when they already own it relative to when they do not (Kahneman et al. 1990; Thaler 1980).

Duration-of-Ownership

Drawing on the positive effect of ownership, prior literature documents a positive relationship between duration-of-ownership and valuation. For example, Strahilevitz and Loewenstein (1998) show experimentally that valuation of a possession increases as a function of duration-of-ownership. This is because, even though people feel attached to an object almost instantly upon being endowed with it (e.g., Kahneman, et al., 1990), complete adaptation to ownership takes time. Adaptation is a gradual process—and increase in valuation occurs until complete adaptation has occurred. However, the effect of duration-of-ownership on consumers' food waste behavior has been underexplored.

In essay 1 (presented in chapter 2), I investigate how differences in *duration of ownership* affect consumers' food waste behaviors. In six controlled experiments, I investigate how duration of ownership affects food waste behaviors. I demonstrate that the same food products are more likely to be wasted as well as wasted more of when they are owned for a longer duration (vs. purchased more recently). These duration-of-ownership effects are independent of manufacturing/expiration dates.

Post-Ownership Evaluations

Consumers evaluate products throughout the consumption cycle. Therefore, based on at which consumption stage these evaluations are created, product evaluations can be categorized into either prepurchase product evaluations (e.g., comparing alternatives) or postpurchase

evaluations (e.g., overall satisfaction) (Dick et al. 1990; Gardial et al. 1994; Lynch Jr et al. 1988; Westbrook and Oliver 1991).

Most academic attention has focused on consumers' prepurchase product evaluations rather than on postpurchase evaluations. For example, based on an informal survey of articles published in the *Journal of Consumer Research* (from 1974 to 1989), it appears that a significant majority (over 400 articles) focused on prepurchase or purchase-related phenomena, while a much smaller number (53 articles) addressed postpurchase consumer behavior (Gardial et al. 1994).

In essay 2 (presented in chapter 3), I explore how a specific *post-ownership experience*, evaluations (positive vs. negative), influences consumers' recycling behaviors, even when these evaluations (e.g., taste of a drink) do not affect recyclability (e.g., of the bottle). I demonstrate that consumers will be more likely to recycle products associated with positive (vs. negative) evaluations, and, thus, will be more likely to recycle a drink's bottle when the taste is evaluated more positively.

CHAPTER 2: HOW DURATION-OF-OWNERSHIP AFFECTS FOOD WASTE BEHAVIOR

Food waste is amongst the biggest global challenges facing us. We lose almost one third of the total food produced every year (about 1.3 billion tons), which is a daunting number((FAO) 2011; Kummu et al. 2012). What is more troubling is that about two-thirds of this wastage is preventable (Farr-Wharton et al. 2014). The implications of such wastage go deeper than just the food that is wasted: the time invested in the provision and preparation of food is also wasted (Watson and Meah 2012). The significant resources used in food production are lost, and the resulting greenhouse gas emissions that occur in the processes of food production, storage, transportation, and waste management are also in vain (Mourad 2016). Thus, it is of paramount importance to identify factors that reduce food waste and thus aid in protecting the environment.

Given the enormity of this issue, reasons underlying food waste have also been investigated. Extant research can be segmented into two broad streams: one aimed at identifying product-level characteristics, while the other attempts to delineate consumer-level characteristics. From the product perspective, effects of packaging (Verghese et al. 2015; Williams et al. 2012) and the importance of date labeling (Milne 2012) in influencing wastage have been investigated. At the consumer level, focus has been on how excessive purchasing, inappropriate storage, and over-preparation contributes to wastage (Porpino 2016). We examine how a specific consumer-related characteristic, "duration of ownership," affects food waste.

Not all products are purchased and consumed within a short window of time—people often purchase food in advance for future consumption, and they also purchase larger quantities

of products to save money (e.g., from Costco Wholesale). Therefore, some items will be stored and owned for a longer duration before use. Thus, it is critical that we understand how this longer duration of ownership affects consumption and disposal behaviors. However, not all food can be stored for long durations. Food can be divided into three categories based on their shelf life: perishable food, which spoil quickly and need refrigeration (e.g., meat, fish, many raw fruits and vegetables), semi-perishable food, which take a longer time to spoil (e.g., onions, potatoes), and, finally, food referred to as non-perishable, which are not really non-perishable but last longer (e.g., canned food, potato chips) (Mallmann 1953). We focus on such kinds of non-perishable food, which are sealed in a container, such as in a box or a can, so that its contents cannot be altered/modified unless the packaging is opened or damaged. Non-perishable packaged foods also have date labels to indicate freshness and can be stored for a reasonably long time. It includes a wide variety of products ranging from liquids (e.g., soda) and snacks (e.g., chips, candy, crackers, cereal, granola bars) to canned products (e.g., tuna, vegetables) and dried food (e.g., dried beans, rice).

We propose that duration-of-ownership is one factor that affects consumers' tendency to waste packaged food. As an illustration, let us consider a concrete example: Imagine there are two bags of potato chips—bag L and bag S. Both bags are *previously unopened* and have *identical* date labels (e.g., same manufacturing and expiration dates, not expired). Consumer Ms. Long (Short) just opened bag L (S) today. They both have about 20% of potato chips left and both consumers are wondering whether to consume or discard the remaining chips. Which of the two consumers would be more likely to waste the remaining chips and how much would they waste? Given that the two bags are identical, one would perhaps not expect any differences in behaviors. However, now imagine that the two bags were purchased at different times. Ms. Long

purchased bag L two months ago, while Ms. Short purchased bag S yesterday. Thus, Ms. Long has owned the bag for a longer duration than Ms. Short. Recognize again that there are no other differences between bags L and S except for the fact that Ms. Long has owned her bag for a longer duration than Ms. Short. Then, which of the two consumers do you think would be more likely to waste the remaining chips and how much would they waste? Would you still expect no difference in behavior?

Indeed, normatively, duration of ownership should not influence behaviors. When two food products (e.g., bags of potato chips) are otherwise identical (i.e., same manufacturing/expiration dates, not expired, previously unopened), the mere difference in duration of ownership should not influence their evaluations and they should be judged in the same manner.

However, we argue that duration-of-ownership will affect consumers' food evaluations and consequent waste behavior, such that Ms. Long will be more likely to waste the remaining food than Ms. Short, and waste more of it. We refer to this phenomenon as the "mere duration-of-ownership" effect and explain why this emerges. We expect the mere duration-of-ownership effects to hold even when the two food products are otherwise identical (i.e., previously unopened, and have the same manufacturing/expiration dates, not expired), and in both single and joint evaluation, suggesting that these effects are robust and will occur in different kinds of evaluation contexts. We believe that duration of ownership has an independent effect over and above those due to manufacturing/expiration dates. We provide support across seven studies. We also further delineate one strategy to lower wastage—merely partitioning duration into multiple stages by moving food from one closet to another can lower perceived duration-of-ownership, and thus lower food wastage.

Our findings enrich several literatures. Our core contribution is to the literature on food wastage and duration history. Prior literature has shown a positive effect of duration-of-ownership, such that the value of a current possession increases as the duration-of-ownership increases (Strahilevitz and Loewenstein 1998). However, how duration-of-ownership will affect food-related behavior has been underexamined. We show that duration of ownership affects perceived food freshness evaluation negatively, which consequently affects taste perceptions and increases wastage. While on the one hand, larger box stores encourage consumers to buy larger quantities of products and incentivize such purchases (by offering quantity discounts), we believe that purchasing and storing products for longer durations of time may be responsible for at least some of the rampant food wastage. These findings have important managerial and public policy implications. Because a longer duration of ownership increases wastage, when storing food in the refrigerator or in their pantry, it may be beneficial if consumers stored food in an orderly manner so as to facilitate consumption of food that is owned longer first. Furthermore, as we show, reorganizing storage location of food can lower food waste behavior. This is because merely changing location of stored food lowers perceived duration-of-ownership. This strategy can lower food waste significantly.

Finally, by encouraging consumers to be cognizant of their wasteful behaviors and by educating them on how to store food appropriately, retailers can earn consumer trust and also teach them how to manage consumption of larger quantities of food, which could be beneficial in the longer term. Indeed, companies that espouse socially and environmentally sustainable practices are awarded by consumers—not only does corporate social responsibility (CSR) have a positive impact on sales and profits (McGuire et al. 1988), but it also increases customer base and loyalty (Martínez and Del Bosque 2013).

THEORETICAL BACKGROUND

Food Waste

The US Department of Agriculture defines food waste as the amount of food that is wasted from the start of the food supply chain (post-harvest) to the end, include both retail level and consumer level waste (Buzby et al. 2014). The food supply chain comprises of the pathway that food takes from production to consumption, along with all the processes and activities involved along the way (Gunders 2012). In recent years, due to the increasing environmental but also social and economic concerns, food waste has received growing interest from policymakers, Non-Governmental Organizations, the general public as well as academics. Given the enormity of this issue, determinants of food waste as well as the underlying factors that encourage, drive, or impede food waste behavior have been investigated.

Extant research can be segmented into two broad streams: one aimed at identifying product-level characteristics, while the other attempts to delineate consumer-level characteristics. At the product level, the focus has primarily been on packaging (Williams et al. 2012) and information provided on packages (Milne 2012). For example, previous studies show that re-sealable and easier-to-empty packages can help reduce food waste (Verghese et al. 2015; Williams et al. 2012). The focus of the stream of research on package information has been to understand how date labeling impacts food waste (Milne 2012). For example, confusion regarding date labels, such as 'best-before' dates (the predicted longevity of quality characteristics) and 'use-by' dates (the predicted longevity of food safety), is a large contributor of food wastage (Leib et al. 2016; Newsome et al. 2014). Giving "consumers the confidence and

option to make use of products after the best-before date" can lower food waste (Toma et al. 2017).

Consumer level characteristics also influence food wastage. At a philosophical level, consumers value food and do not espouse wasting it (Porpino 2016). Some of this can be attributed to environmental concerns, but the financial burden that food wastage imposes on consumers also plays a big role (Graham-Rowe et al. 2014; Neff et al. 2015; Stancu et al. 2016). Yet we see significant amounts of food wasted on a regular basis. Researchers have identified several contributing factors, ranging from cultural and political, to economic and geographic (Thyberg and Tonjes 2016). Behavioral factors that contribute to food wastage can be broadly segmented into the following categories: decisions made during the purchase and the food preparation stages. Indeed, excessive purchasing is a major contributor of food waste (Porpino 2016). In fact, majority of the wastage (greater than 50%) occurs because food is not consumed on time (Williams et al. 2012). Therefore, planning is important—using a shopping list (Jörissen et al. 2015) or auditing inventories prior to shopping (Farr-Wharton et al. 2014) can lower overbuying, and consequently, reduce food waste (Parizeau et al. 2015; Secondi et al. 2015). We extend this research stream by demonstrating that a subjective factor—duration of ownership—can also influence food wastage. To appreciate our thesis, it may be instructive to provide an overview of the rather considerable literature on duration of ownership.

The Effect of Ownership on Food Products

Ownership is generally recognized to have positive effects on evaluations and valuation, and underlies the mere ownership effect (Beggan 1992) as well as the endowment effect

(Kahneman et al. 1990; Thaler 1980). Prior research has also tested the positive effect of ownership on food products. For example, a number of studies replicate endowment effects with food items, such as potato crisps, chocolate bars, and lollipops, all of which are packaged foods (Cramer and Antonides 2011; Kahneman et al. 1991; Kahneman et al. 1990; Reb and Connolly 2007). Furthermore, drawing on the endowment effect, Sen and Block (2009) also demonstrate a positive effect of ownership on food consumption and show that consumers are more likely to consume food products past their freshness dates when they own the products relative to when they do not.

"Duration-of-Ownership" and its Effect on Food Waste Behavior

Based on these positive effects of ownership, prior literature has further documented a positive relationship between duration of ownership and valuation. For example, Strahilevitz and Loewenstein (1998) show experimentally that people want a higher price for a current possession (e.g., mugs) when they have owned it for a longer (vs. shorter) duration; evaluations of attractiveness also increase with duration of ownership. This is because, even though people become attached to an object almost instantly upon being endowed with it (Kahneman et al. 1990), complete adaptation to ownership takes time. As adaptation increases, consumers' valuations of objects as well as their evaluations of the objects increase, until their full adaptation. Although these effects are well established, the effect of duration-of-ownership on food products remains underexamined.

We examine the effect of duration-of-ownership on consumers' food waste behavior. We propose that duration of ownership will have a deleterious effect on food evaluations, and consequently people will be more likely to waste food and waste more of it when it has been

owned for a longer (vs. shorter) duration. Importantly, this effect emerges even when normatively there is no reason for these effects to occur—that is, even when two food products are otherwise identical (i.e., previously unopened, same manufacturing/expiration dates, not expired), and are evaluated jointly, we posit that duration of ownership will still affect evaluations and waste behavior. We believe that duration of ownership has an independent effect over and above those due to manufacturing/expiration dates.

There may be several other reasons why people might expect a deleterious duration-of-ownership effect. We first discuss consumer-relevant factors. Consumers may use durations to make inferences about the product or themselves. The duration may also impact their memory of paying which could also impact perceptions. For example, based on self-perception theory (Bem 1972), consumers may use longer durations to infer that they like the food product less; if they really liked the food then it wouldn't have been in storage for this long. These inferences could increase waste. Consumers may also make inferences about their taste preferences. With longer temporal distances, likelihood of preference changes may be higher. Consequently, consumers may infer that their current taste preferences may differ more from the purchase date when the purchase occurred two months ago (relative to yesterday). These changes in taste preferences could also lead to food wastage. While the two reasons cited above are taste-based, one might also expect purchase-related factors to affect wastage. Consumers may feel more "pain of paying" from a recent (vs. distant) purchase (Prelec and Loewenstein 1998), because of which they may want to extract all the surplus they can from the product. Consequently, they may waste less.

Storage-related factors can also potentially explain our predicted results. Consumers may believe that grocery stores have better storage facilities than that at their home, as these facilities

are maintained professionally. Therefore, food owned for a longer duration may be less fresh, which could also lead to more wastage. However, we propose that our duration-of-ownership effect will hold even when these other factors, such as desirability/liking inferences, preference change inferences, pain-of-paying motivation, and even storage-related concerns do not exist or are controlled for. We argue instead that our effects emerge, at least in part, because of the effect that duration of ownership has on "perceived freshness."

Perceived Freshness

Our proposed construct of perceived freshness refers to the subjective feeling of freshness. Perceived freshness does not always track objective freshness assessments. For example, consider irradiated foods, such as canned vegetables. While the process of irradiation (applying ionized radiation) makes food microbiologically safe, nutritionally sound, with minimal (if any) alteration of taste, consumers do not believe such foods to be "fresh" (Cardello and Schutz 2003). Similarly, when a food is objectively past its freshness date, consumers' perceptions of the likelihood of falling sick differs as a function of ownership—consumers judge expired food that they own (vs. do not own) safer to consume (Sen and Block 2009). Thus, even though freshness can be defined and measured in a wide variety of ways (e.g., oxidative changes, integrity of the physical structure, retention of nutrients, or activity of spoilage bacteria), the perspective that matters most is how consumers perceive freshness (Cardello and Schutz 2003).

The value of food is rooted in its freshness. Notably, perception of food freshness not only affects purchase decisions, but also impacts consumption, and should therefore also influence waste decisions. We argue that duration-of-ownership will affect perceived

freshness—food products owned for longer (vs. shorter) durations will be perceived as being lower in freshness and will be wasted more.

Why might then people hold such biases? Perhaps when date labels (i.e., manufacturing/expiration information) are not available, one may use duration of ownership to infer manufacturing or expiration dates. However, in the case of packaged food products, date labels (e.g., manufacturing/expiration dates) are explicit and known to consumers. Normatively, therefore, duration of ownership should not affect how consumers judge freshness of packaged food products. However, we believe that even when two food products are otherwise identical (e.g., previously unopened, same manufacturing/expiration dates, not expired), and even in joint evaluation, the mere difference in duration of ownership will still affect perceived freshness. In other words, even when consumers are aware that the objective freshness of two identical food products are the same, duration of ownership still affects consumers' perceived freshness. These effects occur over and above those due to manufacturing and expiration dates. We argue that such difference in perceived freshness is, at least in part, due to perceived product newness/oldness.

Mental Accounting Periods and Perceived Newness/Oldness

Although time is continuous, it is not always treated as being continuous or fungible (Rajagopal and Rha 2009, Soman 2001). Individuals structure time into different periods; for example, the hours of a day can be partitioned into work hours versus after-work hours. Similarly, days of the week can be segmented into weekdays vs. weekends (Feldman and Hornik 1981; Soster et al. 2010). While these partitions occur naturally in many cases, significant events

also can act as temporal landmarks. These landmarks can aid in the creation of new mental accounting periods (Dai et al. 2014). For example, when a salient temporal landmark (e.g., a significant event) in between two points in time is highlighted, people are more likely to perceive those two points in time arising in two distinct periods, one period occurring before the landmark and one after (Dai et al. 2014; Peetz and Wilson 2013; Soster et al. 2010; Tu and Soman 2014). We believe that changes in food ownership status will be registered as a salient temporal landmark, which will aid in starting a new mental accounting period.

Previous research has largely focused on examining how the initiation of new mental accounting periods affects financial outcomes (for review, see Read et al. 1999, Thaler 1999, Soman 2004, Somen and Ahn 2011). Besides that, previous research has shown that the start of a new mental accounting period can motivate aspirational behaviors (the fresh start effect) (Dai et al. 2014). However, how the initiation of a new mental accounting period will impact perceptions of duration length has not yet been fully explored.

It is well known that consumers are not as adept at aggregating across time periods (Soster et al. 2010). For example, Soster et al. (2010) argue that when a time period is broken into different mental accounting periods, consumers often do not carry temporal costs incurred in one period to the next period. This finding is generally consistent with the notion that time is less fungible across time periods (Leclerc et al. 1995). Furthermore, recency effect demonstrates that more recent information is better remembered and receives greater weight in forming a judgment than does earlier-presented information (Baddeley and Hitch 1993). Thus, if there are more than one mental accounting periods, we propose that consumers will give more weight to the more recent period (e.g., the current mental accounting period), but less weight to the prior period(s).

This notion is consistent with how people judge how new/old a product is. Products are, by definition, “new to us” when we just own them. Ownership starts a new mental accounting period and consumers are likely to place greater weight to this new period than to other more distant period(s) prior to ownership. This belief is consistent with other findings in the literature. For example, consumers judge product lifetime or lifespan to be the time interval from when a product is sold to when it is discarded (Murakami et al. 2010). Thus, we believe that this selective attention will lead consumers to judge product newness/oldness mainly based on how long it has been in its current state of ownership, rather than by considering its manufacturing date. Therefore, for a food product, the longer it has been in its current mental accounting period, the “older” it will seem. Thus, for food products that are otherwise identical, with the same manufacturing date, it is the duration in the current mental accounting period, not that across all time periods, that determines its perceived newness/oldness: foods purchased/received earlier (vs. more recently) will seem older/less new to consumers. Importantly, while ownership starts the mental accounting period, consumers do not have to be the owner. Ownership by other entities, such as stores or restaurants, could also lead to the initiation of a new mental accounting period.

We expect perceptions of newness/oldness to affect perceptions of product freshness. Therefore, even when date labels are explicitly known to consumers, we believe that duration of ownership will still affect perceptions of freshness. Thus, we propose that duration of ownership will have an independent effect on the judgement of perceived freshness of food products, over and above those due to manufacturing/expiration dates. These biased freshness perceptions will lead to wastage.

Taken together, we predict that Ms. Long, who purchased her bag of chips two months ago will be more likely to waste the remaining food and waste more of it than Ms. Short, who purchased her bag yesterday. We believe this "mere duration-of-ownership" effect emerges, at least in part, because consumers judge products that have been owned for a longer duration to be less fresh.

STUDY OVERVIEW

We test these hypotheses in six experiments. In studies 1 and 2 we document how duration of ownership affects food freshness perceptions. In study 1, we use a joint evaluation context, while in study 2, we use a separate evaluation context. These studies also rule out alternative explanations, including one due to differences based on storage conditions. Studies 3-5 then test the effect of duration-of-ownership on food waste and provide process support. Specifically, study 3 demonstrates how duration-of-ownership affects food waste behavior. Study 4 replicates this effect in a conservative setting where the remaining shelf life for the food product owned for a longer (vs. shorter) duration is longer (vs. shorter), tests proposed mediation process, and rules out pain of paying as an alternative explanation for our effects. In study 5, we demonstrate external validity by showing the mere duration-of-ownership effect with real food waste behavior, rule out several other alternative explanations. Finally, in study 6, we document an approach to lower food waste, while providing additional support for our proposed underlying mechanism.

STUDY 1

Method

In study 1 (pre-registration link: https://aspredicted.org/TPD_4ZX), we used a within-subjects design to test the underlying biases—the longer one owns the product, the less fresh it is. A total of 100 MTurk respondents approved by the Cloud Research platform (M_{age} = 38.29 years; 62% males, 38% females) completed this study in return for nominal payment.

We asked participants to imagine that they had bought a box of cereal yesterday and found another box of cereal in their kitchen closet that they had purchased three months ago. Both boxes were *previously unopened*. Participants learned that "the labels on these two boxes were identical which indicated that both products were manufactured in xxx and should be consumed by xxx" (i.e., manufactured four months before the experiment date and recommended to be consumed in six months; we provided exact month/year). Thus, all participants were provided with both a manufacturing and an expiration date, and the dates were identical for both boxes.

Participants indicated how fresh each of the two boxes of cereal (randomized order) were (1 = not fresh at all, 7 = very fresh), and reported which box was fresher (1 = the box purchased 3 months ago, 4 = indifferent, 7 = the box purchased yesterday). On the next screen, participants recalled the manufacturing and expiration dates for both cereal boxes, respectively. After that, participants were asked to evaluate the storage condition for an unopened box of cereal at their home and in the store, respectively. At last, they provided demographic information, including age and gender (male, female, nonbinary, other, or prefer not to answer).

Results

The order of evaluation (whether the box purchased yesterday was presented and evaluated first or the one purchased 3 months ago) did not elicit any difference (F (1, 98) <1), thus we pooled across this factor and analyzed all 100 responses together.

Freshness. Even though both boxes of cereal were equally fresh (i.e., unopened, same manufacturing and expiration dates), participants believed that the box purchased yesterday (M = 4.98, SD = 1.48) was fresher than the identical box purchased three months ago (M = 4.35, SD = 1.43; t (99) = 4.56, p < .001). Similarly, a one-sample t-test with relative freshness as the dependent variable revealed a similar pattern. Participants perceived the bag purchased yesterday (vs. three months ago) to be fresher (M = 4.63, SD = 1.27), which was significantly higher than the neutral midpoint 4 (t (99) = 4.97, p < .001). This effect even held for those who clearly remembered that the date labels for these two boxes were identical (81 participants; paired-sample t-test: t (80) = 3.08, p = .003; one-sample t-test: t (80) = 2.44, p = .017).

Storage condition. Participants did not believe that their home storage condition (M = 6.00, SD = 1.04) was different from that in the store (M = 5.94, SD = 1.18; t (99) <1, p = .510).

Discussion

Together, these results suggest that perceptually people associate a longer (vs. shorter) duration of ownership with less (vs. more) freshness, and these beliefs are independent of

manufacturing/expiration dates, or storage condition concerns. In other words, duration of ownership has a deleterious effect on food freshness evaluations.

STUDY 2

In study 2, we test how duration-of-ownership affects food freshness evaluations using a between-subjects, separate evaluation design. More specifically, we explore how duration in the current mental accounting period influences food freshness evaluations when the total duration across all time periods (i.e., manufacturing date) is the same. Additionally, we test whether this effect persists when the product is owned by a store and not by the consumer.

We propose that even though food items are otherwise identical (i.e., have the same manufacturing & expiration dates, unopened, not expired), 1) a food product will be judged to be less fresh when it has been in its current state of ownership (e.g., consumer-owned, store-owned) for a longer (vs. shorter) duration. Furthermore, based on positive effects of ownership, 2) we expect consumers to evaluate a food product more positively (e.g., fresher) when they own (vs. do not own) it.

Method

In study 2 (pre-registration link: https://aspredicted.org/YQ4_762), a total of 500 MTurk respondents approved by the Cloud Research platform (M_{age} = 38.52 years; 47% males, 51.2% females) completed this study in return for nominal payment. They were randomly assigned to one of five conditions.

Three hundred participants were randomly assigned to one of three "store-owned" conditions. Participants were asked to imagine that they were shopping at a grocery store for a bag of potato chips. They found a bag of chips (manufactured in xxx; expiry in xxx) (i.e., manufactured five months before the experiment date and recommended to be consumed in five months; we provided the exact month/year). Thus, all participants were provided with a manufacturing and an expiration date.

As participants were about to purchase the bag, we provided additional information. In the control condition (condition 1, in-store), no other information was provided. However, in condition 2, they heard from a clerk that these chips had arrived at the grocery store yesterday (condition 2, in-store, duration = 1 day), while in condition 3, they heard the chips arrived four months ago (condition 3, in-store, duration = 4 months).

The remaining 200 participants were randomly assigned to one of two "consumer-owned" conditions. In this case, they were asked to imagine that they were looking for a bag of potato chips in their pantry. They found an unopened bag of chips (manufactured in xxx; expiry in xxx) (same as those in the "in-store" conditions). They purchased this bag from the grocery store either yesterday (condition 4, at-home, duration = 1 day), or 4 months ago (condition 5, at-home, duration = 4 months).

All participants then indicated 1) how fresh they thought this bag of potato chips was (1 = not fresh at all, 7 = very fresh), 2) how old this bag of potato chips was (1 = not old at all, 7 = very old), and 3) how good the storage condition for chips was in the store (for conditions 1-3)/at their home (for conditions 4-5). At last, they provided age and gender (male, female, nonbinary, other, or prefer not to answer).

Results

Freshness. Even though these chips were identical (i.e., previously unopened, same manufacturing/expiration dates), perceived freshness varied across the different conditions (see Table 1 for details). When no duration information was available, consumers judged the freshness of the in-store food product to be the same as that of a product that was in the store with a short duration (i.e., 1 day), but more positively than that with a long duration (i.e., 4 months) (see contrast (a) and (b) in Table 1 for details). Together these results suggest that when no other information is available, consumers presume that products on the store shelves had arrived recently.

We further ran a 2 (ownership type: in-store vs. at-home) x 2 (duration-of-ownership: 1 day vs. 4 months) ANOVA with freshness evaluation as the dependent measure. We did not include 100 respondents who were in the control condition. A significant main effect of duration-of-ownership emerged (F (1, 396) = 12.02, $p < .001$), suggesting that a food product is judged as less fresh when it has been in the same state of ownership for a longer duration (4 months) versus less (1 day), even though the products were otherwise identical.

A significant main effect of ownership-type also emerged (F (1, 396) = 30.69, $p < .001$). Consumers judged the food product to be fresher when they owned it relative to when the store owned it. Consistently, a recently bought food product was fresher than an identical one in the store (control) (see contrast (c) in Table 1 for details). Together these results successfully replicated the positive ownership effect on food freshness evaluations. The interaction in the 2-way ANOVA analysis did not reach significance (F (1, 396) < 1, $p = .627$), suggesting that the pattern of effects was similar regardless of who owned the product.

Perceived oldness. Our analysis of oldness perceptions elicited similar effects. We conducted identical analysis and obtained very similar patterns of results (see Table 1 for details). A two-way ANOVA with oldness evaluations (excluding control condition participants) with oldness as the dependent measure also revealed a significant main effect of duration-of-ownership (F (1, 396) = 14.57, p < .001), and a significant main effect of ownership-type (F (1, 396) = 4.78, p = .029). The interaction did not reach significance (F (1, 396) < 1, p = .922).

Freshness & perceived oldness. A linear regression analysis showed that freshness evaluation and perceived oldness was negatively correlated (B = -.41, t = -9.66, p < .001).

Storage condition. We did not expect duration of ownership to impact evaluations of storage condition. The planned contrast results revealed that participants expected their home storage condition to be better than that in the store in a separate evaluation context (see contrast (g) in Table 1 for details).

Discussion

Results from studies 1 and 2 together suggest that duration of ownership indeed affects how people judge food freshness: the longer (vs. shorter) a food product is in its current ownership state, the "older (vs. newer)" and less (vs. more) fresh it seems to be, even though these food products are otherwise identical (i.e., unopened, same manufacturing/expiration dates). It is the duration within the current mental accounting period (duration-of-ownership) that drives freshness evaluation, not the duration across all time periods (time since manufacturing).

Furthermore, we successfully replicate the positive effects of ownership in study 2, not only on food freshness evaluations, but also on assessments about the storage condition.

Together, studies 1 and 2 show that storage condition at home is at least no worse than that in the store. Interestingly, from a storage-condition perspective, consumers should judge a food product they have owned for a longer duration to be no worse than an identical one that was purchased more recently. However, results in studies 1 and 2 support the opposite conclusion. Thus, we exclude this alternative explanation and conclude that concerns based on storage condition cannot fully explain these effects.

TABLE 1: STUDY 2 RESULTS

	In-store			**At-home**			
	Control	**1 D**	**4 M**	**1 D**	**4 M**	***F* (4, 495)**	***p***
Freshness evaluation	4.71 (1.67)	4.58 (1.63)	3.97 (1.69)	5.36 (1.28)	4.90 (1.63)	10.39	<.001
Oldness evaluation	3.94 (1.59)	3.93 (1.62)	4.53 (1.28)	3.61 (1.71)	4.18 (1.49)	4.90	<.001
Storage condition	5.12 (1.34)	5.27 (1.22)	5.09 (1.32)	5.81 (1.29)	5.60 (1.33)	5.87	<.001
Contrasts/Coding						***t* (495)**	***p***
Freshness evaluation							
(a)	1	-1	0	0	0	< 1	.558
(b)	1	0	-1	0	0	3.34	< .001
(c)	1	0	0	-1	0	-2.93	.004
Oldness evaluation							
(d)	1	-1	0	0	0	< 1	.963
(e)	1	0	-1	0	0	-2.70	.007
(f)	1	0	0	-1	0	1.51	.131
Storage Condition							
(g)	1/3	1/3	1/3	-1/2	-1/2	-4.59	<.001

STUDY 3

In study 3, we seek to provide empirical support for our duration-of-ownership effect on consumers' food waste behavior: longer the duration of ownership, higher is the likelihood of food being wasted.

Method

We recruited 105 undergraduates (M_{age} = 20.72 years; 30.5% males, 69.5% female) from a large public university in the US in return for partial course credit. We randomly assigned participants to one of two conditions (duration of ownership: one day vs. one month). We asked participants to imagine that they had bought a box of chicken broth either yesterday or last month. They opened the box today and used some of the chicken broth, but not all of it; about 20% remained. Participants then responded to two questions measuring waste behavior: 1) how likely they were to keep the remaining broth (1 = not likely at all, 7 = very likely), which we reverse coded for ease of interpretation to reflect "likelihood of wasting;" and 2) their final decision (binary variable: 0 = keep it, 1 = throw away). They also indicated their perceived duration of ownership (1= not very long, 7= very long) and provided demographic information (gender and age).

Results

Manipulation Checks. We compared perceived duration-of-ownership across the two conditions. As expected, participants who purchased this box of chicken broth last month

reported that they had owned it for a longer duration ($M_{one\ day}$ = 1.38, SD = .72 vs. $M_{one\ month}$ = 4.44, SD = 1.54; $p < .001$).

Food waste. Consistent with our predictions, an ANOVA with likelihood of wasting as the dependent variable revealed that participants who had owned this box of chicken broth for one month versus one day were more likely to waste the remaining broth ($M_{one\ day}$ = 2.68, SD = 1.89 vs. $M_{one\ month}$ = 3.87, SD = 2.00; $F(1, 103) = 9.76$, $p = .002$).

A binary logistic regression also confirmed that respondents were more likely to throw away the remaining broth in the longer duration condition ($M_{one\ day}$ = 15% vs. $M_{one\ month}$ = 56%; B = 1.96, Wald test = 17.04, $p < .001$).

In sum, participants were more likely to waste the chicken broth and more participants were likely to throw the broth when the duration of ownership was longer. The effects persist even when we control for age and gender (likelihood: $F(1, 101) = 9.47$, $p = .003$; decision: B = 1.97, Wald test = 16.91, $p < .001$).

STUDY 4

Study 4 has three main objectives. First, in this and following studies, we ask participants to indicate their perceived freshness of food, which helps provide process insights and show the proposed underlying mechanism—longer duration of ownership lowers food freshness evaluations, which increases wastage. Second, we aim to replicate our effects in a conservative setting and show that people focus too much on duration of ownership, which can lead to inaccurate conclusions. We also seek to rule out another alternative explanation— people may

feel more "pain of paying" from a recent (vs. distant) purchase (Prelec and Loewenstein 1998), which may lower waste.

Method

In study 4 (pre-registration link: https://aspredicted.org/blind.php?x=6bz8g2), we recruited 160 MTurk respondents (M_{age} = 38.71 years; 49% males, 51% females) and randomly assigned them to one of two between-subjects conditions (duration of ownership: one week vs. three months). In both conditions, participants were asked to imagine that they opened a *previously unopened* bag of potato chips (13 OZ) five days ago and ate about 80% of the contents. We manipulated the expiration dates to be different; in the long (short) duration of ownership condition, the label on the bag recommended that it had to be consumed within 7 (5) months (exact month/year). Thus, the bag purchased earlier had a longer remaining shelf-life. Since they had already opened the bag (five days ago in both conditions), participants indicated how likely they would be to eat the remaining chips (reverse coded to represent "likelihood of wasting"), how much they would finish before throwing the bag away (reverse coded to represent "amount of wastage"), and perceived freshness level. After that, there were asked to respond to two questions that measured "pain of paying": 1) To what extent can you feel the pain of paying for this bag of potato chips (1 = Not a lot, 7 = A lot), and 2) To what extent do you feel the monetary sacrifice you made for acquiring this bag of potato chips is salient (1 = Not salient at all, 7 = Very salient); At last, participants reported their perceived duration of ownership and demographics.

Results

Manipulation Checks. As expected, participants who purchased this bag of potato chips three months ago (vs. last week) reported that they had owned it longer ($M_{one\ \text{week}} = 3.30$, $SD = 1.34$, vs. $M_{three\ months} = 4.45$, $SD = 1.49$; $p < .001$).

Food waste. Replicating our previous study 3, participants who had owned the bag of chips for three months (vs. one week) were more likely to waste the remaining chips ($M_{one\ \text{week}} = 3.21$, $SD = 2.13$, vs. $M_{three\ months} = 4.71$, $SD = 2.22$; F (1, 158) = 19.02, $p < .001$), and would waste more of them ($M_{one\ \text{week}} = 2.95$, $SD = 2.31$, vs. $M_{three\ months} = 4.76$, $SD = 2.51$; F (1, 158) = 22.56, $p < .001$). We combined the two pain-of-paying measures (r = .56, $p < .001$) into a composite, but pain of paying did not differ across the two conditions ($p = .731$). The mere duration-of-ownership effect persisted when pain-of-paying was included in the model as a covariate (likelihood: F (1, 157) = 18.76, $p < .001$; amount: F (1, 157) = 22.28, $p < .001$). Thus, pain of paying cannot fully account for our findings.

Food evaluations. Those who purchased the potato chips three months ago (vs. last week) also indicated it was less fresh ($M_{one\ \text{week}} = 3.41$, $SD = 1.81$, vs. $M_{three\ months} = 2.73$, $SD = 1.74$; F (1, 158) = 6.03, $p = .015$), even though its actual remaining shelf-life was longer as its expiration date was later.

Mediation tests. Furthermore, a bootstrapping analysis confirmed that perceived freshness mediated the effect of duration-of-ownership on people's waste behavior (likelihood: indirect effect = .54, SE = .22, 95% CI = [.104, .990]; amount: indirect effect = .61, SE = .25, 95% CI = [.128, 1.09]). In conclusion, this experiment shows that longer duration of ownership

lowers freshness evaluations even when the product has a longer remaining shelf-life, and consequently increases wastage.

Discussion

This study rules out another alternative explanation, pain of paying. In addition, this study shows that duration-of-ownership may bias consumers and lead to an inaccurate conclusion.

STUDY 5

Study 5 seeks to provide empirical support in a real consumption context. In addition, we aim to rule out several alternative explanations:

1) Desirability: people may have held on to the food for a longer duration either because it was undesirable or because it was so desirable that they were reluctant to consume it, and thus desirability may affect people's wastage behaviors.

2) Inferred attitude: according to self-perception theory, people tend to infer their attitude to be consistent their own behavior. In our context, people may infer that they do not like/value a food product that they have owned for a longer duration, and this may increase wastage.

3) Preference change: temporal distance increases the likelihood of preference change, which could increase people's waste behavior.

Admittedly, our time durations are consistent with normal ownership patterns, so we do not believe that these lengths of time would lead to inferences about attitude or preference

change. We rule out these alternative explanations by allowing a third-party (i.e., researchers) to own the product, either for a long or for a short duration so that ownership duration cannot be confused with product desirability inferences, attitude inferences, or preference change inferences. In addition, there is no (inferred) "pain of paying" in this study, which provides additional evidence to rule out this alternative explanation. Importantly, these duration-of-ownership effects do not require ownership to be that of consumers. Any type of ownership could start a new mental accounting period, which should elicit the duration-of-ownership effects.

Method

We recruited undergraduates from a large US public university to participate in this study. Before they entered the lab, we told them that they would be participating in a taste test and provided them with information about all the ingredients in the food product. Only those who were not allergic to any of the ingredients participated in this study. Ninety-four participants (M_{age} = 20.68 years, 71% females) completed this study, and they were randomly assigned to one of two conditions (duration of ownership: five months vs. one week).

All participants first indicated how hungry and thirsty they felt at that moment. At the outset, we informed participants that we were helping a company assess how consumers judge their company's trail mix and then provided each participant with a bowl of trail mix (70g) to snack from. The study was conducted in mid-October. In the long duration-of-ownership condition, participants learned that we obtained this bag of trail mix before the summer break (about 5 months ago). In the short duration-of-ownership condition, we obtained the bag last

week. All participants were explicitly told that this *previously unopened* bag of trail mix was just opened that day; we also provided all with the same expiration date (exact month/year), which was in two months' time.

We also informed all participants that we would provide everyone with a new bowl, and that the remaining unconsumed trail mix would be thrown away. Unbeknownst to respondents, after they left, we weighed the trail mix left behind by each participant—this was the actual amount wasted. Participants also self-reported how much of the trail mix they ate and how much of the trail mix they left behind (both: 1 = not much at all, 7 = a lot), which we combined into a composite after reverse coding the first question ($r = .92$, $p < .001$); together this represented consumers' self-reported waste amount.

To be consistent with our cover story, participants also rated their liking and evaluated the taste of the trail mix. After that, participants evaluated its freshness. Then they indicated perceived duration of "researchers' ownership" (1 = not very long, 7 = very long), recalled expiration date, rated their liking of trail mix in general (1= not at all, 7 = a lot), and provided demographics.

Results

Manipulation Checks. As predicted, participants who were told that this bag of trail mix was received before the summer break (vs. last week) believed that researchers had owned it for a longer duration ($M_{1\ week} = 3.00$, $SD = 1.58$ vs. $M_{5\ months} = 4.69$, $SD = 1.42$; $p < .001$).

Food waste. Consistent with our predictions, even though we provided participants with the same trail mix, participants who were told that this bag of trail mix had been owned by

researchers for five months (vs. one week) actually wasted more trail mix (five months: 52.15 grams vs. one week: 43.62 grams; F (1, 92) = 4.95, p = .028). Although not significant, a similar test with self-reported waste amount elicited a similar pattern of results (F (1, 92) = 3.34, p = .071), such that participants felt they wasted more trail mix when it was owned by researchers for 5 months (vs. one week). At a philosophical level, people value food and do not espouse wasting it (Porpino 2016). This might be the reason why the difference in their self-reported waste amount is smaller than their actual waste amount. Neither hunger, thirst, nor general liking of trail mix reached significance (all ps > .630), and the effect of duration-of-ownership held when these measures were included in the model as covariates (actual waste amount: F (1, 89) = 7.06, p = .009; self-reported waste amount: F (1, 89) = 4.84, p = .030). Thus, we did not include them in subsequent analysis.

Food evaluations. Furthermore, participants who were told that this bag of trail mix was received five months ago (vs. last week) indicated that they liked the trail mix less (F (1, 92) = 7.41, p = .008), it tasted worse (F (1, 92) = 5.54, p = .021), and felt less fresh (F (1, 92) = 12.04, p < .001). We combined them into a composite to measure food evaluations.

Mediation tests. Bootstrapping results confirmed a significant indirect effect (actual waste amount: indirect effect = 6.09, SE = 2.03, 95% CI = [2.320, 10.273]; self-reported waste amount: indirect effect = .62, SE = .21, 95% CI = [.238, 1.043]), verifying the same mediating pathway we found in study 4: longer (vs. shorter) duration of ownership → lower food evaluations → increased waste behaviors.

Serial Mediation. We further introduced taste evaluation into the conceptual model and tested a serial mediation process: longer (vs. shorter) duration of ownership → lower perceived freshness → lower anticipated taste → increased waste behavior. A bootstrapping analysis

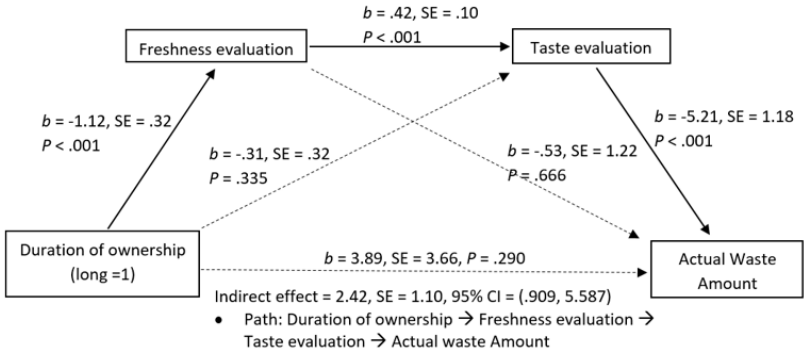
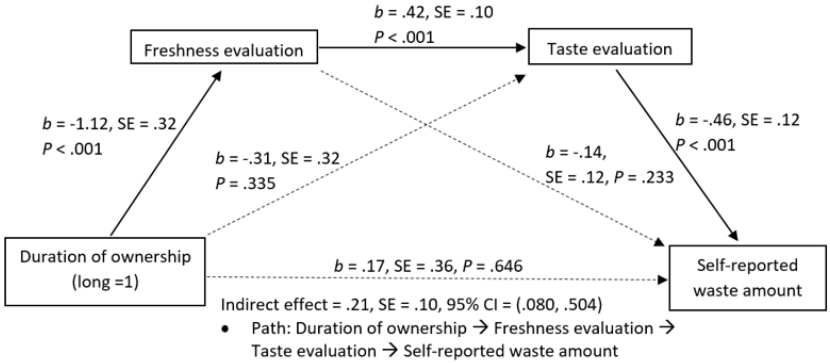
confirmed a negative and significant indirect effect on consumers' actual and self-reported waste amount (see Table 2 for details), verifying the full mediating pathway we proposed. A test of the causal chain by reordering the two mediators did not yield significance (actual waste amount: indirect effect = .162, SE = .385, 95% CI = [-.413, 1.243]; self-reported waste amount: indirect effect = .044, SE = .046, 95% CI = [-.014, .188]), suggesting that the causal chain occurs only in the direction predicted by our theory.

Discussion

In study 5, we show our effects in a context with real waste behaviors, thus demonstrating external validity. Furthermore, we provide evidence consistent with that from study 2 that these duration-of-ownership effects are not constrained to ownership by consumers alone, but extends to ownership by others (e.g., grocery store, researchers). It is the duration in the current state of ownership, regardless of ownership type, that impacts food freshness evaluation, which further affects consumers' food waste behavior.

We tested both the proposed mediation process and a new serial mediation process in this study. Statistically, they both worked. At the conceptual level, freshness and taste are both important attributes in food-related decisions. Freshness perception, as well as taste perceptions, will both affect food consumption and waste behavior. In our next study, we aim to test whether it is important or unnecessary to introduce taste evaluation into the mediational process.

TABLE 2: STUDY 5 RESULTS

		Own for 1 week	Own for 5 months	*F* (1, 92)	*p*
DV	Actual waste amount	43.62 grams (21.62)	52.15 grams (15.52)	4.95	.028
	Self-reported waste amount	4.45 (2.02)	5.14 (1.64)	3.34	.071
Food evaluations	Liking	4.45 (1.60)	3.58 (1.51)	7.41	.008
	Taste	4.55 (1.60)	3.77 (1.59)	5.54	.021
	Freshness	4.50 (1.60)	3.38 (1.51)	12.04	<.001
Serial mediation process					
					

STUDY 6

The goal of study 6 is to demonstrate a strategy to help lower food wastage while corroborating our process explanation. Our thesis is that a longer duration of ownership leads to decreased food evaluations, which increases food wastage. If it is perceived duration of ownership that drives this effect, then any strategy that can reduce perceived duration of ownership should help decrease wastage and attenuate our results.

One way to decrease the perceived duration of ownership could be by breaking the whole storage process into several parts, such as by moving food from one storage place to another. Discretizing the process creates a new mental accounting period. Instead of combining the two periods, consumers will give more weightage to the duration in the newer mental accounting period, which will lower their overall perception of duration of time relative to the total storage time. We propose that when consumers move food from one storage place to another, this creation of a two-stage storage process lowers perceived duration of ownership, which then lowers wastage.

Method

In this study we focused on food products that were owned for a longer duration. We recruited 125 undergraduates (M_{age} = 21.00 years, 46% females) from a large US public university to participate in this study and used a one-factor (storage process: one-stage storage vs. two-stage storage) between-subjects design, with random assignment. In both conditions, participants imagined that they bought a bag of potato chips (8 Ounces) 4 months ago and were informed of the same shelf-life information (we provided an exact date). In the one-stage-storage

condition, they stored this bag in their kitchen closet for 4 months. In the two-stage-storage condition, participants learned that initially they stored this bag in a kitchen closet, which they then moved to another kitchen closet last week. After that, all participants read that they just opened this *previously unopened* bag of potato chips and ate about 80% of them (with 20% remaining). Participants learned that they would be leaving the campus for winter break the following day and thus could not store the remaining chips. Participants then indicated how likely they would be to bring the remaining potato chips with them. Next, we asked participants to indicate that on realizing that they did not plan to bring the remaining potato chips with them, how likely would they be to eat them, and how much would they finish before throwing the bag away (reverse coded to represent "likelihood of wasting" and "amount of wastage," respectively). We then measured perceived freshness, followed by perceived duration of ownership and demographics.

Results

Perceived duration of ownership. Although all respondents owned the potato chips for 4 months, participants in the one-stage-storage condition reported a longer perceived duration of ownership than those in the two-stage-storage condition (F (1, 123) = 10.54, p = .002). Thus, the creation of a two-stage storage process successfully lowered perceived duration of ownership.

Food waste. Consistent with our expectations, participants were less likely to take the remaining chips with them when this bag of potato chips was stored in the same kitchen closet for 4 months than when it was moved (F (1, 123) = 3.15, p = .078). Furthermore, likelihood of wasting, as well as amount of wastage, was higher in the one-stage-storage condition, compared

to the two-stage-storage condition (likelihood: F (1, 123) = 5.42, p = .022; amount: F (1, 123) = 8.73, p = .004)

Food evaluations. Compared to the one-stage-storage condition, people in the two-stage-storage condition expected this bag of potato chips to be fresher (F (1, 123) = 6.13, p = .015).

Mediation tests. A bootstrapping analysis confirmed that perceived freshness mediated the effect of duration-of-ownership on people's waste behavior (likelihood of keeping: indirect effect = .36, SE = .18, 95% CI = [.056, .758]; likelihood of wasting: indirect effect = -.23, SE = .13, 95% CI = [-.539, -.026]; amount of wastage: indirect effect = -.29, SE = .14, 95% CI = [-.601, -.050]).

TABLE 3: STUDY 6 RESULTS

		One stage storage	**Two stage storages**	***F* (1, 123)**	***p***
Manipulation Check	Perceived duration of ownership	5.18 (1.24)	4.40 (1.44)	10.54	.002
DV	Likelihood of keeping	3.00 (1.94)	3.68 (2.33)	3.15	.078
	Likelihood of wasting	4.15 (1.96)	3.33 (1.94)	5.42	.022
	Amount of wastage	3.97 (2.00)	2.97 (1.78)	8.73	.004
Mediator	Freshness	3.32 (1.42)	3.98 (1.56)	6.13	.015

Discussion

While our previous studies documented how duration of ownership influences wastage and food assessments, this study delineates one easily implementable strategy to lower wastage. Merely partitioning the duration of ownership into multiple stages by moving food from one

closet to another can lower perceived duration-of-ownership, which then has positive effects on food assessments, and consequently decrease wastage.

GENERAL DISCUSSION

Across six studies, we provide compelling support for a novel duration-of-ownership effect on consumers food waste behavior: the same packaged food items are more likely to be wasted as well as wasted more of when they are owned for a longer duration, even when the items are otherwise identical (i.e., have identical manufacturing and expiration dates, previously unopened). Moreover, the effect of our duration of ownership effect is not restricted to consumer ownership alone; the effect also emerges in contexts where others (e.g., stores, third-party researchers) own the products. Admittedly, consumers are more likely to have information about their ownership, and less likely to be informed of products owned by stores.

When assessing product freshness, consumers have three sources of information to rely on: manufacturing date, expiration date, and duration of ownership. Normatively, when both manufacturing and expiration dates are available, duration of ownership information is not necessary to evaluate food products. However, as we find, duration of ownership has an effect over and above those due to manufacturing and expiration dates. It appears that ownership leads to the creation of a new mental accounting period. Consumers use the current mental accounting period (duration-of-ownership) to make inferences and do not integrate across the different time periods (prior to ownership) to assess the total age of the product. Food freshness evaluation will further affect taste evaluation, which in turn will affect waste behavior

Extending this further, we delineate one strategy to lower wastage—merely partitioning duration into multiple stages by moving food from one closet to another can create a new mental accounting period, and lower perceived duration-of-ownership. As a consequence, this strategy could lower food wastage.

Our findings enrich several literatures. Foremost, we contribute to a growing literature on food wastage. Scholars in food science and affiliated areas have already identified many factors that may impact food waste behavior. Such factors include demographic characteristics such as age (Van and Woodburn 1987; Visschers et al. 2016), gender (Cecere et al. 2014), education level (Neff et al. 2015), employment status (Qi and Roe 2016), income (Stancu et al. 2016), and family size (Visschers et al. 2016); life-style related factors such as personal norms (Visschers et al. 2016), dietary habit (Parizeau et al. 2015), and household routines (Wahlen 2011); food-related factors such as confusion regarding date labels (Milne 2012), overprovisioning of food (Mallinson et al. 2016; Radzymińska et al. 2016), promotion-driven overconsumption (Porpino 2016; Porpino et al. 2015), package size (Williams et al. 2012), package design (Verghese et al. 2015; Williams et al. 2012), and plate size (Wansink and Van Ittersum 2013). In this research, we demonstrate how a novel consumer-level characteristic, duration-of-ownership, influences wastage. While on the one hand, larger box stores encourage consumers to buy larger quantities of products and incentivize such purchases (by offering quantity discounts), we believe that purchasing and storing products for longer durations of time may be responsible for at least some of the rampant food wastage.

Second, our work also enriches the literature on ownership and ownership history. Prior literature on duration-of-ownership effect is limited and has not been tested in the context of

food products. We provide some insights on this missing gap and explore how duration of ownership affects food evaluation, consumption, and waste behavior.

Third, we contribute to the literature on freshness perceptions. Freshness can be defined and measured in a wide variety of ways. For example, chemists measure freshness by assessing oxidative changes occurring in the food, while microbiologists rate it based on the activity of spoilage bacteria (Cardello and Schutz 2003). While scientists can normatively determine if the food is appropriate for human consumption, how consumers discern freshness will ultimately determine whether or not they will consume this food. We demonstrate a novel factor that influences consumers' perception of freshness—duration-of-ownership—and show how this affects judgments.

These findings have important managerial and public policy implications. The pandemic has increased how much consumers buy and store for later usage, which could lead to increased duration of ownership and therefore wastage. It may therefore be important to store food in an orderly manner so as to facilitate consumption of food that is owned for a longer duration first. Furthermore, as we show, reorganizing storage location of food can lower food waste behavior. This is because merely changing location of stored food lowers perceived duration-of-ownership. Retailers also need to be cognizant of the importance of "perceived" duration of ownership on freshness perspectives. Perhaps ensuring that customers believe shelves are being restocked on a regular basis will help influence their freshness judgments and increase purchase. This can potentially lower waste.

Finally, by encouraging consumers to be cognizant of their wasteful behaviors and by educating them on how to store food appropriately, retailers can earn consumer trust and also teach them how to manage consumption of larger quantities of food, which could be beneficial in

the longer term. Indeed, companies that espouse socially and environmentally sustainable practices are awarded by consumers—not only does corporate social responsibility (CSR) have a positive impact on sales and profits (McGuire et al. 1988), but it also increases customer base and loyalty (Martínez and Del Bosque 2013).

We would be remiss not to highlight some of the limitations of this research. First, we focus on packaged food waste behavior and thus only look at the effect of longer duration-of-ownership on food products. However, the effect of duration-of-ownership may also emerge in other non-food categories. Future research could expand on our findings, by generalizing them to other product categories, to other price points, and to other modes of evaluations (e.g., separate vs. joint), and document downstream consequences (e.g., willingness to accept), and delineate boundary conditions. Second, we did not consider individual differences in perceptions of duration of ownership and its effects on food assessments. It is quite possible that some people care less about ownership duration or freshness than others. Such individual differences are worth exploring in future research.

In summary, we introduce how duration-of-ownership affect food assessments negatively, and thus the same food items are more likely to be wasted as well as wasted more when they are owned for a longer duration. We provide insights on why this effect occurs and document an easy way to help reduce food waste behavior.

CHAPTER 3: THE EFFECT OF EVALUATIONS ON CONSUMER RECYCLING BEHAVIOR

While the industrial age has heralded affluence and choice, it has also unfortunately increased wastefulness. According to the U.S. Environmental Protection Agency (EPA), approximately 292.4 million tons of municipal solid waste (MSW) were generated in 2018, compared to only 88.1 in 1960 (EPA 2020). Trashing products means that not only did we not utilize the full potential of the raw material, but that we will be imposing further stress on our landfills and incineration facilities. One way to counteract such wastefulness is by encouraging consumers to recycle. During the past decades, structural changes (such as providing recycling facilities) and consumer education campaigns (which stress the importance of recycling) have indeed helped increase recycling rates from 14.5 million tons (9.6 percent of MSW) in 1980 to 69.1 million tons (23.6 percent) in 2018 (EPA 2020). Yet, these numbers remain paltry. A large amount of recyclable material still ends up in trash bins. For example, 25.6% of paper and paperboard has been sent to landfills, and only 34.1% of metal waste generated has been recycled (EPA 2020). Thus, it is of critical importance to understand how consumers can be encouraged to recycle more.

Consumer Recycling Behavior

Recycling is defined as the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into new products (i.e., recycling aluminum

cans, paper, and bottles, etc.; The U.S. EPA). Because recycling enables the retrieval of secondary raw materials, and at the same time relieves stress on landfills and incineration facilities, it is critical to address today's waste problems. Thus, it is important to understand how consumers can be encouraged to recycle more.

Consumers' decisions to recycle (vs. trash) products are subject to a variety of influences, which can be segmented into three broad streams: consumer-level characteristics, contextual predictors, and product-related factors. Examples of consumer-level predictors include knowledge, attitudes, commitment, normative beliefs, and habit. For example, the overwhelming previous research on the effect of knowledge confirms it to be a strong and consistent predictor of recycling behavior. In general, the more knowledgeable consumers are about which materials are recyclable, and when and where materials are collected, the more likely that they are to recycle (Gamba and Oskamp 1994; Schultz 2002). Consumers' attitudes toward recycling are also related with their recycling behavior. For example, previous research demonstrates a positive relationship between environmental concern and recycling, and this attitude-behavior relationship is stronger when recycling requires more (vs. less) effort (Schultz and Oskamp 1996; Schultz et al. 1995). Similarly, increasing consumers' commitment (e.g., signing a commitment pledge) to recycling, especially personal commitment, can also increase recycling (Wang and Katzev 1990). Furthermore, a number of studies have reported a strong, positive relationship between normative beliefs and recycling behavior (Schultz 2002). Both injunctive norms (beliefs about what others think a person should do) and descriptive norms (beliefs about what other people are doing) motivates consumers to act in line with the norm, and thus the more they experience a favorable injunctive/descriptive norm toward recycling, the more likely they are to recycle (Geiger et al. 2019; Schultz 2002). Besides theses, past recycling behavior can also affect

future behavior. Past behavior may lead to a habit to recycle, and therefore increase likelihood of future recycling (Verplanken and Aarts 1999).

Contextual factors also affect consumers' decisions to recycle or trash a product. Applied researchers have long attempted to increase recycling behavior. One common approach is to offer external rewards to increase recycling behaviors (Diamond and Loewy 1991; Schultz and Oskamp 1996). Another common strategy is to reduce the amount of effort required to recycle, such as by providing curbside (vs. drop-off) recycling facilities (Folz 1991; Schultz and Oskamp 1996). Short distances to recycling facilities also stimulated recycling (Schultz et al. 1995). Likewise, convenience can help increase recycling as well (D'Amato et al. 2016; Pearson et al. 2012). For example, previous research has found a significant causal relationship between providing recycling bins and amount of waste recycled. Even if people believe recycling is virtuous, they will still not recycle unless they have a recycling bin at home (Robertson and Walkington 2009).

At the product level, previous work has examined the effect of product size and form distortion on consumer recycling behavior (Trudel and Argo 2013). If the consumption process distorts a product sufficiently from its original form (i.e., changes in size or form), consumers perceive it as less useful and in turn are more likely to trash (vs. recycle) it. Likewise, researchers find that people are more likely to recycle (vs. trash) identity-linked products because trashing a self-linked product is viewed as an identity threat (Trudel et al. 2016).

Product Evaluations

We posit that a specific product-related factor, evaluations (positive vs. negative), can impact consumers' recycling behaviors. Evaluations are defined as positive and negative judgments about a product before, during, or after its use (Gardial et al. 1994). Moreover, a product evaluation not only encapsulates a cognitive evaluation outcome (a good/bad judgment about a product, such as "the product performed well"), but also includes an emotional response (Gardial et al. 1994). Evaluations also represent one's liking or disliking of an idea, concept, or an object (Petty and Brinol 2006). For example, satisfaction is an overall emotional response that captures post-consumption evaluations (Ekinci et al. 2008; Gardial et al. 1994; Oliver Richard 1997).

We are interested in evaluations of products. A natural follow-up question may be how are these product evaluations formed? Consumers evaluate products throughout the consumption cycle, during pre-purchase consideration of alternatives, when making a purchase, to when consumption occurs, and even post consumption. Therefore, product evaluations comprise of both prepurchase and postpurchase evaluations (Dick et al. 1990; Gardial et al. 1994; Lynch Jr et al. 1988; Westbrook and Oliver 1991). Although there are similarities between the two, prepurchase and postpurchase product evaluations also differ in some important ways (Gardial et al. 1994). For example, while during the prepurchase stage consumers may evaluate a subset of available alternatives, during the postpurchase stage, consumers may only evaluate their experience with the chosen option. Moreover, prepurchase evaluations mainly focus on a product's anticipated performance, while postpurchase evaluations may capture actual performance. Some attributes, such as tastes, may be more easily judged after consumption (Gardial et al. 1994; Nelson 1970). Furthermore, postpurchase evaluations, compared to

prepurchase evaluations, typically contain a higher degree of both cognitive evaluation outcomes and affective emotional responses (Gardial et al. 1994).

Factors Affecting Product Evaluations

At the most fundamental level, factors that impact assessments of product performance influences product evaluations. For example, a food or drink that tastes good (vs. bad) will be evaluated more positively. Prior consumer research considers product evaluations to be a goal-directed process; that is, products' anticipated performance (prepurchase expectations) function as goals. Product evaluations depend on the extent to which a product's actual performance (postpurchase experiences) can achieve a consumer's goals (Gardial et al. 1994; Van Osselaer and Janiszewski 2012). In general, if the product performance meets or exceeds our expectations then we are likely to evaluate the product positively. Likewise, a product whose performance exceeds our expectations also will be evaluated positively (Oliver 1977). Changes in expectations can also affect product evaluations. For example, participants rate a pen more positively when their expectations are modest (vs. high) (Cardozo 1965).

Because of the goal-directed nature of product evaluations, consumers are also influenced by evaluations of other consumers. For example, when consumers read reviews of products posted on a variety of platforms, such as Amazon, Yelp.Com, and Rotten Tomatoes, it is also likely to affect their expectations for product performance, especially in contexts where they do not have strong attitudes for the product. Moreover, prior research has shown that consumers' rating behaviors are significantly affected by previously posted ratings, which may even lead to what are referred to as "ratings bubbles" (Moe and Trusov 2011; Muchnik et al. 2013).

Therefore, in addition to affecting expectations, other consumers' judgments may also directly affect how we evaluate products, which is consistent with the notion of conformity (Bernheim 1994).

Another factor that has a major impact on evaluations is pricing. Although product price does not provide direct information about a product's performance, consumers judge a product's performance conditional on its price (Petty and Cacioppo 1986; Thaler 1985; Zaichkowsky 1988). A product that is priced favorably will be evaluated positively (Dodds et al. 1991; Thaler 1985; Wadhwa and Zhang 2015). Relatedly, product packaging has also been shown to impact evaluations (Magnier and Schoormans 2017; Steenis et al. 2017).

Other affiliated factors that influence evaluations include a brand's image (Dodds et al. 1991) or where the product is sold (Dodds et al. 1991). Where the product is made can also impact evaluations. Indeed, a large stream of research documents that country-of-origin and other country-related factors can also impact evaluations (Chen et al. 2014).

Beyond the obvious factors that influence evaluations, how consumers process information and engage in evaluations also impact their assessments. For example, perceptions of the level of congruity between products and their associated product category schema can also affect product evaluations. Products that are moderately incongruent from their associated category schemas stimulate processing that leads to a more favorable evaluation relative to products that are either congruent or extremely incongruent (Cohen and Basu 1987; Mandler 1982; Meyers-Levy and Tybout 1989). Congruity between product and evaluation context also impacts evaluations. For example, consumers rate a bottle of ketchup more favorably after viewing a story about a fast-food restaurant than about a supermarket, because ketchup is more closely linked to fast-food restaurants (Lee and Labroo 2004).

Next, we discuss how evaluations might impact recycling behavior.

CONCEPTUAL DEVELOPMENT

Product evaluations play an integral role in impacting consumer decisions. We are interested in how product evaluations affect consumers' recycling behaviors; therefore, we focus mainly on products where consumers are about to make a disposal decision postpurchase.

In the context of postpurchase evaluations, prior research has primarily focused on how such evaluations impact future engagement with products. For example, positive postpurchase evaluations and greater satisfaction increase repurchase intentions and increase willingness to recommend the product to others (Etkin and Sela 2016). However, might these evaluations also affect consumers' disposal decision—whether they trash or recycle a product? For example, while the evaluations of a drink's taste (positive vs. negative) is likely to affect consumers' propensity to repurchase the drink, would it also impact their decision to recycle the container?

From a material-value perspective, there should be no reason to expect product evaluations to affect consumers' recycling propensity, as long as the evaluations have no bearing on the recyclability of the product/the container of the product. That is, if consumers are aware that a product (e.g., a soda can; a paper box) is recyclable, then, normatively, their disposal decisions should be independent of the evaluations. For instance, when two consumers evaluate the same soda drink differently—consumer A positively evaluates the taste, but consumer B negatively evaluates the taste, their evaluations should have no bearing on their willingness to recycle the container. To the extent the can is recyclable, both consumers should be equally likely to recycle it. However, we argue that even when evaluations of a product (e.g., taste of a drink) is not related to the recyclability of the product or its container (e.g., of the bottle), the

evaluations will still impact consumers' disposal decisions. We posit that when consumers evaluate a drink's taste positively (vs. negatively), they will be more likely to recycle its container. To put it more formally,

H1: When a product has been evaluated positively (vs. negatively), people will be more likely to recycle (vs. trash) its associated recyclable part (e.g., container).

Our predicted effect emerges even when the evaluations have no bearing on the evaluations of the recyclable parts in terms of its recyclability. We propose that our effect starts with a transfer of valence. Recognize that liking a product is not synonymous with liking its recyclable parts (e.g., the container), especially when the recyclable parts are separable and independent from the product (e.g., container box/bottle/can). Clearly, the valence of a product evaluation is closely related to consumers' attitudes toward the product (Petty and Brinol 2006). However, if the evaluation of the product has to influence people's recycling of the container, then it is not enough that the product (e.g., drink) alone has a positive valence on some specific attributes (e.g., taste, efficacy) (Brendl et al. 2005). This valence has to also transfer to the product's container, which would then affect consumers' attitudes toward this container. Thus, for the effect of product evaluations to influence consumers' recycling behaviors, the valence of the product evaluation must transfer to the container. In other words:

H2: When a product has been evaluated positively (vs. negatively), even though these evaluations have no bearing on the product's associated recyclable part (e.g., the container), people will also evaluate the recyclable part (e.g., container) more positively.

Due to affect transference, we expect consumers to also evaluate a container more positively when its product has been evaluated positively (vs. negatively). However, a natural follow up question might be - how might these container evaluations affect consumers' decisions to trash or recycle the product?

We believe that an affective association may underlie this effect as well. In general, recycling is considered as good and positive for the environment because it reuses waste in a closed-loop cycle (Asuamah et al. 2012; Liboiron 2009). Most people also believe it is good that we take greater account of the environment (Bruvoll et al. 2002). Campaigns even use themes such as "Recycle. It's Good for the Bottles. It's Good for the Can" (Liboiron 2009). We argue that "Recycling" and "Good" may already become an automatic association for consumers. When one event occurs, consumers expect to see the other event occur as well, regardless of whether the causal relationship makes sense or not. More specifically, even though the logical causality is that recycling is good, consumers may also respond more positively to recycling when a "good" cue has been activated. Therefore, when people evaluate a container more positively, they feel they should recycle (vs. trash) it. It is important to note that this response is more of an automatic trigger, and consumers may not even be aware of it. If our process explanation is correct, then interrupting this process should mitigate this effect. For example, inserting a recyclability prompt prior to their disposal decision will interrupt this automatic association, and therefore attenuate the effect. We put it more formally:

H3: Inserting a recyclability prompt prior to consumers' disposal decision will mitigate the effect of evaluations on consumers' recycling behavior.

We also rule out an alternative cognitions-based explanation for our effects. In our contexts, product evaluations have no bearing on the recyclability of the product/the associated container. Yet, it is possible that consumer may believe otherwise based on their evaluations. According to the process of inferential belief formation, when processing the given cue from a task environment, one might develop beliefs about other aspects of the task stimuli not represented by given cues (Fishbein et al. 1975; Olson 1978). For example, in the context of attitudinal conditioning, after consumers become aware of the contingency between the conditioned (CS) and the unconditioned stimuli (US), they may start to infer something about this relationship, and then inferential belief about the CS will be formed (Kim et al. 1996). In our context, consumers may also develop inferred beliefs about the recyclability of the container from its evaluation, even though such judgments are not rational. In other words, when a recyclable part (e.g., container) has been evaluated more (vs. less) positively, even though these evaluations are independent of its recyclability, people may erroneously infer this to be more recyclable and more worthy of recycling. Although we think this explanation is unlikely to hold merit, we rule this out in our studies.

STUDY OVERVIEW

We test these hypotheses in four experiments. In studies 1 and 2, we document how product evaluations affect consumers' recycling behaviors, supporting H1. Specifically, in study 1, we demonstrate external validity by showing this effect with real recycling behavior. Study 2 replicates this effect in a context where the product that is being evaluated (taste of a drink) is separable and independent from its recyclable part—the container. Studies 3 and 4 provide process support. Specifically, study 3 provides evidence for H2. In study 4, we introduce a moderation design to provide more process support, supporting H3.

STUDY 1

In study 1, we provide empirical support demonstrating the effect of evaluations on consumers' recycling behaviors. We test this effect with real disposal, demonstrating external validity.

Method

We recruited 153 undergraduates (M_{age} = 20.58 years, 65% female) to participate in this study for partial course credit. Each participant completed this study in an individual lab room to avoid distractions. We provided each participant with an identical piece of origami paper and a pen and asked them to make an origami fox following a tutorial (see figure 1). Then they were required to take their finished origami fox to the lab assistant. The lab assistant took pictures of their work and told them that an auto-grading system would score their work (but in fact the

grade was assigned randomly). While waiting for their (manipulated) grade, participants responded to several questions, and indicated 1) how difficult it was to make their origami fox, 2) how long it took them to finish the origami fox, 3) how much they enjoyed making the origami fox, and 4) what their mood was now.

After that, half of the participants randomly received a (manipulated) positive grade (Score: 8.5/10; You did better than 85% of the participants), while the other half received a (manipulated) negative grade (Score: 4.5/10; 85% of the participants did better than you). After receiving their (manipulated) grade, we informed all the participants that they could not take their origami work with them (because we wanted to ensure that every participant made their own origami). So, we asked participants to dispose of their origami work in their individual lab room before leaving. Each room had two bins: a recycling bin and a trash bin. Each bin also contained three origami foxes. We included the same three foxes in each bin to ensure that the number of foxes in the bins did not inadvertently influence decision-making (see figure 1).

After disposing of their origami work, we asked a host of questions to assess how our manipulations impacted consumer evaluations. Participants indicated 1) how satisfied they were with their origami score, 2) to what extent they respected their origami work, 3) to what extent they should treat their origami work in a respectful way, 4) how satisfied they were with their origami work, 5) how much they liked their origami work, and 6) how good did they think their origami work was. Participants also reported how tired and hungry they were, and lastly reported demographics (age and gender). Unbeknownst to participants, after they left, the lab assistant recorded whether they recycled or trashed their fox and removed it to retain the same presets for each participant.

In addition, we recruited two undergraduate research assistants (blind to the hypothesis) to grade these origami foxes independently.

Results

Manipulation Checks. After receiving their (manipulated) grade, all participants responded to several questions to indicate their satisfaction with the score, as well as their feelings about their own origami work, including their respect, satisfaction, liking, and evaluation. As shown in Table 4, all of these measures reached (marginal) significance. Thus, our manipulation was successful. A (manipulated) evaluation from others would affect how consumers judge their own work.

Recycling behavior. As expected, participants were more likely to recycle (vs. trash) their origami work when they evaluated the work positively (vs. negatively) (see Table 4 for details).

Other Measures. Before receiving their (manipulated) grade, all participants responded to several questions, and indicated how difficult, effortful, and enjoyable the task was, as well as their mood. As shown in Table 4, none of these measures reached significance. In addition, we recruited two undergraduate research assistants (blind to the hypothesis) to grade the origami foxes independently. We combined their evaluations (r = .55, $p < .001$) to form a composite measure of actual evaluation score. As expected, this actual evaluation score did not vary across the two conditions. The effect of (manipulated) evaluation on recycling behavior held even when difficulty (recycling behavior: B = .82, Wald test = 4.63, $p = .031$), effort (recycling behavior: B = .81, Wald test = 4.43, $p = .035$), enjoyment (recycling behavior: B = .78, Wald test = 3. (B = .82, Wald test = 4.63, $p = .051$), or actual evaluation score (recycling behavior: B = .88, Wald

test = 5.22, $p = .022$) was included in the model as a covariate. None of these variables were significant except for enjoyment (B = .50, Wald test = 13.19, $p < .001$).

In addition, participants who received a manipulated positive (vs. negative) evaluation felt more tired, while there was no difference in their hunger level. The effect of (manipulated) evaluation on recycling behavior held even when tiredness and hunger were included in the model as a covariate (recycling behavior: B = .79, Wald test = 4.18, $p = .041$).

Discussion

In summary, study 1 provides some real behavioral evidence for how evaluations impact recycling behavior, supporting H1. Even though the evaluation is only about their work performance and has nothing to do with the actual recyclability of the origami paper, this received (and manipulated) evaluation indeed affects how they evaluate their own origami work, and impacts their recycling decisions: more of the participants end up recycling (vs. trashing) their origami work when they receive a (manipulated) positive (vs. negative) evaluation on their fox work.

FIGURE 1: ORIGAMI TUTORIAL AND LAB ROOM SETTING (STUDY 1)

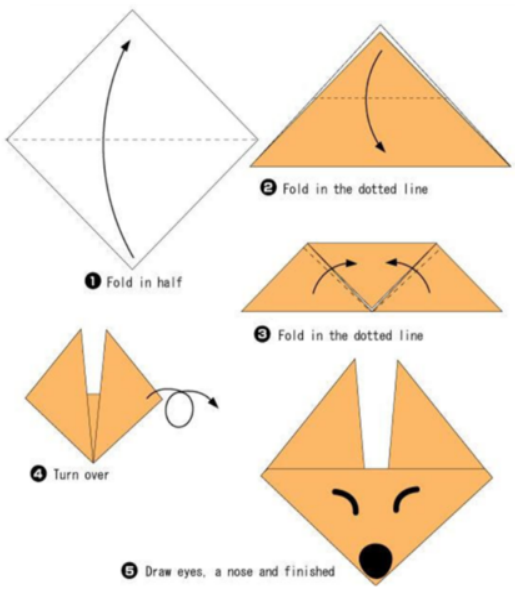


TABLE 4: STUDY 1 RESULTS

		Negative Eva	Positive Eva		*F* (1, 151)	*p*
Manipulation Checks	Satisfaction (with the score)	1.83 (1.28)	4.93 (1.47)		192.99	<.001
	Respect 1	4.31 (1.59)	4.88 (1.50)		5.25	.023
	Respect 2	4.27 (1.70)	4.85 (1.65)		4.64	.033
	Satisfaction (with the fox)	4.01 (1.84)	5.17 (1.34)		19.75	<.001
	Like	4.44 (1.76)	4.91 (1.48)		3.19	.076
	Evaluation (self-report)	4.19 (1.79)	4.68 (1.55)		3.24	.074
		Negative Eva	**Positive Eva**	**B**	**Wald test**	***p***
DV	Recycling Percentage	65% (0.48)	81% (0.39)	.84	4.84	.028
		Negative Eva	**Positive Eva**		***F* (1, 151)**	***p***
Other Measures (before-manipulation)	Difficulty	2.12 (1.31)	1.97 (1.27)		<1	.498
	Effort	2.29 (1.19)	1.99 (1.16)		2.65	.106
	Enjoy	4.51 (1.59)	4.81 (1.53)		1.42	.235
	Mood	4.64 (1.22)	4.88 (1.15)		1.56	.214
Actual performance	Evaluation (from 2 RAs)	5.82 (1.68)	5.47 (1.87)		1.50	.223
Other Measures (after-manipulation)	Tiredness	3.63 (1.87)	4.20 (1.70)		3.90	.050
	Hunger	3.41 (1.96)	3.69 (2.01)		<1	.380

STUDY 2

In study 2, we seek to replicate the effect of evaluations on consumers' recycling behavior in a different evaluation context: product evaluation. Furthermore, in study 1, the origami paper had already been made into an origami fox and given either a positive or a negative grade. In this case the product (origami) was not distinguishable from the product that was disposed—that is, the origami paper. When participants were making their disposal decisions, it is likely that they were unable to think about the origami paper independently. In this study (as well as all the following studies), we will explore whether these effects apply to a separable and recyclable part associated with the product.

Method

We recruited 170 undergraduates (M_{age} = 20.49 years, 68% females) from a large US public university to participate in this study in return for partial course credit. We used a one-factor (evaluation: positive vs. negative) between-subjects design, with random assignment.

Under the guise of evaluating a brand of bottled water, participants were randomly assigned to either the positive or the negative evaluation condition. In the positive (negative) evaluation condition, participants saw the same picture of a bottled water (see Figure 2) and were informed that this brand of bottled water was very well (poorly) rated on a shopping website with an evaluation score of 4.8/5 (1.8/5). Furthermore, we explicitly informed participants the reasons underlying the positive (negative) evaluations: most customers agreed that this brand of bottled

water tasted really good (didn't taste good to them). In both cases, the product was priced the same.

To be consistent with our cover story, participants first reported 1) how good they thought this brand of bottled water was, 2) how likely were they to purchase it, as well as 3) if they received a free bottle from this brand, how likely were they to finish it. After that, they responded to the recycling propensity measure and indicated that after they finished it, how likely they were to throw the bottle into the recycling bin (1= Not likely at all, 7= Very likely). They then indicated that to what extent did they think this bottle was worth recycling (1= Not at all, 7= A lot) and lastly reported demographics (age and gender).

Results

Manipulation Checks. As expected, participants in the positive (vs. negative) evaluation condition evaluated the bottled water more positively, had a higher willingness to purchase it, and were more likely to finish it (see Table 5 for details). Others' product evaluations successfully influenced consumers' own product expectations.

Recycling behavior. Consistent with our expectations, consumers were more likely to recycle the bottle when its taste was positively (vs. negatively) evaluated by others (see Table 5 for details).

Other. Worthy of recycling did not reach significance (see Table 5 for details). The effect of product evaluation on recycling behavior still marginally held even when perceptions of recycling worthiness was included in the model as a covariate (recycling behavior: F (1, 168) =

2.88, $p = .091$; worthy of recycling: $F(1, 168) = 123.40$, $p < .001$). This suggests that consumers did not use evaluation to make inferences about recycling worthiness.

FIGURE 2: STIMULI USED IN STUDY 2

TABLE 5: STUDY 2 RESULTS

		Negative Eval.	**Positive Eval.**	***p***
Manipulation Check	Evaluation	1.96 (1.16)	5.22 (1.16)	<.001
	Willingness to purchase	1.67 (1.02)	4.49 (1.59)	.005
	Likelihood to finish	4.26 (1.88)	6.53 (.92)	<.001

		Negative Eval.	**Positive Eval.**	***F* (1, 168)**	***p***
DV	Likelihood to recycle	5.34 (1.72)	5.82 (1.29)	4.27	.040
Other	Worthy recycling	6.00 (1.33)	6.21 (.99)	1.39	.240

Discussion

In summary, study 2 provides consistent evidence for how product evaluations impact recycling behavior, supporting H1. Even though the product's taste has no bearing on the bottle's recyclability, it affects consumers' recycling behaviors differentially: when consumers evaluate the taste of a drink positively (vs. negatively), they are more likely to recycle the bottle.

We also provide preliminary evidence to suggest that consumers do not infer recycling worthiness of a product's container based on evaluation of the product, suggesting that this alternative explanation does not hold. We provide more evidence to rule this explanation out in our subsequent studies.

Note that just because the product is evaluated positively or negatively does not mean that the container will also be judged accordingly. The container is distinct from the product. However, we believe the valence of product evaluation will be transferred to the container (H2). That is, when a product has been evaluated positively (vs. negatively), people will also evaluate such recyclable part (e.g., container) more positively, even though these evaluations have no bearing on its associated recyclable part (e.g., container). We aim to test this transfer process in study 3.

Furthermore, after this transferring process, one would still need to use either a cognitive inferential judgment, an affective association, or both to guide their behavior. In the next three studies, we seek to demonstrate the mechanism underlies this effect.

STUDY 3

The goals of study 3 are two-fold. First, we seek to replicate our evaluation effect on recycling behavior in a new evaluation context: that of product efficacy. Second, we provide evidence for the affective transfer of valence process (H2) and rule out our cognitive inference-based mechanism.

Method

In study 3, we recruited 300 MTurk respondents (M_{age} = 40.06 years; 54.7% males, 42.7% females) approved by the Cloud Research platform. We used a one-factor (evaluation: positive vs. negative) between-subjects design, with random assignment.

Participants were asked to imagine that they were trying a new brand of energy drink that would improve concentration and focus. They were randomly assigned to either the positive or the negative evaluation condition. In the positive evaluation condition, participants learned that they felt a big energy boost, while in the negative condition, they did not feel a boost. Consequently, participants in the positive (negative) evaluation condition would rate this energy drink a 5 out of 5 (1 out of 5).

They then learned that they would like to dispose of its can after they finished their drink. A trash bin was just next to them, and the recycling bin was a 5-minute walk away. Participants then responded to two recycling propensity measures and indicated 1) how likely they were to throw the can into the recycling bin (1= Not likely at all, 7= Very likely), and 2) what they were going to do with the can (binary, trash vs. recycle the can). After that, they evaluated 1) how good this can was (1= Not good at all, 7= Very good), indicated 2) how recyclable this can was

(1= Not at all, 7= A lot), and reported age and gender (male, female, nonbinary, other, or prefer not to answer).

Results

Recycling behavior. Consistent with our first two studies and H1, participants were more likely to recycle the bottle when the product (in this case efficacy) was evaluated more positively (vs. negatively), and more of the participants chose to recycle (vs. trash) the can (see Table 6 for details).

Evaluation of the container. Participants in the positive (vs. negative) evaluation condition indeed evaluated the can of this energy drink more positively ($M_{negative}$ = 3.94, SD = 1.80 vs. $M_{positive}$ = 5.45, SD = 1.22; $p < .001$), even though the product evaluation related to the efficacy of the drink and had no bearing on the quality of the container. Yet, consumers evaluated the can positively. Thus, the valence of the product's efficacy evaluation transferred to the can, supporting H2.

Recyclability. Consistent with the recycling worthiness measure used in study 2, participants' perceptions and judgments about the recyclability of the can were also independent of product evaluations in this study and did not vary across the two conditions ($M_{negative}$ = 6.53, SD = .82 vs. $M_{positive}$ = 6.57, SD = .78; $F\ (1, 298) < 1$). Thus, we rule out the cognition-based inferential process in this study again. Moreover, the effect of product evaluation on recycling likelihood (F (1, 297) = 6.45, p = .012) and disposal decision choice (B = .66, Wald test = 6.54, p = .011) persisted even when recyclability was included in the model as a covariate.

Mediation tests. Bootstrapping results (Process model 4; Hayes 2018) confirmed a significant indirect effect (indirect effect = .42, SE = .13, 95% CI = [.167, .672]) verifying that product efficacy evaluations were transferred to the can, which then influenced consumers' recycling likelihood. We then subjected the data to a serial multiple mediation analysis (Process model 6; Hayes 2018), with the disposal choice as the dependent variable. Bootstrapping results confirmed a significant indirect effect, verifying the full mediating pathway we proposed (see Table 6 for details).

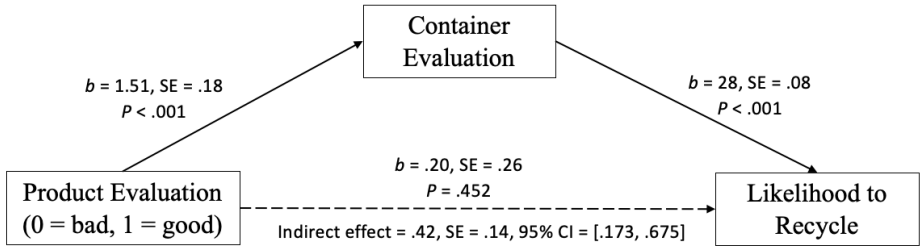
Discussion

Study 3 provides some evidence that it is a transfer of valence from product evaluation to the container evaluation (H2). However, studies 2 and 3 provide consistent evidence ruling out the cognitive inference-based argument that evaluations inform recyclability perceptions, which then drives disposal behaviors.

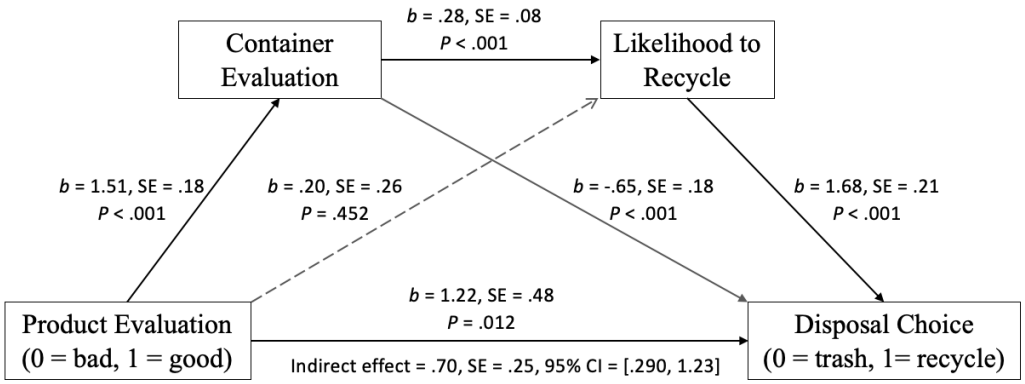
TABLE 6: STUDY 3 RESULTS

		Negative Eval.	Positive Eval.	*F* (1, 298)		*p*
DV	Likelihood	4.81 (2.16)	5.42 (1.97)	6.60		.011
				B	**Wald test**	***p***
	Choice	61% (.49)	75% (.44)	.65	6.64	.010

Mediation



Serial Mediation



STUDY 4

According to the prior three studies, we find consistent and robust evidence that evaluations affect consumers' recycling behavior, even when these evaluations have no bearing on the recyclability of the product/its associated recyclable parts.

It is of critical importance to understand how consumers can be encouraged to recycle more. Given that evaluations are fundamental to not just consumption but to everything we do in life, it would be helpful to mitigate the toxic impact of negative evaluations on consumers' recycling behavior.

From a material-value perspective, there should be no reason to expect that product evaluations would affect consumers' recycling propensity. If consumers are aware that a product (e.g., a soda can; a paper box) is recyclable, then, normatively, their disposal decisions should be independent of the evaluations. However, we do find that disposal decisions are impacted by evaluations. Our theory posits that this occurs because of affect transfer: people transfer their evaluation of the product to the container, and furthermore, a positive evaluation will trigger them to recycle. If our process explanation is correct, then interrupting this process by reminding them to think about the recyclability of the container should mitigate this behavior. In this study we allow affect transfer process to complete but insert a prompt prior to disposal that should serve to remind consumers of the recyclability of the container. We expect this to lead consumers to behave more rationally and make their disposal decision based on the recyclability of the container rather than its evaluation.

Method

In study 4 (pre-registration link: https://aspredicted.org/Y62_WTS), we recruited 600 MTurk respondents (Mage = 40.05 years; 44.8% males, 53.7% females) approved by the Cloud Research platform. We used a 2 (evaluation: positive vs. negative) x 2 (recyclability reminder: control, no reminder vs. with reminder) between-subjects design, with random assignment. We asked participants to imagine that they were sitting on a park bench enjoying their afternoon, and they opened a box of chocolate candy (5 OZ/141g) (a new flavor, see Figure 3). In the positive (negative) evaluation condition, participants learned that they really liked (did not like) this new flavor and they would give it a 9.5 (1.5) out of 10. All participants first evaluated how good this container box was (1= Not good at all, 7= Very good). We specifically measured their evaluation toward the container before they made a disposal decision. This would serve to indicate if the product evaluations transfer to the container.

While we allowed the affect transfer process to complete for all, after the container evaluation, half the participants were interrupted and asked to indicate recyclability of the box (1= Not at all, 7= A lot). The other half were not interrupted.

All participants then learned that they would like to dispose of the box after they finished the candy. A trash bin was just next to them, while the recycling bin was a 5-minute walk away. Participants then responded to two recycling propensity measures: 1) how likely they were to throw the box into the recycling bin (1= Not likely at all, 7= Very likely), and 2) what they were going to do with the box (binary, trash vs. recycle the can). At last, they reported age and gender (male, female, nonbinary, other, or prefer not to answer).

FIGURE 3: STUDY 4 STIMULUS

Results

Evaluation of the container. We measured their evaluation of the container before the manipulation of its recyclability. Consistent with study 3, there is a significant main effect of product taste evaluation on container evaluation: participants in the positive (vs. negative) evaluation condition evaluated the container box more positively ($M_{negative} = 2.14$, $SD = 1.60$ vs. $M_{positive} = 5.73$, $SD = 1.45$; $p < .001$). This provides support for our affect transfer process argument: the valence of the product's taste evaluations was transferred to the container.

Recyclability. Only half the participants were asked to evaluate the recyclability of the container prior to disposal. As expected, taste evaluation did not affect recyclability judgments ($M_{negative} = 5.56$, $SD = 1.48$ vs. $M_{positive} = 5.46$, $SD = 1.56$; F (1, 298) <1). In other words, consumers were cognitively aware that the recyclability of the container box was independent of the taste of the candy.

Recycling behavior. A two-way ANOVA with likelihood of recycling as the dependent measure revealed a significant interaction (F (1, 596) = 5.29, p = .022). A two-way Binary Logistic Regression with disposal choice as the dependent measure also revealed a similar pattern. The interaction reached significance (B = -.66, Wald test = 3.89, p = .049). As expected, when respondents were not asked to evaluate the container's recyclability prior to disposal, our effects replicated: when the candy evaluations were positive (vs. negative) consumers were more likely to recycle the box and more of them chose to recycle (vs. trash) the container. However, when participants were interrupted with a question asking about the recyclability of the box prior to making their disposal decision, the pattern of results were consistent with our expectations. First, and perhaps most importantly, the question prompt increased consumers' recycling likelihood in the negative evaluation condition. Second, the question prompt did not negatively impact recycling likelihood for those who evaluated the product positively. Thus, asking participants to assess the recyclability of the container successfully mitigated the influence from a negative product evaluation, while it did not influence recycling when product was positively evaluated (see Table 7 for details).

Moderated Mediation tests. We subjected the data to a moderated mediation analysis, as shown in Table 7 (Process model 14; Hayes 2018). We expected the recyclability question to moderate the effects of affect transfer process. The results were consistent with our expectations. Bootstrapping results confirmed a significant interaction (B = -.18, SE = .079, p = .023), verifying the moderated mediation we proposed (see Table 7 for details). We also tested for a moderated serial mediation analysis (Customize model) (Hayes 2018), which also documents how the process impact choice. These results were consistent with our theory and expectations, supporting H3 (see Table 7 for details).

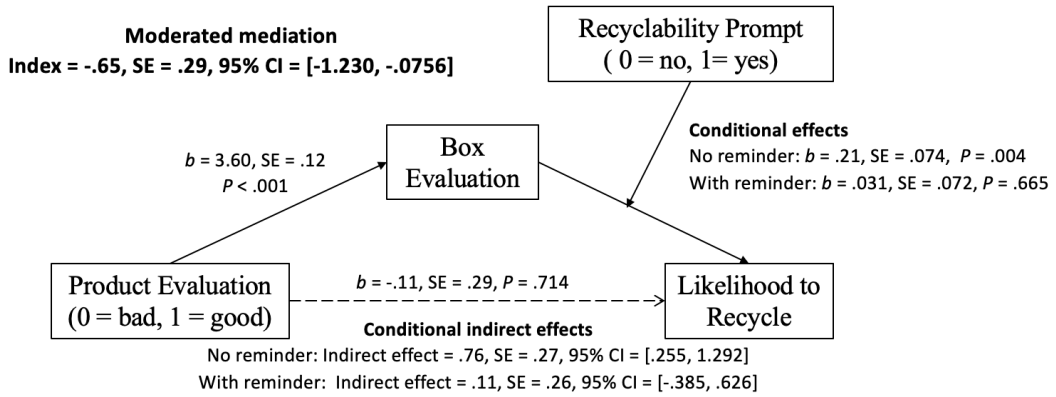
Regression analysis. When participants were reminded to think about the recyclability of the container box, neither product evaluation nor container evaluation would affect their recycling behavior. Then what could be the underlying mechanism behind their recycling decision? We further ran a regression analysis to provide some correlational evidence. As shown in Table 8, participants' likelihood to recycle a container box was positively correlated with their judgment of the container's recyclability, and their likelihood to recycle also correlated with their disposal decisions to trash or recycle.

TABLE 7: STUDY 4 RESULTS

Dependent variables

		Negative Eval.	**Positive Eval.**	***F* (1, 596)**		***p***
Likelihood	No Prompt	4.10 (2.36)	4.87 (2.29)	8.41		.004
	With Prompt	4.62 (2.28)	4.53 (2.23)	<1		.724
				B	**Wald test**	***p***
Choice	No Prompt	49% (.50)	65% (.48)	.63	3.13	.008
	With Prompt	61% (.49)	60% (.49)	-.028	<1	.906
		No Prompt	**With Prompt**	***F* (1, 596)**		***p***
Likelihood	Negative Eval.	4.10 (2.36)	4.62 (2.28)	3.87		.050
	Positive Eval.	4.87 (2.29)	4.53 (2.23)	1.66		.199
				B	**Wald test**	***p***
Choice	Negative Eval.	49% (.50)	61% (.49)	.46	3.88	.049
	Positive Eval.	65% (.48)	60% (.49)	-.20	<1	.404

Moderated Mediation and Moderated Serial Mediation


Moderated mediation
Index = -.65, SE = .29, 95% CI = [-1.230, -.0756]
Recyclability Prompt
(0 = no, 1= yes)
Conditional effects
No reminder: b = .21, SE = .074, P = .004
With reminder: b = .031, SE = .072, P = .665
b = 3.60, SE = .12
P < .001
Box
Evaluation
Product Evaluation
(0 = bad, 1 = good)
b = -.11, SE = .29, P = .714
Likelihood to
Recycle
Conditional indirect effects
No reminder: Indirect effect = .76, SE = .27, 95% CI = [.255, 1.292]
With reminder: Indirect effect = .11, SE = .26, 95% CI = [-.385, .626]

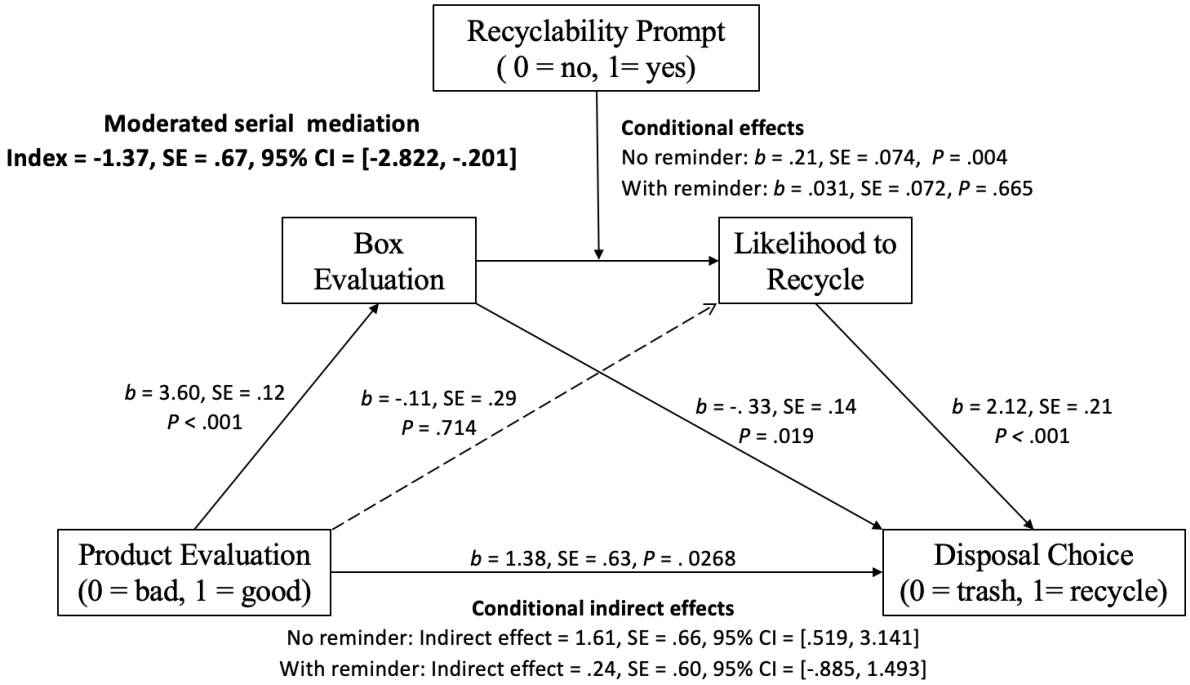

Recyclability Prompt
(0 = no, 1= yes)
Moderated serial mediation
Index = -1.37, SE = .67, 95% CI = [-2.822, -.201]
Conditional effects
No reminder: b = .21, SE = .074, P = .004
With reminder: b = .031, SE = .072, P = .665
Box
Evaluation
Likelihood to
Recycle
b = 3.60, SE = .12
P < .001
b = -.11, SE = .29
P = .714
b = -. 33, SE = .14
P = .019
b = 2.12, SE = .21
P < .001
Product Evaluation
(0 = bad, 1 = good)
b = 1.38, SE = .63, P = . 0268
Disposal Choice
(0 = trash, 1= recycle)
Conditional indirect effects
No reminder: Indirect effect = 1.61, SE = .66, 95% CI = [.519, 3.141]
With reminder: Indirect effect = .24, SE = .60, 95% CI = [-.885, 1.493]

TABLE 8: STUDY 4 REGRESSION RESULTS

Dependent Variable: Likelihood to Recycle			
	B	**SE**	***P***
Product Evaluation (0 = bad, 1 = good)	-.19	.38	.625
Evaluation (of the box)	.04	.08	.649
Recyclability (of the box)	.368	.08	<.001
Dependent Variable: Disposal Choice			
	B	**SE**	***P***
Product Evaluation (0 = bad, 1 = good)	-.015	.042	.717
Evaluation (of the box)	.007	.009	.423
Recyclability (of the box)	-.015	.009	.126
Likelihood to Recycle	.193	.006	<.001

GENERAL DISCUSSION

Together, these studies document that, when the product is evaluated positively (vs. negatively), consumers are more likely to recycle the product or its recyclable parts (e.g., containers), even though these evaluations do not affect the actual and inferred/perceived recyclability of the product or the container. These effects occur because 1) a transfer of valence: the valence of a product evaluation will be transferred to its associated recyclable parts (e.g., container), 2) positive container evaluation will then trigger consumers to recycle, unless an interruption is inserted.

Our findings enrich several literatures. Foremost, we contribute to a growing literature on consumers' recycling behavior. A variety of factors can influence consumers' recycling behavior. Such factors include 1) consumer-level characteristics, such as knowledge (Gamba and Oskamp 1994; Schultz 2002), attitudes (Schultz and Oskamp 1996; Schultz et al. 1995), and past recycling behavior (Verplanken and Aarts 1999); 2) contextual factors: such as external rewards (Diamond and Loewy 1991; Schultz and Oskamp 1996) and convenience (D'Amato et al. 2016; Pearson et al. 2012); as well as 3) product-level factors, such as product distortion (e.g., size and form distortion) (Trudel and Argo 2013), and identity-relevance (Trudel et al. 2016). In this research, we demonstrate how a specific product-related, evaluations, affect consumers' recycling behavior. We also propose an intervention to mitigate the toxic influence from negative evaluations.

Second, our work also enriches the literature on postpurchase product evaluations. Prior literature on postpurchase evaluations is mainly focused on how evaluations are formed, what factors influence evaluations, and how evaluations impact future engagement with products

(Etkin and Sela 2016). We provide some novel insights on how postpurchase products affect consumers' disposal decisions, even when these evaluations have no bearing on the recyclability of the product.

These findings have important practical contributions. Municipal solid waste has been unfortunately increasing every year. Trashing products means that not only did we not use the full potential of the raw material, but that we will be imposing further stress on our landfills and incineration facilities. Thus, it is important to understand why consumers trash recyclable stuff and how they can be encouraged to recycle more. We find that products evaluations may unnecessarily discourage consumers' recycling behavior when the product is negatively evaluated. However, these effects could be mitigated if participants are reminded to think about product recyclability before their disposal decisions. It may therefore be important educate consumers to help reduce unnecessary waste due to negative product evaluation.

We would be remiss not to highlight some of the limitations of this research. First, we focus on products that will be used up quickly. In other words, the time interval between consumption and disposal decision is very short. Future research could examine whether the effect of evaluations on recycling behavior could be generalized to situations where the time interval between consumption and disposal is longer. Second, we did not consider individual differences. It is quite possible that some people are less likely to transfer product evaluations to the container or may automatically evaluate recyclability prior to making their disposal decision. Such individual differences may be worth exploring in future research.

In summary, we introduce how product evaluations affect consumers' recycling decisions, even when these evaluations are independent of its recyclability or assessments of

recycling worthiness. We provide insights on why this effect occurs and document an intervention to help attenuate the toxic impact from negative evaluations.

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