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EFFECTS OF SERVEWARE MATERIALITY ON
FOOD PERCEPTIONS, CONSUMPTION, AND WASTE

by

SARA WILLIAMSON

A dissertation submitted to the Graduate Faculty in Marketing in partial fulfillment of the requirements for the Degree of Doctor of Business, The City University of New York - Baruch College

2016

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This manuscript has been read and accepted for the Graduate Faculty in Business in satisfaction
of the dissertation requirement for the degree of Doctor of Business.

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ABSTRACT

Effects Of Serveware Materiality On Food Perceptions, Consumption, and Waste

by

Sara Williamson

Advisor: Lauren G. Block, PhD

Three lab studies and three field studies indicate that food waste and consumption is influenced by serveware disposability. Studies indicate that consumers waste more food when eating with disposable plates and consume more food when eating with permanent plates. The effect persists whether participants choose their own type and quantity of food or are given the same amount of food, whether they are responsible for plate disposal or not, and whether the serveware is touched/held or not. Process level support is provided via an IAT test to explain this effect as a perceptual readiness to dispose of food when on disposable serveware and to consume food when on permanent serveware.

ACKNOWLEDGEMENTS

My academic success is only possible because of the love and support I have received from so many people. Most importantly, I must first offer my sincere gratitude to Dr. Lauren G. Block, my dissertation advisor and academic mentor, for the opportunities and insight she provided over the past four years. Thank you, Lauren, for believing and investing in this “wild card.” You welcomed me into your life and have been so incredibly generous with your time, resources, and knowledge. A thank you is not nearly enough, so I can only hope to make you proud of your investment in me.

A special thank you to our PhD Program Coordinator, Steve Gould, for his invaluable guidance and instruction throughout my time as a student. And many thanks to Steve and Lauren, as well as Pragya Mathur and Punam A. Keller, for serving on my dissertation committee and for catapulting my career success; all that I have accomplished is possible because of the support I received from you. I must also thank the other doctoral faculty in my program for offering a supportive environment to the Marketing PhD students at Baruch. To Ana Valenzuela, Sankar Sen, Stacey Finkelstein-Young, Sunaina Chugani, and Sajeesh – we are better at our jobs because you are so good at yours. Additionally, thanks to our department chair, David Luna, for your encouragement and support along the way. Of course, I cannot overlook the diligence and care that Joseph Weintrop provided as the Executive Officer of the PhD program at Zicklin. And, all of the leadership I received from the above mentioned was made possible by the diligent support staff at Baruch College. Specifically, in regard to my academic career and sanity, many thanks to Leslie DeJesus.

In reflection, the PhD students at Baruch are not only talented but incredibly collegial, and I’m fortunate to emerge from this particular program. Thank you to my cohort Lauren Mayor for being (often literally) by my side for the journey and for your tolerance, discretion, and team spirit; we did this together, and I have the utmost respect and admiration for you. Thanks to my cohort Boram Nam for being the ultimate cheerleader and for your friendship, empathy, and loyal support. To “upperclassmen” Chrissy Martins, Rhonda Hadi, Zoe Rogers, Diogo Hildebrand, Dan Rubin, Veronika Ilyuk, and Yan Meng, thank you so much for your generosity of time, mentorship, and resources. To Ann McNeel, in particular, what a wicked way for the universe to bring us together, but thank God, because I couldn’t have done it without you. And to the students that joined along the way, I learned so much from you and truly value our relationship. In particular, a special thanks to Emily Goldsmith, Sara Basklenti, and Lama Lteif for always being so willing to lend a hand and to share a thought.

Over the years, my life has become more enriched with academic colleagues who have contributed to my success and have become my friends. In particular, I want to acknowledge and thank Tracy Rank-Christman, Courtney Baker, and Kirk Kristofferson for some of the best

conversations and adventures that nerds like us could conjure up. I'm a better researcher and educator because of my time with you.

It's important to remember where this all began, so I must also acknowledge the hard working, supportive folks at the University of Kentucky College of Agriculture, Food, & the Environment for granting me the opportunity to become a better researcher and educator through food marketing projects that really made a difference for Kentucky's communities. A special thanks to Tim Woods and Lee Meyer for encouraging me to embark upon my academic career. I must also thank Jennifer Hunter and Kenny Burdine who, despite drowning in their own responsibilities, taught me the important and unspoken formalities of being a graduate student. In reflection, I owe a debt of gratitude to Leigh Maynard and Tracy Kitchel for introducing me to academic research, of which I fell in love. And to Roger Brown, who taught me about the value and satisfaction of being a good teacher and mentor – this understanding has truly enriched my life.

For this dissertation work, in particular, I want to acknowledge and thank those who made the research possible. The field studies were made possible by generous help from foodservice and institutional staff and, in particular, our field assistant, Mikayla Block. I'd also like to thank Robert Burnham for his incomparable assistance with survey administration and data programming on a very complicated IAT experiment. Additionally, some of this research was funded by a generous grant from the Cornell Center for Behavioral Economics in Childhood Nutrition Programs.

Most of all, I want to acknowledge my family and loved ones – a huge assembly of bossypants who, while encouraging me to pursue my dreams and persevere, often settled for inadequate time and attention from me over the past eight years while I've earned my graduate degrees. Thank you - I love you all. In particular, my fiancé made it possible for me to earn the privilege of my dream job without going hungry, homeless, or crazy; for all that you've selflessly contributed, Joshua, this is *our* PhD.

Finally, I will always acknowledge two important people who introduced me to my lifelong passion – the production, meaning, and marketing of food. I will be eternally grateful and indebted to Mac Stone and the late Michael Judge for planting and nurturing a seed which has changed my life for the better.

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INTRODUCTION

According to the Food and Agriculture Organization (FAO), the U.S. wastes 30 percent of its food, valued at \$162 billion annually (Royte 2014). Food waste is a growing problem, not only in the United States, but across the World. It is considered "one of the great paradoxes of our time: Hundreds of millions of people go hungry, and yet we waste a whopping 1.43 billion tons of food — one third of what we produce" (Barclay 2013).

Although some of this waste is a result of mismanagement by producers, manufacturers, distributors, and retailers, a large proportion of food waste is at the hands of individual consumers (Coleman-Jensen et. al 2011). Consumers waste 50% more food today than did in 1970 (Wee 2016), to the extent that consumer level food waste could fill the 90,000 Rose Bowl stadium every day (Bloom 2010). According to the UN, an average consumer in Europe and North America wastes between 209–254 pounds of food annually (Pandika 2013). In fact, research suggests that the average U.S. family wastes between 15 and 25% of the total food they buy (WSJ 2010), while other studies report that disposal of purchased yet uneaten food costs a family of four between \$500 and \$2,000 a year (Nassauer 2012). At the end of the day, one in four calories intended for human consumption goes uneaten (UNEP 2015).

Societal changes in our way of eating are much to blame for this consumer waste phenomenon. Dining out and takeout meals account for 50% of U.S. food expenditures (Nassauer 2012). We're constantly eating "on the go," with no option to save uneaten food for later. In addition to eating more food away from home, consumers are also being served larger portions (Young and Nestle 2002; NIH 2013). Thus, consumers are often left with a difficult decision to either eat more or waste more. This shift in our consumption behavior isn't just fast-

food specific; many consumers are wasting by necessity at conference banquets, work and school foodservice lunches, and social events like weddings and fundraisers.

With such an increase in food consumption away from home, it's no surprise that the proportion of total waste made from disposable serveware has also been on the rise. Overall, Americans throw away enough serveware materials each year to circle the equator 300 times (Wills 2010). In fact, consumers who regularly use disposable serveware for lunch may generate up to 100 pounds of trash per year (Reuseit 2013). This parallel trend of increasing food waste and increasing use of disposable serveware begs an important research question: *is consumer food waste influenced by serveware disposability?*

There is ample evidence that social, environmental, and atmospheric cues influence what foods we choose, how much we eat during a consumption episode, and even how much we like it (cf. Chandon and Wansink 2012 for a review). Researchers have only more recently begun a systematic exploration of the role of serveware on food perception and consumption volume. A substantial stream of research from Spence, Piqueras-Fiszman, and colleagues has investigated the influence of serveware characteristics on food perceptions to find that the particular material from which cutlery is made has a significant influence on our evaluation of the food being eaten (Harrar and Spence 2013; Piqueras-Fiszman and Spence 2011; Spence et al. 2012). For example, Spence and Harrar (2013) show that eating yogurt with a lightweight plastic spoon results in different perception of taste, density, expensiveness, and sweetness than for the same product eaten with a heavyweight plastic spoon or metal spoon. And while there is ample research to suggest that food consumption volume is influenced by serveware characteristics such as size, shape, weight, and color (cf Wansink 2014 for review), the particular effect of serveware

materials on consumption, and the antithesis of food consumption - food waste, has not been explored.

We theorize that the effect of serveware materials on food waste is best explained by our experiences with serveware materials and consumption over time. This leads consumers to a perceptual readiness to dispose of food when on disposable serveware and to consume food when on permanent serveware. Support for this perceptual-readiness explanation can be found in the relevant cultural norms related to eating on disposable plates. Specifically, social norms established by repeated associations over time favor the perception-categorization process: consumers are conditioned to throw away disposable plates and the food that remains on them; at picnics, seminars, parties and even at home, we bring our disposable plates to the trash can and toss the entirety – food and all. By contrast, while we might also toss leftover food from a permanent plate, the plate itself is not discarded. Over time, consumers learn to categorize meals on disposable serveware differently than meals on permanent serveware; this, in turn, influences subsequent consumption according to the serveware materials with which food is consumed. We suggest that, through this process, disposable plates become associated with food waste, and that this perception-behavior link activates automatically -- even when people are not expected or required to throw away the plate.

Our objective is to contribute to the consumer behavior literature by providing insights on untested factors that contribute to individual food waste. In particular, we build on the literature that examines how properties of the materials used to serve or consume food influences perceptions and consumption of food. We study the effects of a new property, material disposability, on food perceptions and food waste. Thus, our contribution is three-fold. First, we investigate a hitherto untested property of serveware, whether the plate material is either

permanent or temporary/disposable, on food perception, food and plate categorization, and actual consumption and waste behavior. Second, we provide evidence for an undocumented effect of plate disposability such that people waste more/consume less food when it is eaten on a disposable plate and waste less/consume more food when it is eaten on a permanent plate. Finally, our results provide preliminary evidence that the process of wasting food on disposal plates is automatic and may be related more to categorizing plate and food as disposable rather than believing the food served is of lower quality or does not taste as good.

THEORETICAL BACKGROUND

Automatic Categorization (Perceptual Readiness) Effects

There is ample research to support that subtle environmental cues can activate cognitive and affective processes without awareness or intent (Bargh 2002; Sela and Shiv 2009). When these cues prime a concept within the consumers' mind, they can have an automatic effect of perception on action (Bargh and Chartrand 1999). These effects can be explained with the perception-behavior theory, which posits that contextual stimuli can influence behavior nonconsciously through a two-stage process, where an automatic perceptual activity creates automatic behavioral tendencies through the perception-behavior link (Bargh and Chartrand 1999). This perception-behavior link is activated through categorization; objects acquire meaning by being categorized, where stimulus properties serve as cues to the membership of the object in one or more categories (Bruner 1957). If the stimulus properties match up to the category characteristics, this process is automatic; Bruner (1957) termed this process as "perceptual readiness."

According to Fiske and Pavelchak (1986), the process of perceptual categorization extends to the activation of an evaluative tag, such that the act of perception not only leads to automatic categorization but also the automatic retrieval of concepts that have been attached to the properties of the stimulus. Specifically, upon perception of a stimulus and its properties, an automatic attitude activation occurs and the stimulus is quickly classified without intention or consideration (Bargh and Chartrand 1999; Fiske and Pavelchak 1986; Zajonc 1980). This process of automatic categorization is supported by ample literature on implicit associations, where consumers categorize pairs of stimuli faster when the association between the pairs is stronger (Greenwald, McGhee, and Schwartz 1998; Greenwald, et. al 2009). Indeed, the literature suggests level of food consumption may result from how people spontaneously categorize food and food consumption as good vs. bad (Oakes and Slotterback 2001; Rozin, Ashmore, and Markwith 1996), healthy vs. unhealthy (Raghunathan, Naylor, and Hoyer 2006) and forbidden vs. not forbidden (Knight and Boland 1989).

The perception-behavior link, where consumers exhibit behavioral predispositions towards a stimulus, is also supported in the literature on semantic networks. Semantic associations enhance the mental accessibility of concepts related to an object (Sela & Shiv, 2009). Once a semantic association is activated, related concepts can also be activated along a “semantic network” (Förster, Liberman, and Friedman 2009). Accordingly, activated semantic constructs can increase the likelihood of potentially related behaviors (Sparrow and Wegner 2006), especially in cases where the mental representation is highly related to the stimulus (Higgins 1996). For example, Berger and Fitzsimons (2008) found that repeated exposure to an everyday environmental cue (i.e., the color orange) influenced product choice by priming a

certain concept (i.e., Halloween). This exhibits a perception-behavior link that is established through consumption experiences over time.

Taking all of this into consideration, the literature demonstrates how frequent or recent exposure to conceptually or perceptually related cues increases accessibility, making it easier to process stimulus properties of the product. To this extent, we theorize that repeated exposure to disposable serveware materials increases accessibility to relative semantic constructs related to food disposal. Specifically, consumers' repeated exposure to consuming food with disposable serveware materials and subsequently disposing of those materials makes the concept of disposal more accessible in contexts where disposable serveware is used. Consequently, serveware materials are associated with consumption behavior; when serveware material is categorized as disposable, consumers exhibit a perceptual readiness to dispose which results in a willingness to stop eating and dispose of the serveware and any remaining food. Following this theorizing, we hypothesize that

H1: A greater amount of food will be wasted when it is served on disposable (vs. permanent) serveware.

In the same vein, consumers are likely influenced by permanent serveware in the opposite manner. When serveware is perceived as permanent, consumers do not have a strong disposal association and are thus more willing to keep eating. Thus, we expect that permanent serveware encourages consumption. Specifically, we hypothesize that

H2: A greater amount of food is consumed when it is served on permanent (vs. disposable) serveware.

Research supports this theorizing, as a series of investigations by Wansink, Van Ittersum, and colleagues demonstrates the significant impact that serveware can have on an automatically activated perceptual readiness to consume larger quantities of food. For example, studies indicate that larger plates or bowls serve as a perceptual cue for food fill-levels and lead to larger portion sizes and subsequent consumption volume (Van Ittersum and Wansink 2012; Wansink and Van Ittersum 2013; Wansink, Van Ittersum, and Painter 2006). In a particularly relevant study, permanent serveware was part of a total dining experience observed to promote consumption by signaling that the food is a meal instead of a snack (Shimizu et al., 2010). In this investigation, researchers manipulated environmental and situational cues to create either an atmosphere of a meal or one of a snack. In addition to manipulating the permanence of the serveware (ceramic/paper plates, glasses/plastic, cloth/paper napkins), the researchers also varied the presence (vs. absence) of utensils, tables and seating to activate a meal or a snack categorization. Their findings indicated greater consumption of ambiguous foods (e.g., pizza, chicken wings) when participants thought of it as a meal compared to a snack. While the effect of serveware permanence cannot be disentangled from the other situational and environmental cues, to the best of our knowledge, this is the only study that incorporates serveware permanence as a partial means of activating categorization.

Perceptual Transference

Evidence is mounting that non-consumable elements, such as cutlery, plates and even peripheral containers (e.g., condiment containers) have the potential to alter food perceptions. For example, research supports that cutlery material influences perceptions of taste (Harrar and Spence 2013; Piqueras-Fiszman, et al. 2012; Piqueras-Fiszman and Spence 2011). In some cases, physiological or chemical changes to the food and drink itself may occur; for instance, changes

to the shape of wine glasses causes varied release of organic molecules, which then can affect taste of the wine itself (Fischer and Loewe-Stanienda 1999). And, in another example, participants sampling cream from spoons plated with different metals (gold, copper, zinc and stainless steel) that were otherwise identical in shape, size and weight rated the dominant flavor, bitterness, differently dependent on materiality (Harrar and Spence 2013). Likewise, yogurt was rated as better tasting and of higher quality when tasted from a metallic spoon versus a visually indistinguishable plastic spoon (Piqueras-Fiszman, et al. 2012).

In other cases, serveware materiality may change psychological perceptions of food and drink without changing the actual properties of the food or drink. Ample research supports that perceptions of serveware characteristics such as the weight, color or shape of plates is transferred to the food itself without a direct sensation transfer to the mouth. In a series of studies, Piqueras-Fiszman and her colleagues show that the attributes of plate weight is transferred to perceptions about the food (Piqueras-Fiszman, et al. 2011; Piqueras-Fiszman and Spence 2012a, b). For example, when participants sampled yogurt from visually identical yet differentially weighted bowls, ratings of perceived density, expected satiety and liking increased as the weight of the bowls increased (Piqueras-Fiszman, et al. 2011; Piqueras-Fiszman and Spence 2012b). In a study on haptic cues (Krishna and Morrin 2008), some participants rated mineral water served in a flimsy plastic cup as lower quality when they touched the cup versus only saw the cup; it is important to note that, although this research provides valuable insights for serveware effects on food ratings, there is no evidence in this particular investigation on the sensory effects of different serveware materials.

This research on perceptual transference reveals an important distinction between a direct transference of serveware material perceptions to food perceptions (i.e., heavy serveware, dense

food), versus a transference of semantic associations between material perceptions and food perceptions (i.e., heavy serveware, food quality). Taking all of this into consideration, the effect of serveware disposability on food waste could be a result of perceptual transference. The transference could be direct, for example, plate disposability influences perceptions of food disposability to result in more food wasted. Or, the transference could be semantic in nature; for example, plate disposability influences perceptions of food taste and quality to result in more food wasted.

Summary

The literature described above indicates two processes that may influence the effect of serveware disposability on food consumption and waste. The automatic categorization explanation would be supported by a perceptual readiness to dispose of food eaten from a disposable plate and to consume food eaten from a permanent plate. This would be supported if a) more food is wasted when the plate is categorized as disposable and b) an implicit association is observed between plate material and a choice to consume or dispose of the food. On the other hand, it may be that actual food perceptions are influenced by perceptions of the serveware, which in turn influences amount of food wasted. This would be supported by observing that food perceptions (e.g. disposability, taste, quality) mediate the effect of serveware disposability on food waste.

In sum, we expect that the material of the serveware (disposable vs. permanent) will affect food waste and consumption. Accordingly, we hypothesize that a greater amount of food will be wasted when consumers eat from disposable plates compared to when they eat from permanent plates. Coincidentally, the flip-side to this hypothesis is that people will consume a

greater amount of food when eating from permanent plates (vs. disposable plates). We test two explanations for this effect: perceptual readiness versus perceptual transference, with a bias toward the perceptual readiness explanation.

OVERVIEW OF THE STUDIES

We conducted six studies that test our hypothesis that serveware disposability affects food waste/consumption. Three lab studies and three field studies indicate that people waste more food/consume less when eating on disposable compared to permanent plates even when they are not responsible for plate disposal. Our studies also provide insight into why serveware disposability impacts food waste/consumption. First, we conducted three field studies (Studies 1a, 1b, and 1c) to test our main hypothesis; the studies were conducted at a buffet lunch to provide evidence that serveware disposability influenced the amount of food wasted in a natural real-world setting and, importantly, when people self-select the amount and type of food. Next, we present two studies (Studies 2a and 2b) that investigate the effect of perceptual transference between plate materials and food perceptions on amount of food wasted. Finally, Study 3 provides process level support for the automatic categorization explanation via an IAT test that measures associations between a choice to keep or stop eating food on permanent or disposable plates. We find that our results hold when the food is ambiguously a snack or meal (pizza), unambiguously a snack (donuts) and unambiguously a meal (lunch buffets). Further, the effect persists when participants are served the same amount of food and when they serve themselves.

FIELD STUDIES 1a, b, AND 1c: THE EFFECT OF SERVEWARE DISPOSABILITY ON FOOD WASTE AT BUFFET LUNCHEONS

In three field studies, we tested our hypothesis in a lunch buffet setting; studies 1a and 1b were conducted in an executive education program at an East Coast university and study 1c was conducted in a school lunchroom at an East Coast high school. These buffet dining contexts provided a setting where participants were free to take as much food as they wanted on their plate or bowl and had a choice among a variety of foods.

Field Studies 1a and 1b: Common Procedure and Method

In the first two field studies, we tested our hypothesis in a lunch buffet setting in an executive education program at an East Coast university. Participants enrolled in this executive education program are always served a buffet lunch in the dining area and were unaware their behavior was being observed. Further, we were able to observe differences in consumption and waste behavior between restaurant-quality permanent plates and disposable plates of the same size and color.

In both field studies, we collected aggregate data on food waste by plate materiality; we were unable to measure amount taken, consumed/wasted for each individual. The total weight of the buffet food was measured in the kitchen prior to being served. After getting their own food, participants sat with each other at tables and ate their lunch. As per their customary tradition, the dining staff removed diners' plates when they were finished eating. However, rather than immediately discarding the food waste, the dining staff brought all the used plates to the kitchen, where a researcher scraped any food that was left on the plates or bowls into a large bin and

weighed the cumulative waste on a sensitive cafeteria-grade scale. None of the participants were aware their intake or food waste was being measured in either of the field studies.

The manipulation for plate materials was carried out by placing either disposable plates (paper plates and bowls) or permanent plates (ceramic plates and bowls) at the beginning of the buffet line. All bowls and plates, both disposable and permanent, were plain white and of equal sizes and volumes.

After finishing their lunches, the participants returned to their lecture; a few minutes prior to the end of this lecture, participants were asked if they would provide brief feedback about the meal for future meal planning. Specifically, participants rated the taste and quality of the meal (1 = very bad, 7 = very good) and satisfaction with the meal (1 = very dissatisfied, 7 = very satisfied; cf. (Krishna and Morrin 2008), whether they were currently restricting their food intake and whether they had any food restrictions that prevented them from eating items from the meal (yes/no), whether they usually eat a meal for lunch (yes/no), and their level of hunger before and after the meal (1 = very full, 7 = very hungry; cf. Mishra, Mishra, and Masters, 2012). Participants also indicated their age and gender.

Assuming a uniform distribution, that is food waste would occur in both conditions with equal frequency, we calculated an independent samples t-test to compare the aggregate proportion of food wasted in the disposable versus permanent conditions. Because food waste was measured on an aggregate level, we could not match survey results with food waste. However, consistent with our experiments, results of ANOVAs on the survey items indicated there were no differences in perceived taste, quality, or satisfaction with the meal, hunger before

or after the meal, meal behavior, or food restrictions across conditions of plate disposability for either of the field studies ($F_s < 1$).

Field Study 1a

Forty participants (52.5% female, $M_{\text{age}} = 43.5$ years) were observed over two consecutive days during lunch time. All participants were assigned to the permanent plate condition on day 1 and to the disposable plate condition on day 2.

This study allowed us to measure amount of food taken from the buffet for each day. Using this information, we calculated the proportion of food wasted as the total amount of food left uneaten on the plates (Permanent = 5.25 lbs, Disposable = 8.5 lbs) divided by the total amount of food taken from the buffet (Permanent = 62.5 lbs, Disposable = 54.7 lbs). Results showed a significant difference ($t(39) = 9.36, p < .001$) between the proportion of food wasted in the disposable condition (15.5%, $SD = 0.05$) and the permanent condition (8.4%, $SD = 0.02$). As predicted, participants wasted a greater proportion of the total food taken when lunch was eaten from disposable plates. Interestingly, participants took more food in the permanent condition ($M_{\text{permanent}} = 1.57$ lbs) compared to the disposable condition ($M_{\text{disposable}} = 1.37$ lbs); this difference could be due to menu variation and is accounted for in study 1b.

The results of this field study provide evidence that plate materials influence the volume of food wasted. Specifically, we show that participants waste more food when their meal is consumed from disposable plates (plate and bowls), compared to a permanent one, even when participants chose their food items and served themselves. Although we did not observe any differences in food quality and satisfaction, one limitation of this study is that the menu was different for each condition, as we could not offer the same lunch options to participants two

days in a row. Thus, in our next field study, we control for this by manipulating plate material within one lunch period (i.e., same menu items).

Field Study 1b

Forty participants (38.2% female, $M_{\text{age}} = 39$ years) were observed for this study. To control for menu, all participants ate lunch from the same buffet line on the same day. The procedure followed that used in study 1a with one exception: twenty permanent plates and bowls were placed at the beginning of the buffet line, allowing the first 20 participants to use permanent plates. After the last permanent plate was used, a member of the dining staff restocked the buffet table with paper plates and bowls, apologizing to the remaining 20 people in line that “the foodservices’ dishwasher has broken.” All plates and bowls were white in color and matched for size and volume. Participants were not made aware of the field study and none of the participants questioned the replacement of the buffet line with disposable plates nor reported suspicions regarding it.

Results show a significant difference ($t(19) = 2.58, p < .01$) between the amount of food wasted in the disposable condition (1.2 lbs, $SD = 0.69$) and the permanent condition (0.8 lbs, $SD = 0.46$). As hypothesized, participants in the disposable plate condition wasted more food taken from the buffet than did participants in the permanent plate condition.

The results over two field studies among executive MBA students provide corroborating evidence that more food is wasted when it is served on disposable serveware compared to permanent serveware. In study 1a, we could not control for the menu items between conditions. This was corrected in study 1b, however in this study we could not account for the amount of food taken in each condition. In our next field study, we both keep the menu consistent and

account for the amount of food taken. Further, while we have thus far observed that plate material affects food waste among adults, we sought to determine if this effect would surface with a younger population who may have less experience with serveware disposal.

Field Study 1c

Approximately 240 high school students (ages 14-18) and 10 faculty (ages 24-55) were observed during two lunch sessions. Participants were unaware that their behavior was being observed, and proceeded with their customary routine of requesting hot food from a staffed buffet line and then visiting a cold-food buffet (salad bar) and serving themselves. The food service director worked with us to choose two dates approximately one month apart that he could serve the exact menu, and that there were no special school activities scheduled that would meaningfully alter the student population on that day (e.g., grade level class trips).

All food was weighed before service and any uneaten food was scraped into a waste bin. On the first observation day, participants ate on their usual permanent serveware (plates, bowls, cups and utensils) and scraped their food waste into a garbage bin, per their usual procedure. Since we ultimately needed to calculate average waste per plate, we stationed two student monitors near the garbage bins with a counter. These monitors recorded the number of plates from which garbage was being disposed. Approximately four weeks later, we returned to the lunchroom for the second observation, in which we replaced the usual serveware with disposable serveware; any participant who asked the dining staff about the disposable serveware was told “the dishwasher is broken.” The student monitors recorded the number of plates, cups, and utensils that participants discarded. The weight of the discarded serveware was subtracted from the total garbage weight to provide our subsequent measure of food wasted.

We calculated the proportion of food wasted as a difference between amount of food taken and amount of food scraped into the garbage. Results are reported as an average of total plates used during service ($N=271$) and show a significant difference ($t(270) = -3.47, p < .001$) between the proportion of food wasted in the disposable condition (19.5%) and the permanent condition (10.8%). As predicted, participants wasted a greater proportion of the total food taken when lunch was eaten from disposable material.

Further, and in support of field study 1a, participants wasted more yet took less food in the disposable condition ($M_{\text{taken}} = 7.71$ ounces, $M_{\text{wasted}} = 1.5$ ounces) and wasted less yet took more in the permanent condition ($M_{\text{taken}} = 10.13$ ounces, $M_{\text{wasted}} = 1.09$ ounces). This result suggests that people may be equally satiated on less food when consuming with disposable serveware. Future work could explore the process behind this result and the contexts under which it could be helpful versus harmful. For example, in a school lunchroom setting where students often get their main nutrition for the day, we may hope to see higher levels of consumption and lower levels of waste. On the other hand, in commercial foodservices such as fast casual dining, managers may be inclined to cut costs by serving smaller portions on disposable serveware if consumers are just as easily satiated with less food.

STUDIES 2a AND 2b: SERVEWARE MATERIAL EFFECTS ON FOOD PERCEPTIONS AND WASTE

Study 2 tests our main hypothesis and explores the psychological process underlying the relationship between serveware disposability and food waste. In study 1, we observed our effect when the food was unambiguously a meal (lunch buffets). In study 2a, we selected pizza, a food

which is ambiguously a snack or meal, because it is a popular food that does not require utensils. This allowed us to control the serveware material to one component – the plate. In study 2b, we conducted the same procedure with donuts because they are plate neutral: donuts are typically taken from a plate or box but not consumed on the plate.

Study 2a: Pizza

Despite the fact that pizza is often served on disposable plates as an “eat on the go” food, we expected greater waste when the food was consumed on disposable plates compared to permanent plates. We also intended to observe this effect when the food type is popular among the sample population (i.e., college students).

Method

Forty-nine participants (64% female, $M_{\text{age}} = 20.5$ years) in an undergraduate business program at an East Coast university, taking the same class but at different times in the afternoon (i.e., sessions), served as the sample for this study. Participants in the different class sessions reported equal levels of pre-consumption hunger ($F < 1$) and therefore class session will not be considered further.

Participants arrived to class to find a plate of pizza on each of their desks as an end of semester treat. Each participant was given exactly three slices of pizza (pies cut into 16th) on a plate that was either permanent (hard reusable plastic) or disposable (paper). All plates were 10” diameter, plain borderless white; to control for plate weight, thick, heavy-stock paper plates were matched as closely as possible to the weight of thin, light plastic plates. In an effort to minimize the effect of any plate weight differences or haptic cues from the material, we placed each plate of pizza on each desk prior to their entering the classroom so that no participant carried or held

any plates. Prior to placing pizza on the desks, we weighed each plate of food on a cafeteria grade digital scale.

Participants ate the pizza while they listened to a short lecture on business writing skills. To control for effort associated with food disposal, the participants were told to raise their hands when they were finished eating, and a classroom assistant would collect their plate. Participants were unaware during the time they were eating that there would be an opportunity to participate in a survey. Only once the lecture was over and their pizza plates were collected were participants asked whether they would participate in a voluntary survey in which they would be asked several questions related to the pizza and their general eating habits in exchange for course credit. After participants left the classroom, the wasted pizza on each plate was weighed and recorded. Plates and surveys were pre-numbered so that the plate waste could be matched with the corresponding survey response.

The survey measured participants' perceptions of the food's quality and taste (1 = very bad, 7 = very good, $r = .84$, $p < .001$) as well as overall satisfaction with the pizza (1 = very dissatisfied, 7 = very satisfied; (cf. Krishna and Morrin 2008). To get a sense of potential over/under-consumption, participants were queried on two items, "Today, I ate past the point of being full," and "I wish I could have eaten more pizza" (1 = disagree and 7 = agree); post-consumption satiety was measured by asking participants to indicate their level of hunger ("After eating my snack, my level of hunger was", 1 = "very full", 7 = "very hungry"; (cf. Mishra, Mishra, and Masters 2012).

We also collected several measures as potential covariates. General attitudes toward waste was measured on two items: "I wish I could have saved my leftover pizza for later," and "I

feel guilty about not eating all my pizza” (1 = disagree, 7 = agree). We measured pre-consumption hunger by asking students to respond to the statement “Before eating my food, my level of hunger was” on a 7 point scale (1 = “very full”, 7 = “very hungry”; (cf. Mishra, Mishra, and Masters 2012). We also asked participants to report their perception of the weight of the pizza and the weight of the plate, each on a seven point scale (1 = light, 7 = heavy; (cf. Piqueras-Fiszman et al. 2011; Piqueras-Fiszman and Spence 2012a, b). Specific dieting was measured by asking participants to rate whether they are currently dieting to lose weight (1 = disagree, 7 = agree). General eating habits were assessed on two items: “I monitor what I eat in order to be healthy,” and “I usually eat whatever I want (R),” $r = .50, p < .001$). Lastly we asked for participant age and gender.

Results

One person was excluded from the analyses because a gluten intolerance prevented the participant from consuming the pizza. Note that any differences in the degrees of freedom reflect missing data on the survey responses.

As predicted, food waste was higher/consumption was lower among participants who ate from a disposable plate. An ANCOVA with pre-consumption hunger, pre-consumption weight of the pizza and current dieting behavior as covariates, and plate condition as the independent variable revealed a significant main effect of plate condition ($M_{\text{disposable}} = .30$ ounces, vs. $M_{\text{permanent}} = .09$ ounces $F(4, 43)=9.53, p < .001$), a significant effect of hunger ($F(4, 43) = 5.82, p < .05$), and insignificant effects of pre-consumption pizza weight and current dieting behavior ($F_s < 1$). Note that levels of pre-consumption hunger did not differ by plate condition ($F(1, 47) = 1.11, p > .10$). The effect of plate condition on wastefulness remains significant when the

covariates are removed; ANOVA indicates that participants in the disposable plate condition wasted more food/consumed less pizza than participants in the permanent plate condition ($M_{\text{disposable}} = .29$ ounces, vs. $M_{\text{permanent}} = .10$ ounces, $(F(1, 47) = 9.55, p < .01)$).

A perceptual transfer account would be supported if food perceptions mediated the effect of serveware disposability on food consumption/waste. Although participants did not carry the plate at any time, those in the permanent plate condition perceived the plate as heavier than those in the disposable plate condition ($M_{\text{permanent}} = 5.61, M_{\text{disposable}} = 3.69, F(1, 47) = 18.00, p < .001$). However, plate weight perceptions did not mediate the relationship between serveware disposability and food waste; note that, while it differed according to plate condition, perceived plate weight did not significantly influence food waste ($F < 1$). Further, plate condition did not affect perceived weight of the pizza ($F < 1$), nor did it significantly influence participant's perceptions of taste and quality ($F(1, 46) = 2.42, p > .10$) or overall satisfaction with the pizza ($F < 1$), thus providing no support for transference effects, direct or semantic, of plate weight on food perceptions. As well, serveware disposability did not significantly affect participants' satiety ($F < 1$), perceived overconsumption, or perceived under-consumption ($Fs < 1$).

Plate condition did not influence participant's general eating behavior ($F(1, 48) = 1.49, p > .10$), nor did their eating behavior influence how much food was wasted ($F < 1$). Plate condition had no effect on how guilty participants felt about not eating all their pizza or whether they wished they could have saved their pizza for later ($Fs < 1$). Not surprisingly, the more participants wasted, the guiltier they felt ($\beta = 2.40, t(48) = 2.09, p < .05$); however, there was no effect of waste on whether they wanted to save their pizza for later.

Discussion

Study 2a confirms our theorizing that serveware disposability influences food waste/consumption. Consistent with our main hypothesis, our findings demonstrate that more food is wasted when it is served on a disposable plate than a permanent plate despite being perceived as equally appealing. Pizza served on both disposable and permanent plates were rated of equal taste and quality; thus we find no evidence of a transference from serveware perceptions to food perceptions. Moreover, perceived weight of the pizza, overall satisfaction with the food, and satiety were equal across both plate conditions, thus offering no evidence of an embodied weight transference. This finding is at odds with the literature indicating visually identical yet differentially weighted serveware can activate embodied transference of weight-based inferences (Piqueras-Fiszman et al. 2011; Piqueras-Fiszman and Spence 2012b). Our findings suggest that differential weight alone, in the absence of visual identity and haptic cues (participants did not lift/carry the plates), may not be enough to activate embodied perception (cf. Krishna and Morrin 2008).

In the next study, we again test the effect of disposability on food perception and food waste/consumption. In addition to taste and quality perceptions, we tested other food and plate perceptions (e.g., visual appeal and healthfulness) that might arise as a result of serveware perceptions transferring to food perceptions. We also preliminarily explore an automatic categorization explanation.

Study 2b: Donuts

To test the generalizability of our findings, we replicated the results we observed for pizza, ambiguously a snack or meal, with donuts, an unambiguous snack. Importantly, donuts are

generally consumed without utensils and do not need a plate. Thus, interaction with the plate itself is minimized during consumption of a donut.

Method

Sixty-eight participants (49.3% female, $M_{\text{age}} = 19.25$ years) in an undergraduate business program at an East Coast university who were taking the same class but at different times (i.e., sessions) served as the sample for this study. Participants were assigned to either a permanent or disposable plate condition, according to their class session. Class session did not impact the results and will not be discussed further.

Each participant was given two plain donuts on a plate that was either permanent or disposable. Because the donuts were machine-made, each donut was the same size and shape, and each two-donut serving offered the same amount of food. All plates were 10" diameter, plain borderless white; to control for plate weight, thick, heavy-stock paper plates were matched as closely as possible to the weight of thin, light plastic plates. To control for the actual plate weight, the plate with donuts was placed on each desk prior to participants entering the classroom; no participant carried or held any plates of food.

The same procedure as in Study 2a was used in this study. Upon entering the classroom, participants were told that the donuts were an end of semester treat. To control for associations related to the act of throwing away the plate and food, the participants were told to raise their hand when they were finished eating, and a classroom assistant would collect their plate. A mini-lecture about business internships was used to conceal that participants were taking part in a study; they were unaware their food intake was measured. Once the lecture was over and their plates were collected, the participants were informed that they would receive course credit in

exchange for their voluntary participation in a survey. Once all participants completed the survey and left the classroom, the wasted donuts were weighed and recorded. Plates and surveys were pre-numbered so that the plate waste could be matched with the corresponding survey response. To assess whether participants were aware of how much they ate and wasted, we asked them to respond to two open-ended questions, “How many servings of donuts were on your plate today?” and “How many servings of donuts did you eat today?” The differences between responses to these two measures were used to reflect participants’ perceptions of how much food they wasted.

The survey queried participants on measures of food quality and taste perceptions (1 = very bad, 7 = very good), overall satisfaction with the food (1 = very dissatisfied, 7 = very satisfied; cf. Krishna and Morrin 2008), over/under-consumption (“Today, I ate donuts past the point of being full,” and “I wish I could have eaten more donuts”; 1 = disagree and 7 = agree), and post-consumption satiety (“After eating my food, my level of hunger was,” 1 = “very full”, 7 = “very hungry”; cf. Mishra, Mishra, and Masters 2012). Perceptions of value for the donuts was measured by asking participants how much they were willing to pay for the donuts (open ended) and their likelihood of purchasing the donuts they received (1 = “very unlikely,” 7 = “very likely”).

We also collected several measures as potential covariates. General attitudes toward waste was measured on two items: “I wish I could have saved my leftover donuts for later,” and “I feel guilty about not eating all my donuts” (1 = disagree, 7 = agree). We measured pre-consumption hunger by asking students to respond to the statement “Before eating my food, my level of hunger was” on a 7 point scale (1 = “very full”, 7 = “very hungry”; (cf. Mishra, Mishra, and Masters 2012). We also asked participants to report their perception of the weight of the food and the weight of the plate, each on a seven point scale (1 = light, 7 = heavy; (cf. Piqueras-

Fizzman et al. 2011; Piqueras-Fizzman and Spence 2012a, b). Specific dieting was measured by asking participants to rate whether they are currently dieting to lose weight (1 = disagree, 7 = agree). General eating habits were assessed on two items: “I monitor what I eat in order to be healthy,” and “I usually eat whatever I want (R).”

In addition to these measures, participants also provided ratings of visual appeal (“The food on my plate seemed crowded”, 1 = disagree, 7 = agree; “How appealing was your food when you first saw it on the plate/when you decided to stop eating?” 1 = very unappealing, 7 = very appealing), and perceptions of healthfulness and indulgence on 7 point scales (“Compared to similar foods, the food on my plate was:” less healthy/more healthy, less indulgent/more indulgent, lower calorie/higher calorie; “How much did you care about the caloric content of your donuts today?” not at all/very much; “The impact of eating the donuts on your overall well-being will be:” negative/positive; “The overall healthiness of my food was:” very unhealthy/very healthy) and on an open-ended scale (“How many calories do you think were in one donut on your plate today?;” cf. Knight and Boland 1989; Raghunathan et al. 2006). Participants reported perceptions of the disposability of the plate and the donuts (1 = non-disposable, 7 = disposable), and two indirect measures of plate quality, purchase likelihood (1 = very unlikely, 7 = very likely) and willingness to pay (open-ended). Lastly, we asked for participant age and gender.

Results

Participants who consumed at least part of the donut were included in the results. Thirteen participants (6 in the disposable condition and 7 in the permanent condition) who declined to eat any part of the donut because they don’t eat donuts in general or for dietary

restrictions were excluded from the analyses, resulting in 56 usable surveys for subsequent analysis ($N_{\text{disposable}} = 31$, $N_{\text{permanent}} = 25$).

Results confirm our hypothesis that people waste more (thus, consume less) when eating on a disposable plate than on a permanent plate. ANCOVA with pre-consumption hunger and current dieting behavior as covariates and plate condition as the independent variable revealed a significant main effect of plate condition on the amount of food wasted ($M_{\text{disposable}} = 1.30$ ounces, $M_{\text{permanent}} = .64$ ounces, $F(3, 52) = 4.54$, $p < .05$), a significant effect of pre-consumption hunger ($F(3,52) = 5.72$, $p < .05$) and a non-significant effect of current dieting behavior ($p > .10$). The effect of plate condition on waste remains marginally significant when covariates are removed from the analysis ($M_{\text{disposable}} = 1.27$ ounces, $M_{\text{permanent}} = .67$ ounces, $F(1, 54) = 3.55$, $p < .07$).

Results of perceived waste mirror that of objective waste. The effect of condition on perceived food wasted is significant when controlling for pre-consumption hunger ($F(2, 53) = 6.66$, $p < .01$), where those eating from a disposable plate reported more food wasted than those eating from a permanent plate ($M_{\text{disposable}} = .58$ servings, $M_{\text{permanent}} = .28$ servings, $F(2, 53) = 4.76$, $p < .05$). The effect of plate condition remains marginally significant when hunger is removed from the analysis ($M_{\text{disposable}} = .57$ servings, $M_{\text{permanent}} = .30$ servings, $F(1, 54) = 3.52$, $p < .07$).

We find no support for transference effects of plate disposability on food perceptions. Although participants in the permanent plate condition perceived the plate as heavier than those in the disposable plate condition ($M_{\text{disposable}} = 2.81$, $M_{\text{permanent}} = 4.64$, $F(1, 54) = 14.07$, $p < .001$), perceived plate weight did not influence food waste ($F < 1$) or perceived weight of the donuts ($F < 1$). Plate condition did not significantly influence participants' perceptions of taste and quality

($F < 1$), overall satisfaction with the donuts ($F < 1$), participants' satiety ($F < 1$), perceived overconsumption ($p > .10$), perceived under-consumption ($F < 1$), or any of the measures of donut healthfulness or indulgence ($F_s < 1$). Although the food on the disposable plate appeared more crowded ($M_{\text{disposable}} = 3.48$, $M_{\text{permanent}} = 2.46$, $F(1, 54) = 5.04$, $p < .05$), this did not affect food consumption ($F < 1$) and the food did not differ between conditions on visual appeal before or after eating the food ($F_s < 1$).

Results provide some preliminary support for an automatic categorization effect of plate disposability on food waste. ANOVA revealed a main effect of condition, such that participants in the disposable plate condition perceived their plate as more disposable and participants in the permanent condition perceived their plate as more non-disposable ($F(1, 54) = 73.45$, $p < .001$; $M_{\text{disposable}} = 6.06$, $M_{\text{permanent}} = 2.36$). Importantly and suggestive of an automatic categorization process, perceptions of plate disposability significantly influenced perceptions of donut disposability ($\beta = .20$, $t(54) = 2.87$, $p < .01$). However, perceptions of donut disposability do not have a direct effect on waste ($F < 1$); there is no evidence that perceptions of donut disposability mediate either the effect of plate condition or perceptions of plate disposability on food waste.

Plate disposability did not influence participant's general eating habits (e.g., "I monitor what I eat in order to be healthy," $F < 1$), nor did their habits influence donut wastage ($F < 1$). Plate disposability had no effect on how guilty participants felt about not eating all their donuts or whether they wished they could have saved their donuts for later ($F_s < 1$). Finally, plate disposability did not change purchase likelihood ($F < 1$) or willingness to pay ($F < 1$) for the food.

Discussion

Study 2b replicates the effect of serveware disposability on food waste: More food was wasted when the plate was disposable than when the food was served on a permanent plate. Consistent with Study 2a, we found no evidence that could support transference effects as the explanation for our observed effects of plate disposability on food waste and consumption.

We do find preliminary evidence that suggests the link between serveware disposability and food waste/consumption may depend on automatic categorization through perceptual readiness. Direct support for automatic categorization can be obtained by accessing implicit associations, where consumers categorize pairs of stimuli faster when the association between the pairs is stronger (Greenwald et al. 1998; Greenwald et al. 2009). Study 3 tests the automatic categorization process by measuring response times for the hypothesized pairs: disposable/stop eating/waste and permanent/keep eating/consume versus the non-hypothesized combinations: disposable/keep eating/consume and permanent/stop eating/waste.

STUDY 3: SERVEWARE MATERIAL EFFECTS VIA AUTOMATIC CATEGORIZATION

Study 3 was designed to provide more evidence for the effect of automatic categorization on the material-behavior link between plate disposability and food waste. We conducted an implicit association test (IAT) to measure the strength of mental associations between a choice to keep or stop eating with the concepts of material permanence versus disposability. The IAT is consistently supported as a reliable and valid categorization task that measures response time in categorizing stimuli as a proxy for the strength of associations between two concepts (Greenwald

et al. 1998), where a faster response time suggests a stronger association. Support for our theorizing would be obtained if we find stronger associations (i.e., faster response times) between consumption (i.e., keep eating) and permanent plate materials (vs. disposable plate materials) and stronger associations between wasting (i.e., stop eating) and disposable (vs. permanent) plate materials.

Method

One hundred U.S. masters-level panelists (54% female, $M_{\text{age}} = 37$ years) were recruited from Amazon Mechanical Turk and compensated \$2 for participation in the survey. In order to conduct this experiment online, we used a web platform for the IAT (Mason, Allon, and Ozturk 2012). To represent the concepts of consumption and waste, our target categories were assigned as (A) keep eating and (B) stop eating, where the stimuli was a series of 20 images of the same foods on either disposable or permanent plates; the foods ranged in general healthiness and type (i.e. meal, snack, dessert; see Appendix A for sample stimuli). By labeling our waste concept as “stop eating,” we presented the opposite behavior to “keep eating” and also avoided using the word waste, which could elicit a social desirability bias. The association categories for plate materials were assigned as (1) permanent and (2) temporary, where the stimuli was a series of 10 words that were either permanent or disposable materials. To avoid explicitly priming the concept of disposal, we chose the category “temporary” for our disposable material words; by using the category “temporary,” we presented the opposite of “permanent” and also intended to help participants focus on the food when choosing “keep eating” vs. “stop eating” as opposed to focusing on categorizing the actual plate as disposable.

Participants were instructed to “Imagine that you are eating a meal. You will be presented with a number of images of foods on a plate. For each image, please imagine that you have been eating that food. Your task is to categorize the meal accordingly. Please do this as quickly as possible while also making as few mistakes as possible.” Then, over a series of seven blocks, the stimuli (either images or words) were presented in the middle of the screen. To the upper left and right of the stimulus were the target and/or association categories. Participants were instructed to categorize the stimuli by using their keyboard (when the stimulus belonged to a category on the left, they pressed the “E” key; when it belonged to a category on the right, they pressed the “I” key). As a DV measure, their reaction time (in milliseconds) was recorded for each stimuli. At the end of the IAT, participants were instructed to follow a link to the second part of their task, a Qualtrics survey, where we measured age and gender.

The IAT followed a traditional seven block design. Blocks 1 and 2 were “training blocks,” where participants were asked to categorize a single association between images of food on disposable or permanent plates and “keep eating” or “stop eating” (block 1) and material words as “permanent” or “temporary” (block 2). In blocks 3 and 4, participants saw the pairings of target and association categories which we hypothesized were congruent, and were asked to categorize the food images and material words as either “keep eating or permanent” vs. “stop eating or temporary.” Block 5 was another training session, where the target categories were presented on reverse sides of the screen. In blocks 6 and 7, the pairings used in blocks 3 and 4 were reversed; participants saw category pairings that we hypothesized were incongruent (“keep eating or temporary” vs. “stop eating or permanent”). We predicted that response time for categorization would be faster when category pairings were congruent vs. incongruent.

Results

A comparison of mean response times between congruent and incongruent categories shows that response latencies are significantly lower when the pairs are congruent (“keep eating and permanent” and “stop eating and temporary”; $M = 961.32$ milliseconds, $SD = 205.38$ milliseconds) than when they are incongruent (“keep eating and temporary” and stop eating and permanent;” $M = 1084.93$ milliseconds, $SD = 266.08$ milliseconds; $t(99) = -5.55, p < .001$). Results indicate the D score (Greenwald et al. 2003) is positive and significantly different from zero, suggesting a stronger implicit association among our congruent pairs than our incongruent pairs ($D = .25, SD = .05; t(99) = 4.72, p < .001$). This supports our theorizing that associations between temporary materials and stop eating, as well as and permanent materials and keep eating, elicit a stronger perception-behavior link than their incongruent counterparts.

In order to better understand the implicit associations for each of our congruent pairs, we further investigated the response latencies among our categorical pairings. We observed that response times for both congruent pairs were faster than their incongruent counterparts. We find support for the association between “stop eating” and disposable materials. Specifically, participants’ response times for categorizing words and images as “stop eating or temporary” in block 4 was significantly faster ($M = 985.33$ milliseconds, $SD = 210.47$) than for the incongruent pairing “stop eating or permanent” in block 7 ($M = 1072.28$ milliseconds, $SD = 262.23; t(99) = -2.68, p < .001$). Further, we find the same support for participants’ response times for categorizing words and images as “keep eating or permanent” in block 4 ($M = 937.30, SD = 219.67$ milliseconds) versus the incongruent pairing “keep eating or temporary” in block 7 ($M = 1097.59$ milliseconds, $SD = 283.73; t(99) = -6.55, p < .001$).

Discussion

Study 3 demonstrates that people hold implicit associations between plate materials and waste, as well as consumption. As hypothesized, the IAT supports a stronger association as revealed by faster response times when pairing “keep eating” and permanent materials compared to “keep eating” and disposable materials, and a stronger association (faster response times) between “stop eating” and disposable materials compared to “stop eating” and permanent materials. Results of this study support an automatic categorization explanation for the effects of plate disposability on food waste and consumption. It is worth noting that we did not counterbalance the order of critical blocks 4 and 7 between-subjects. Thus, one potential limitation of this study is that participants may have suffered some degree of cognitive inertia, although this limitation is minimized when using aggregate data (Messner and Vosgerau 2010).

GENERAL DISCUSSION

Extant research provides more insights on why individuals over-consume than on why individuals waste food. Our research suggests that serveware materials are an important and influential element of the consumption environment, and have important implications for food consumption volume and, distinctively here, food waste. The results of three lab studies and three field studies confirm our hypothesis that serveware disposability affects food waste. We show that people waste more food when eating on disposable compared to permanent plates even when they do not have to throw away the plate after they finish eating. This effect is obtained when the food is ambiguously a snack or meal (pizza), unambiguously a snack (donuts), and

unambiguously a meal (lunch buffets). Our findings maintain when people are served a fixed quantity of food and when people self-select the amount and type of food.

We also provide evidence that an automatic categorization process underlies the effect of serveware disposability on food waste/consumption. The automatic categorization process is implicated by the direct links found between plate disposability and food waste. More direct evidence for automatic categorization is from an implicit association test (IAT) revealing that people have a stronger association between “keep eating” and permanent materials compared to “keep eating” and disposable materials, and a stronger association between “stop eating” and disposable materials compared to “stop eating” and permanent materials.

We do not find support for perceptual transference effects; plate disposability did not alter food perceptions and overall satisfaction with the food (Studies 1 and 2). While it may be possible that the limited range of quality in pizza and donuts might have accounted for the lack of transference effects, this explanation is unlikely because we did not find transference when testing for a wide variety of foods in our field studies. Although serveware disposability affected weight perceptions in Study 2, these perceptions were not transferred to food consumption as in the study by Krishna and Morrin (2008). The difference between our study and theirs is that participants “handled” the cups serving the liquid, whereas we did not permit our participants to carry their plates with or without food. Along the same lines, transference effects may be stronger when the serveware materials touch the lips as in glasses and spoons (Harrar and Spence 2013; Piqueras-Fiszman et al. 2012; Piqueras-Fiszman and Spence 2011), than serveware or other serveware that does not come into direct contact with the mouth. More research is needed to understand when and how transference effects determine waste/consumption.

Despite our null results, we nonetheless view our findings as informative in building a systematic understanding of the conditions under which perceptual transference would and would not obtain. The inconsistency between food perceptions and food consumption volume is not surprising given the well-established literature on the instability of the attitude-behavior link. Considerable research indicates that attitudes are temporarily constructed judgments and that contextual factors, in our example, plate disposability, may undermine the consistency between attitudes and behaviors (Wilson and Hodges 1992).

It is interesting to note that in our studies we found no differences in perceived satiety despite the differences in consumption volume (Studies 1 and 2). In other words, people eating on permanent plates consumed more food but did not feel fuller compared to people eating on disposable plates. In contrast to the “mindless eating” that seemed to occur here, some serveware does cue satiety. For instance, compared to larger forks, smaller forks serve as a perceptual cue that more bites are required to get full; consequently, consumers are shown to eat more food when using smaller forks (Mishra et al. 2012). Future work is needed to provide an understanding of when and what serveware influences perceived satiety.

Consumers and marketers can benefit from a deeper understanding of the antecedents and consequences, as well as interventions, for wasteful behavior. We believe our work points to several interesting directions for the limited body of research for consumer wastefulness. For example, future investigations could explore alternatives to wasting food. There are two general scenarios where a choice to dispose of food would occur: those where consumers *can* save their leftover food and those where they *cannot*. Our research focused on the latter, where consumers cannot not save their uneaten food, thus, they must choose to either eat more of it or throw it out. In contrast, there is an unexplored alternative where consumers *can* save their

uneaten food, and the choice set is extended: eat more, save it for later, or throw it out. The alternatives to wasting food may play a role in determining which of these consumption paths a consumer may follow – eating, storing, or wasting.

Findings from this research also provide directions for marketers of food products. Approximately half of all food produced in the U.S. goes to waste each year, costing stakeholders along the food supply chain billions of dollars (Bloom 2010). To address the issue, several public and private sector initiatives are focused on food waste reduction in both the US and internationally (Gunders 2013). Our results suggest that consumption materials, such as serveware and even product packaging, must be considered in these efforts to reduce food waste.



As previously mentioned, waste by necessity is likely a large contributor to the consumer food waste phenomenon. More consumers than ever are eating “on the go” and away from home. Food waste is particularly high among school lunchrooms, and has been increasing significantly in recent years. According to the EPA, the average American child throws away 67 pounds of lunch food per year (Reuseit 2013). Coincidentally, over the past 15 years, USDA funded public school lunchrooms have been transitioning from permanent to disposable serveware due to budgetary limitations for labor, replacements, and storage. As our findings demonstrate, serveware disposability can affect food waste. However, the question remains as to how the effect can be attenuated. While the superficial answer in this context is for public schools to revert back to permanent serveware, the reality is that infrastructure for public school foodservices does not support such a transition. A more cost-efficient method would be to make people aware of the link between disposable plates and food waste with the hope that they will take less and waste less food. Or, food cafeteria staff can serve less food on disposable plates if they know students will eat less/waste more. Further research is required to test these hypotheses

to provide public policy makers guidance for economical solutions that mitigate the waste effects of serveware materials among institutional foodservice settings. In addition, USDA lunchroom funding could be adjusted to account for costs of purchasing and maintaining permanent serveware. This is an important issue to address, as millions of students get their main nutrition for the day through public school foodservices. Wasted food in this context is also wasted nutrition.

Lastly, it is also important to account for negative impacts of the actual serveware materials. With such an increase in food consumption away from home, it's no surprise that the proportion of total landfill waste made from consumption materials has also been on the rise. The impact of disposable serveware on landfill space must be addressed throughout the supply chain and by appealing to "green" consumers. Studies show consumers who demonstrate waste avoidance practices also demonstrate greater concern for the environment (Haws et al. 2012) and product disposal (Webb, Mohr, and Harris 2008), as well as a stronger likelihood of environmentally friendly behaviors (Balderjahn 1988). Thus, it is possible we may observe that environmental concerns significantly reduce the effects of disposable serveware on food waste because consumers anticipate disposing of the serveware itself. Further, varying perceptions of plate disposability may influence wasteful behavior among environmentally concerned consumers, where highly disposable serveware (non-reusable styrofoam) may have a much greater effect on food waste reduction than materials that seem recyclable (paper or thin plastic) or reusable (metal or hard plastic). These ideas await formal investigation.

Appendix A

Study 3: Sample Stimuli and Association Category Words

Categories	Stimuli
<p>Target Category A: “Keep Eating”</p>	<p>Images: Food* on permanent porcelain plates</p> 
<p>Target Category B: “Stop Eating”</p>	<p>Images: Food* on disposable paper plates</p> 
<p>Association Category A: “Permanent”</p>	<p>Permanent Material Words: porcelain, ceramic, glass, stainless steel, crystal</p>
<p>Association Category B: “Temporary”</p>	<p>Disposable Material Words: paper, plastic, styrofoam, cardboard, compostable</p>
<p>*Foods <i>All items were presented in same quantity and arrangement on both disposable and permanent plates.</i></p>	<ul style="list-style-type: none"> • Macaroni and cheese • Ruben sandwich • Peanut butter and jelly sandwich • Chicken Caesar salad • Kale salad • Enchiladas • Beef curry with rice • Salmon with asparagus • Rice and bean casserole

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