

Creating When You Have Less: The Impact of Resource Scarcity on Product Use Creativity

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This research examines how a general sense of resource availability influences consumers' product use creativity. The authors propose and demonstrate that the salience of resource scarcity versus abundance enhances the novelty of product use solutions in independent consumption environments. An investigation of the underlying process finds that scarcity salience activates a constraint mindset that persists and manifests itself through reduced functional fixedness in subsequent product usage contexts (i.e., makes consumers think beyond the traditional functionality of a given product), consequently enhancing product use creativity. This work advances the extant creativity literature, currently limited to examining the effects of context-specific resource constraints, by establishing a context-independent linkage between resource availability and product use creativity. Furthermore, this research contributes to the scarcity literature, which has primarily focused on investigating the quantity and frequency of consumption, by examining the impact of scarcity on the quality of consumption solutions.

Keywords: creativity, innovativeness, product use, scarcity, abundance, resource constraints

While scarcity has been a pervasive aspect of human life (Booth 1984), people in modern industrialized societies take resource availability for granted (Côté 1993, 1996; Zhu and Ratner 2015). Consumerism and overacquisition have become the order of living and abundance has emerged as the norm, especially in the first world societies

(Adams, Bruckmuller, and Decker 2012; Côté 1993, 1996; Riesman 1950). Simultaneously, creativity has become an important component of the mainstream consumption environment, business world, and daily living. Since many businesses now thrive on consumers' ability and desire to be creative (Mehta, Zhu, and Cheema 2012), they offer consumers various opportunities to engage in creative consumption, such as choosing home decor and fashion (Burroughs and Mick 2004; Burroughs, Moreau, and Mick 2008), selecting food and leisure (Hirschman 1984), and self-designing products (Moreau and Herd 2010).

One question that arises is, what is the interplay between these two defining features of the modern society—resource availability and consumer creativity? While existing literature in consumer creativity has argued that limiting context-specific resource availability (i.e., constraining the input resources relevant to the task at hand) leads to higher creativity within that context (i.e., more creative performance on that particular task; Moreau and Dahl 2005, Sellier and Dahl 2011), it remains to be investigated whether a general sense of resource availability (e.g.,

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scarcity vs. abundance) may produce a context-independent impact on consumption creativity. This issue holds significance because consumers are frequently exposed to contextual cues that may remind them of resource scarcity or resource abundance in daily lives, and such encounters can impact their mindset and in turn affect subsequent creative consumption (Brandstätter and Frank 2002; Briley and Wyer 2002; Chandran and Morwitz 2005).

In addition, various lines of research suggest a possible negative correlation between resource availability and creativity. Yet, to our knowledge, none of the research has directly examined whether and why a general sense of scarcity versus abundance may produce a systematic impact on consumer creativity. For example, the literature on materialism shows that high levels of material values are negatively associated with individuals' intellectual and spiritual development (Belk 1985; Burroughs and Rindfleisch 2002; Kasser 2003; Richins and Dawson 1992). The literature on consumption and society argues that creativity is incompatible with the repetitiveness of modern mass production, which is shifting the culture from one that was intellectually challenging into one that is hurried, familiar, and entertaining (Linder 1970; Schor and Holt 2000). In addition, historians have suggested a negative relationship between overconsumption and innovation (Diamond 2005; Tainter 1990). Similarly, the literature on paradoxes of technology suggests that while innovation and technology provide various benefits such as freedom, control, and efficiency, they could also usurp human motivation and skills, leading to dependence, ineptitude, and disengagement (Mick and Fournier 1998). Furthermore, it has been proposed that subsistence consumers living in poverty may engage in innovative behaviors with greater frequency and intensity (Hill 2001; Rosa, Geiger-Oneto, and Fajardo 2012). In spite of this rich body of knowledge suggesting a negative relationship between resource availability and consumer creativity, there is little laboratory evidence demonstrating such causal linkage and the reasoning behind it.

The current research addresses these issues by examining how scarcity versus abundance might enhance or inhibit consumer creativity in an independent consumption context. While examining the role of resource availability, we focus on the perceived supply level of physical resources that are required for an individual's normal growth and maintenance (Dunst and Leet 1987). We study consumer creativity in the context of product usage, which is assessed through the novelty (e.g., originality and innovativeness) and appropriateness (e.g., effectiveness and usefulness) dimensions (Goldenberg, Mazursky, and Solomon 1999; Moreau and Dahl 2005; Sternberg and Lubart 1999) of everyday product use solutions adopted by consumers (Hirschman 1980; Ridgway and Price 1994). A pilot study conducted with 47 MBA students (28 women) at a large East Coast university confirmed the existence of a negative correlation between real-life availability of physical resources, which was

measured through the items adopted from the family resource scale ($\alpha = .84$; Dunst and Leet 1987), and individuals' creativity in the context of everyday life product usage, which was measured through the creative reuse subscale ($\alpha = .87$; Price and Ridgway 1983; $r = .38$, $p = .009$).

We theorize this context-independent impact of resource scarcity (vs. abundance) on product use creativity by building on three streams of research that suggest a connection between scarcity and a cognitive orientation focused on the existence of constraints (Shah, Mullaninathan, and Shafir 2012), a context-dependent linkage between constraints and consumer creativity (Moreau and Dahl 2005; Scopelliti et al., 2014; Ward 1994), and the carryover effects of mindsets on subsequent decision making (Brandstätter and Frank 2002; Briley and Wyer 2002; Chandran and Morwitz 2005; Xu and Wyer 2007). Specifically, we hypothesize that scarcity salience in a prior context activates a constraint mindset that persists and manifests itself through diminished functional fixedness (i.e., makes consumers think beyond the traditional functionality of a given product) in a subsequent and unrelated product usage context. Such reduction in functional fixedness in turn increases the creativity of the product use solutions. However, when a general sense of abundance is salient, a constraint mindset will be absent and the consumers will be more likely to employ a traditional known product use solution to solve the active problem. In accordance, we predict that the salience of scarcity versus abundance will reduce functional fixedness and hence enhance product use creativity.

This research promises to make several theoretical contributions. First, the current research adds theoretical understanding to the consumer creativity literature (Burroughs and Mick 2004; Dahl and Moreau 2007; Mehta and Zhu 2009; Moreau and Herd 2010) by demonstrating a context-independent linkage between resource constraints and consumers' product use creativity and by providing process evidence (i.e., reduction in functional fixedness) for this relationship. In doing so, this research also contributes to the multiple lines of literature that have alluded to a negative relationship between abundance and creative cognition. We provide direct empirical evidence demonstrating that a general sense of scarcity versus abundance increases consumer creativity and the reasoning behind it. This research also adds to the existing scarcity literature (Laran and Salerno 2013; Roux, Goldsmith, and Bonezzi 2015; Sevilla and Redden 2014; Shah et al. 2012; Zhu and Ratner 2015) by shifting attention away from investigating the quantity and frequency of consumption (e.g., the number of products supplied, acquired, or used), to exploring the impact of scarcity on consumption quality (e.g., the novelty and appropriateness of product use solutions). Finally, the results from this research deliver important practical implications in terms of creative product design, usage, and disposal.

The remainder of the article is organized as follows: We first review the relevant literature on scarcity, creativity, and mindsets to generate predictions about why scarcity

salience may enhance product use creativity. The first two experiments then demonstrate the proposed main effect, followed by four process studies that show the mediating role of functional fixedness and the moderating role of an experimentally induced focus on traditional versus nontraditional product functionality. We conclude with the theoretical and practical implications of our findings.

THEORETICAL BACKGROUND

Product Use Creativity

Creativity has been defined as the generation of ideas, insights, or solutions that are both novel and useful in solving the problem at hand (Amabile 1983; Sternberg and Lubart 1999). When this problem-solving capability is applied toward addressing consumption-related problems, it is referred to as consumer creativity (Hirschman 1980). While extant consumer creativity research has primarily focused on consumers' creative performance (Mehta and Zhu 2009), creative process (Dahl and Moreau 2007), product adoption (Mehta et al. 2012), and product design and customization (Moreau and Herd 2010), consumer creativity can also manifest itself in the context of product usage (Burroughs and Mick 2004).

When faced with a novel consumption problem, consumers could either adopt a new product or use an existing product in a new but an effective or useful way to solve the problem at hand. For example, to remove carpet stains, one could either buy a carpet cleaning detergent or use baking soda and vinegar available at home. Likewise, to get rid of the bacteria-induced odor of one's shoes, one could either buy a shoe odor eliminator or use a dryer sheet available at home. We refer to the latter type of behaviors as product use creativity, which is the focal construct in our research. Specifically, we define product use creativity as using a previously adopted product to solve consumption problems in a novel (e.g., original and innovative) and appropriate (e.g., effective and practical) manner.

Our definition of product use creativity is in line with previous research on usage innovativeness that has studied consumers' receptivity to using existing products in new ways to solve a consumption problem (Hirschman 1980; Ridgway and Price 1994). We extend this body of knowledge that has primarily focused on novelty (e.g., originality and innovativeness) of product usage, by also taking into account the appropriateness (e.g., effectiveness and usefulness) of such usage. Our conceptualization of product use creativity is consistent with existing research noting that both novelty and appropriateness are essential when assessing creativity (Goldenberg et al. 1999; Moreau and Dahl 2005; Sternberg and Lubart 1999).

Scarcity and Constraint Mindset

As a pervasive aspect of human life (Booth 1984), a fundamental concept in economics (Brock 1968), and one of

the most influential principles of persuasion in society (Cialdini 2009), scarcity has attracted attention from various disciplines and has been examined for its broad implications on lifestyle and consumption patterns. For example, a part of the research on scarcity has investigated a variety of sociological, political, economic, and personal characteristics of resource-constrained people, such as their living conditions (Hill 2001; Ludwig, Duncan, and Hirschfield 2001; Rosa et al. 2012), health (Johnson, Mermin, and Murphy 2007), education (Bernheim, Garrett, and Maki 2001), and social capital (Cleaver 2005).

Another part of the research on scarcity, and more relevant to the current work, has examined how scarcity shapes consumers' cognitive orientation and decision making (Chaturvedi, Chiu, and Viswanathan 2009; Shah et al. 2012). In particular, this research shows that scarcity affects consumer behavior within a given consumption context by activating a cognitive orientation focused on the constraints. For example, Folkes, Martin, and Gupta (1993) find that scarce versus abundant supply quantity of a product led consumers to focus on this constraint (i.e., diminished supply), which consequently decreased the usage amount of the product. Along a similar line of reasoning, Shah et al. (2012) show that participants assigned a scarce versus abundant budget in a multiple-round game were engaged in addressing the demands of each current round, that is, focusing on the constraints while failing to consider what would come in the future rounds (i.e., neglecting problems unrelated to the presented constraints), which resulted in excessive borrowing. To summarize, this stream of research has provided converging evidence that scarcity produces a context-dependent effect on consumption behaviors by inducing a cognitive orientation that is focused on the constraints.

Furthermore, the literature on mindsets has shown that the cognitive orientation activated by contextual cues or task engagement in a specific context can persist as a generalized mindset, in turn affecting judgment and decision making in subsequent, unrelated contexts (Brandstätter and Frank 2002; Briley and Wyer 2002; Chandran and Morwitz 2005). This context-independent linkage between mindset and behavior occurs because the activated mindset defines the general way through which individuals attend to and process information (Xu and Wyer 2007). For example, Luchins and his colleagues (Luchins 1942; Luchins and Luchins 1959) demonstrate that once participants comprehend a complex rule for solving an initial series of problems, they persist in applying this rule to later problems, even when the problems could be solved in a simpler manner. Similarly, Xu and Wyer (2007) find that asking participants to state their preference for choice alternatives in one product domain activates a "which-to-buy" mindset, which consequently increases their likelihood of making a purchase in unrelated product domains.

Based on the distinct streams of research just cited, we expect that the salience of resource scarcity will activate a

constraint mindset (i.e., a general cognitive orientation focused on the existence of constraints), which can persist and affect consumer decision making in a subsequent, independent consumption context.

Constraint Mindset and Product Use Creativity

Previous research has shown that inducing context-specific constraints in the creative process leads to novel and original ways of solving problems, resulting in higher creativity of the generated solutions within the constrained local environment (Stokes 2001). For example, Burroughs and Mick (2004) demonstrate that constraining the time available to complete a given task leads to more creative consumer solutions for that particular task. Likewise, Otnes, Kacen, and Lowrey (2001) document that task-relevant external constraints such as budgets increase creativity in Christmas gift giving. A similar effect of constraints has also been demonstrated in the domain of consumer-driven product design processes. For example, Sellier and Dahl (2011) find that constraining the availability of task-specific inputs in the creative process (e.g., reducing the number of yarn options offered to consumers for a knitting project) leads to more innovative design outputs in the corresponding domain (e.g., scarf designs). Similarly, Finke and his colleagues show that restricting the set of parts (e.g., hook, sphere, and ring) or an inventive category (e.g., furniture, appliances, or toys) during an inventive process leads to more innovative creations (Finke 1990; Finke, Ward, and Smith 1992).

Importantly, Moreau and Dahl (2005) suggest that task-specific constraints enhance consumer creativity because the presence of constraints leads people to stray from traditionally established means and solutions, that is, the path of least resistance (POLR). While by default, people tend to follow the POLR as it is much easier and cognitively efficient to retrieve and implement known and established solutions (Ward 1998). These established and previously successful solutions tend to be predictable, repetitive, and neither surprising nor novel (Stokes 2001). Yet when the constraints are induced in a task environment, previously established conditions often no longer hold in the constrained environment (Moreau and Dahl 2005). Task-relevant constraints thereby often force individuals to move away from the POLR, consequently leading to more creative task solutions. Consistent with this line of thinking, Finke et al. (1992) reason that the positive impact of task-specific restrictions on inventive processes arises because these restrictions discourage conventional thinking (Finke 1990; Finke et al. 1992). In the context of product usage, the POLR manifests itself in the form of functional fixedness, which is a cognitive bias that limits a person to using an object only in the way it is traditionally used (Duncker 1945). For example, if someone needs a paperweight but only has a hammer, he or she may not see how the hammer

can be used as a paperweight. This fixation on a hammer's traditional functionality (i.e., following the POLR in its usage) indicates a high level of functional fixedness, which often results in low product use creativity.

Together, these findings on the context-dependent linkage between constraints and creativity, along with the research proposing the possible connection between scarcity and a generalized constraint mindset, suggest that a general sense of scarcity might produce a context-independent impact on product use creativity, which, as explicated in the earlier section, is assessed through two dimensions: its novelty (e.g., originality and innovativeness) and its appropriateness (e.g., effectiveness and usefulness) (Moreau and Dahl 2005; Sternberg and Lubart 1999). More specifically, we propose that the constraint mindset activated by the salience of scarcity in a prior context will persist and manifest itself through decreased functional fixedness in the subsequent product usage contexts (i.e., will make individuals move beyond the traditional uses and functionality of a given product). This reduction in functional fixedness consequently will make people approach product use solutions from different perspectives and in unusual ways, therefore increasing the novelty of the product use solutions. However, when a general sense of abundance is salient, a constraint mindset will not be activated. In this case, individuals will follow the default POLR and be less likely to move away from the traditional functionality of a product, thereby resulting in lower novelty of the product use solutions.

Further, it may appear that moving away from a product's functional fixedness that leads to higher novelty may also lead to fanciful product use solutions that have little relevance to the customer and are neither effective nor useful (i.e., are lower in appropriateness; Moreau and Dahl 2005). However, we argue that because the setting of our inquiry entails a constraint mindset that arises out of a general sense of scarcity, the appropriateness or effectiveness of the product use solutions should be of prime importance. Hence, although scarcity salience will enhance novelty, we do not expect any decrease in the appropriateness of the product use solutions. In line with our reasoning, previous literature examining the effects of poverty on consumer behavior argues that although the subsistence market places demonstrate high innovativeness, such innovations are safe and productive as subsistence consumers strive to achieve a desired outcome that appropriately solves the problem at hand (Rosa et al. 2012). Additionally, previous research examining the effect of task-relevant constraints on consumer creativity has also observed that task-relevant constraints can enhance novelty without compromising on the appropriateness. For example, Moreau and Dahl (2005) observed a nonsignificant impact of constraints on appropriateness of the generated solutions. In a similar vein, Sellier and Dahl (2011) observed a nonsignificant effect of choice constraint on appropriateness when examining the joint

effect of expertise and choice constraint as well as cognitive busyness and choice constraint on design outcome.

To summarize, we hypothesize that scarcity salience will increase product use creativity by enhancing the novelty of product use solutions without compromising on the appropriateness of the solutions. We explain that this occurs because scarcity salience activates a constraint mindset that persists and manifests itself through reduced functional fixedness in subsequent product usage contexts (i.e., makes consumers think beyond the traditional functionality of a given product).

We test our hypotheses in six experiments. Experiments 1 and 2 demonstrate that the salience of scarcity versus abundance enhances the novelty, without compromising the appropriateness, of the product use solutions in the contexts of both divergent and convergent thinking. Experiments 3 and 4 provide direct support for the proposed mechanism by showing that functional fixedness mediates the relationship between resource availability and product use creativity. The final two studies provide further process evidence by demonstrating that the context-independent effect of scarcity salience on product use creativity is moderated when consumers are primed with a general sense of nontraditional product functionality (experiment 5) or explicitly fixated on the traditional functionality of a product (experiment 6).

EXPERIMENT 1

Experiment 1 was conducted with an aim to test our main thesis that a general sense of resource scarcity enhances product use creativity. Resource availability was manipulated at three levels (i.e., scarcity, abundance, and control) through a writing task adapted from [Vohs, Mead, and Goode \(2006\)](#). Product use creativity was captured through a toy-building task that was adapted and modified from [Moreau and Dahl \(2005\)](#) to suit the setting of our study and was assessed through both novelty and appropriateness dimensions. We expected that scarcity salience would enhance the novelty without compromising the appropriateness of the toys built.

Method

A total of 95 undergraduate students (52 women) at the University of Illinois at Urbana-Champaign participated in this experiment in exchange for extra course credit. The experiment was run in small groups of no more than four people per session. Upon arrival, participants were randomly assigned to one of three resource availability conditions (i.e., scarcity, abundance, or control). The participants assigned to the scarcity and abundance conditions first completed a writing task on computers. Specifically, the participants in the treatment conditions were asked to take three minutes and write an essay about

either growing up having scarce resources (scarcity condition) or growing up having abundant resources (abundance condition). After completing the writing task, the participants completed an ostensibly unrelated toy-building task under the guise of a “new products study” ([Moreau and Dahl 2005](#)). The participants in the control condition proceeded directly to the toy-building task. For this “new products study,” all participants were provided with the same number and type of “Krinkles” building blocks and asked to use these pieces to build a creative prototype of a toy that a typical child between the ages of five and seven years can play with ([Moreau and Dahl 2005](#)). Once participants finished building their toys, they answered demographic questions and were then debriefed and dismissed.

Results and Discussion

Novelty. We first assessed the 95 toy prototypes created by our participants on the novelty dimension. To do so we hired 15 judges from the same population as our study participants and asked them to rate each toy built on three items: innovativeness, novelty, and originality ([Moreau and Dahl 2005](#)) using a 7 point scale (1 = Not at all; 7 = Very much). Next, we averaged each of the 15 judges' ratings on these three items (i.e., innovativeness, novelty, and originality) to obtain 15 novelty scores for each prototype built. These 15 scores were then averaged to obtain an overall novelty score for each toy prototype ($\alpha = .92$). A one-way analysis of variance (ANOVA) returned a significant main effect of resource availability on the novelty of the toy prototypes created by the participants using the Krinkles pieces ($F(2, 92) = 3.88, p = .024$). The toy prototypes created by the participants in the scarcity condition ($M = 3.72$, standard deviation [SD] = 1.15) were judged to be more novel as compared to those created by the participants in either abundance ($M = 3.04, SD = .94; t(92) = 2.66, p = .009$, Cohen's $d = .65$) or the control condition ($M = 3.17, SD = 1.01; t(92) = 2.09, p = .039$, Cohen's $d = .51$). No difference was observed in the judged novelty of the toy prototypes created under the abundance versus the control condition ($t < 1$).

Appropriateness. To assess appropriateness of the toy prototypes, we hired a second set of 15 judges and asked them to rate each toy built on the three items capturing the appropriateness dimension of creativity—effectiveness, practicality, and usefulness ([Moreau and Dahl 2005](#))—using a 7 point scale (1 = Not at all; 7 = Very much). Following the same procedure as for novelty, we calculated an overall appropriateness score ($\alpha = .92$) for each prototype. A one-way ANOVA conducted for this overall appropriateness score yielded nonsignificant results ($F < 1$), such that no difference was observed in the appropriateness of the toy prototypes generated across scarcity ($M = 4.25$,

SD = 1.02), abundance ($M = 4.25$, $SD = .76$), and control ($M = 4.39$, $SD = .80$) conditions (all t 's < 1).

Discussion. Together, the results from this study provide direct empirical support that a general sense of scarcity versus abundance leads to more novel product use solutions without compromising their appropriateness. These results thus advance prior creativity literature by providing initial controlled laboratory evidence for a context-independent linkage between task-irrelevant constraints (i.e., a general sense of scarcity) and creativity in the context of product usage. Further supporting our hypothesis, we did not find any difference in novelty of the toy prototypes between the abundance and control conditions, thereby indicating that scarcity indeed enhances novelty of product use solutions. Also, as hypothesized and consistent with prior creativity literature (Moreau and Dahl 2005; Sellier and Dahl 2011), we did not find any difference in appropriateness of the product use solutions across the three resource availability conditions.

EXPERIMENT 2

Experiment 2 extended the findings of experiment 1 in two ways. First, whereas experiment 1 employed a product usage context that was divergent in nature (the participants could use the provided Krinkles pieces to create many different toy prototypes), experiment 2 tested our focal hypothesis in a convergent thinking context (the problem at hand has a single correct solution). Second, this experiment provided initial support for the proposed underlying process based on functional fixedness. As in experiment 1, resource availability was again manipulated at three levels (i.e., scarcity, abundance, and control). To capture product use creativity, we used a convergent thinking task that requires one to use a set of given products beyond their traditional functionality so as to solve the given task creatively (Duncker 1945). We expected that the participants who encountered scarcity salience in a prior unrelated context would be more likely to use the provided products in novel but appropriate ways to solve the given task.

Method

A total of 153 American adults (92 women) completed an online study in exchange for \$0.90 and were randomly assigned to one of the three resource availability conditions (i.e., scarcity, abundance, and control). As in experiment 1, the participants assigned to the scarcity and abundance conditions began the study by completing a writing task in which they were asked to take three minutes and write an essay about growing up having scarce or abundant resources, respectively. The participants in the control condition proceeded to the second task directly.

Next, all participants were presented with the candle task developed by Duncker (1945). Specifically, the participants were shown a picture containing several products on a table: a candle, a pack of matches, and a box of tacks, all of which were next to a wall. Participants' task was to figure out how to attach the candle to the wall by using only the objects on the table, so that the candle burns properly and does not drip wax on the table or the floor. The correct solution consists of emptying the box of tacks, tacking it to the wall, and placing the candle inside, so that the box of tacks is used as a candleholder. Notably, in this task, finding the correct solution requires a person to use the box of tacks in a novel fashion by overcoming functional fixedness, that is, recognizing a use beyond its typical functionality (Duncker 1945; Glucksberg and Weisberg 1966). After writing down the solution to this task, the participants answered demographic questions and were debriefed.

Results and Discussion

Creativity. Of the 153 participants who completed the study, 20 people indicated having knowledge about the candle task and its solution beforehand. The data from these participants were not included in further analysis (including these data in the analysis did not substantively change the observed pattern). The remaining 133 responses were coded as correct or incorrect in line with previous literature; for a solution to be considered correct, responses had to include the use of the box of tacks as a candleholder (Maddux and Galinsky 2009). Overall, 35 of the 133 participants (i.e., 26.3%) correctly solved the problem. A chi-square test revealed a significant main effect of resource availability on the correctness of the solutions ($\chi^2(2, N = 133) = 10.69, p = .005$, Cohen's $d = .59$). Further, we conducted binary logistic regression analysis to assess the differences between the conditions. The results showed that a higher percentage of participants in the scarcity condition ($M = 44.2\%$) correctly solved the candle problem as compared to those in the abundance ($M = 15.6\%$, $B = 1.46$, standard error [SE] = .51, $Wald = 8.07, p = .005$) and control ($M = 20.0\%$, $B = 1.15$, $SE = .48$, $Wald = 5.70, p = .017$) conditions. No difference was observed between the abundance and control conditions ($B = .31$, $SE = .56$, $Wald = .30$, not significant).

Discussion. Results from this experiment demonstrate that the effect of scarcity salience on product use creativity holds in product usage contexts that require convergent thinking, thus displaying generalizability of our findings. Replicating the findings from experiment 1, we did not observe any difference between the abundance and the control condition, suggesting that scarcity salience, rather than abundance, drives the observed effects. Further, these results provide initial evidence for our proposed underlying mechanism. We find that participants for whom scarcity

was made salient used the available products more creatively by behaving in a less functionally fixed manner: thinking beyond products' typical functionality (e.g., using the box of tacks as a candle stand). The next two studies directly examine the role of functional fixedness as the underlying mechanism (i.e., a mediator) that drives the effect of resource availability on product use creativity. While experiment 3 measures functional fixedness through the assessments made by an independent group of judges, experiment 4 utilizes self-reported ratings provided by the participants who generated the product use solutions.

EXPERIMENT 3

The main objective of experiment 3 was to provide direct evidence for the proposed mediating role of functional fixedness in the relationship between resource availability and product use creativity. As in previous experiments, the writing task adapted from Vohs et al. (2006) was employed to manipulate a general sense of scarcity versus abundance. Product use creativity and functional fixedness were measured through a subsequent task in which participants were asked to generate as many creative uses as they could for an everyday use product (Guilford 1959; Mehta et al. 2012).

Method

A total of 56 undergraduate students (34 women) at Carnegie Mellon University completed this study in exchange for extra course credit. Participants were randomly assigned to either the scarcity or abundance condition and first completed the writing task as in previous experiments. After participants had completed the writing task, they were presented with an ostensibly unrelated usage task, in which the participants were asked to generate as many creative uses for a brick as they could think of, but to refrain from listing both the typical uses and the uses that are virtually impossible. Following Mehta et al. (2012), participants were given two minutes to generate their list. The study ended with participants answering the demographic questions and being debriefed.

Results and Discussion

A total of 349 uses of a brick were generated by all participants. No difference was observed in the number of uses generated under the two resource availability conditions ($M_{\text{scarcity}} = 6.31$, $SD = 2.36$ vs. $M_{\text{abundance}} = 6.17$, $SD = 2.67$; $F < 1$).

Novelty. To assess novelty of these uses, we invited 15 independent judges from the same population as the participants in the main experiment and asked them to rate each of the 349 brick uses on three items—innovativeness, novelty, and originality—on a 7 point scale (1 = Not at all;

7 = Very much). Thirteen judges returned the completed rating tasks. These ratings were then used to calculate an overall novelty score for each participant. To do so, (1) we averaged the three ratings (i.e., innovativeness, novelty, and originality) for each judge, to obtain 13 novelty judge scores for each of the 349 uses of brick; (2) these 13 judge scores were averaged to obtain mean novelty score for each brick use ($\alpha = .86$); (3) finally, we calculated an overall novelty score for each participant by averaging the mean novelty scores for all of the uses generated by that particular participant. A one-way ANOVA revealed a significant main effect of resource availability on the overall novelty score ($F(1, 54) = 6.37$, $p = .015$, Cohen's $d = .68$) such that the brick uses generated by the participants in the scarcity condition ($M = 2.73$, $SD = .41$) were judged to be more novel than the uses generated by individuals in the abundance condition ($M = 2.42$, $SD = .49$).

Appropriateness. To assess the appropriateness of the brick uses, we invited another set of 15 judges from the same population as our study participants and asked them to rate each idea in terms of effectiveness, practicality, and usefulness on a 7 point scale (1 = Not at all; 7 = Very much). All 15 judges returned the completed ratings. These ratings were then used to calculate an overall appropriateness score ($\alpha = .62$) for each participant following the same procedure as used to calculate the novelty score. A one-way ANOVA showed a nonsignificant difference between the appropriateness of the uses generated under scarcity ($M = 4.65$, $SD = .26$) versus abundance condition ($M = 4.74$, $SD = .29$; $F(1, 54) = 1.37$, $p > .2$).

Functional Fixedness. Finally, we examined the impact of scarcity versus abundance on functional fixedness. Functional fixedness has been defined as a cognitive bias that limits a person to using an object only in the way it is traditionally used (Duncker 1945). Accordingly, we measured the degree of functional fixedness exhibited in the generated brick use solutions by assessing to what extent the uses generated by each participant were different from the traditional function of a brick. Specifically, we hired 12 independent coders from the same population as our study participants and asked them to rate each of the 349 brick uses in terms of how different each was from a traditional function of a brick on a 7 point scale (1 = Not at all different from the traditional function of a brick; 7 = Very different from the traditional function of a brick). These ratings ($\alpha = .91$) were then used to calculate an overall functional fixedness score for each participant, as with novelty and appropriateness, such that a higher score on this scale indicates lower functional fixedness (i.e., the use being very different from the traditional function of a brick). As expected, a one-way ANOVA revealed a significant main effect of resource availability on functional fixedness score; the participants in the scarcity condition displayed lower functional fixedness ($M = 3.26$, $SD = .52$) as compared to

those in the abundance condition ($M = 2.80$, $SD = .79$; $F(1, 54) = 6.48$, $p = .014$, Cohen's $d = .69$). Finally, we ran a mediation analysis to examine the indirect effect of resource availability on the novelty of the generated brick uses through functional fixedness (Hayes 2013). A bias-corrected bootstrap confidence interval obtained by resampling the data 5000 times did not include zero and therefore indicated presence of a significant indirect (i.e., mediation) effect ($\beta = .27$, $SE = .11$, bias-corrected 95% confidence interval [CI], .07–.51).

Discussion. The results from this experiment provide further support for our focal hypothesis and the proposed underlying mechanism. We find that in a product usage context a general sense of scarcity makes people behave in a less functionally fixed manner, that is, think beyond the obvious or more traditional ways of using a given product, which in turn enhances novelty of the generated product use solutions. Consistent with the results from experiment 1, we found no significant differences in the appropriateness of the brick uses generated under the scarcity versus abundance condition. These findings are in line with previous research showing that deviating from a path of traditional solutions, as induced by presence of constraints, does not necessarily improve or detract from the appropriateness of the task solution (Moreau and Dahl 2005). Notably, we also did not observe any difference in the number of uses generated by participants under the two resource availability conditions. These results suggest that in our setting, scarcity salience increased the novelty of the generated uses without affecting fluency (i.e., the number of uses generated). This result is consistent with the findings from existing creativity research showing that an independent variable may produce a significant main effect on the novelty dimension of creativity without significantly impacting the fluency dimension. For example, Mehta et al. (2012) found that while noise level affected the novelty of the solutions generated in a creative task, it did not influence the fluency with which the solutions are generated.

In this experiment, although we used different scales and different sets of judges, we relied on the same set of brick use solutions generated by our participants to assess both functional fixedness and product use creativity. In the next study, we measure functional fixedness by directly asking participants to recall the extent to which they tried to think beyond traditional functionality and common uses. This self-reported measure allows us to access the proposed mediating role of functional fixedness using the materials that are different from those used to assess product use creativity.

EXPERIMENT 4

Experiment 4 replicated and extended the findings from experiment 3 in two ways. First, while the focal task in

experiment 3 involved simply generating uses for a given everyday use product, in experiment 4, we utilized a real-life problem in which participants could decide on how to use a given product to solve the focal problem—either to harness its traditional usability or use this existing product in a creative way. Second, in experiment 3, we measured functional fixedness using the same brick uses that were used to assess product use creativity, and to do so we relied on the ratings of independent sets of judges. In experiment 4, we measured functional fixedness by directly asking participants to report the extent to which they tried to think beyond traditional functionality and common uses while trying to come up with new product use solutions.

Method

A total of 60 undergraduate students (24 women) at the University of Illinois at Urbana-Champaign completed this study in exchange for extra credit. As in previous experiments, the participants were randomly assigned to either the scarcity or abundance condition and completed the manipulation writing task (two participants who failed to complete the writing task as instructed were not included in the analysis). Next, they were presented with a real problem faced by the school and asked to suggest a solution. Specifically, the participants were told that during the summer the computer labs were relocated by a moving company and all equipment came packed in bubble wrap sheets. (Note that the school's computer labs were indeed moved to a new location at the university where this study was run during that summer break. The students in the subject pool regularly use these computer labs and hence were aware of this move.) Participants were further informed that as per the contract the packaging material was university property and that the school now had about 250 bubble wrap sheets left behind by the moving company. Participants were asked to come up with an idea/solution for what the school should do with these bubble wrap sheets. To assure that all participants had the same idea about what the product looked like, five bubble wrap sheets were placed in the middle of the behavioral lab during all experimental sessions.

Once participants finished writing their ideas, they were asked to respond to the five items that were designed to capture the construct of functional fixedness, each on a 7 point scale (1 = Not at all, 7 = Very much; higher scores on the scale indicated lower functional fixedness). In particular, the participants were asked to indicate, "While thinking about your proposed solution to the bubble wrap problem faced by the school, to what extent did you (1) try to think beyond the traditional functionality of the bubble wrap, (2) consider the features of bubble wrap that are irrelevant to its common use, (3) consider the potential ways of using bubble wrap that are not relevant to its common use, (4) work to come up with an uncommon use for

bubble wrap, and (5) enjoy thinking of ways to use a bubble wrap that were beyond its ordinary use.” Finally, all participants answered the demographic questions and were debriefed.

Results and Discussion

Novelty. To assess the novelty of the generated solutions, we hired 20 judges from an online panel in exchange for \$2.50 each and asked them to rate each solution on three items—innovativeness, novelty, and originality—using a 7 point scale. Three judges failed instructional manipulation checks (Oppenheimer, Meyvis, and Davidenko 2009) and their ratings were not included in the analysis. Following the procedure used in experiment 1, these 17 judges’ ratings were then used to calculate an overall product use novelty score for each participant ($\alpha = .99$). Replicating the results from previous experiments, a one-way ANOVA revealed a significant main effect, such that the solutions generated for bubble wrap usage by the participants in the scarcity condition ($M = 3.52$, $SD = .95$) were judged to be more novel than the uses generated by individuals in the abundance condition ($M = 2.98$, $SD = .85$; $F(1, 56) = 5.06$, $p = .028$, Cohen’s $d = .60$).

Appropriateness. Next, to assess appropriateness of the solutions, we hired another set of 20 judges from an online panel and asked them to rate each solution on three items capturing the appropriateness dimension—effectiveness, practicality, and usefulness—using a 7 point scale. One judge failed the instructional manipulation check, and this judge’s ratings were not used in the analysis. An overall appropriateness score was then created ($\alpha = .99$) following the same procedure as in previous experiments. Supporting results observed in the previous studies, a one-way ANOVA revealed a nonsignificant effect of resource availability on the appropriateness ($M_{\text{scarcity}} = 4.73$, $SD = 1.27$; $M_{\text{abundance}} = 4.78$, $SD = 1.02$; $F < 1$).

Functional Fixedness. We averaged participants’ self-reported scores on the five functional fixedness items to create a functional fixedness index ($\alpha = .86$), such that higher scores on this index indicated lower functional fixedness. A one-way ANOVA returned a significant main effect of resource availability on functional fixedness, such that the participants in the scarcity condition demonstrated significantly lower functional fixedness (i.e., higher scores, $M = 3.90$, $SD = 1.36$) as compared to the participants in the abundance condition ($M = 3.07$, $SD = 1.40$; $F(1, 56) = 5.31$, $p = .025$, Cohen’s $d = .60$). To examine the role of functional fixedness in the relationship between resource availability and novelty of product use solutions, a mediation analysis was conducted using a bootstrap approach (Hayes 2013). A 5000 resamples bootstrap produced a 95% bias-corrected bootstrap CI that did not include zero, indicating a significant indirect (i.e.,

mediation) effect of functional fixedness on the resource availability and product use novelty relationship ($\beta = .24$, $SE = .12$, bias-corrected 95% CI, .044–.527). Further, to test whether this mediation pattern replicates when functional fixedness is measured through the same procedure as used in experiment 3, we invited 15 judges from our subject pool population and asked them to rate each of the bubble wrap use solutions on how different they thought each idea was from a traditional function of bubble wrap. Twelve judges returned the completed ratings, which were then used to calculate an overall functional fixedness score for each participant ($\alpha = .96$). A one-way ANOVA ($M_{\text{scarcity}} = 3.65$, $SD = 1.63$; $M_{\text{abundance}} = 2.87$, $SD = 1.31$; $F(1, 56) = 3.86$, $p = .054$, Cohen’s $d = .53$) and the mediation analysis ($\beta = .38$, $SE = .20$, bias-corrected 95% CI, .02–.81) replicated the results observed for the self-reported measure of functional fixedness.

Discussion. Together, the results from experiments 3 and 4 provide converging evidence for our theorizing that scarcity salience lowers functional fixedness and consequently leads to higher novelty of product use solutions without compromising the appropriateness of the product use solutions. In the next two experiments, we provide further process evidence by examining whether the effect of scarcity versus abundance on product use creativity is moderated when consumers are either primed with a general sense of nontraditional product functionality (experiment 5) or explicitly fixated on the traditional functionality of a product (experiment 6).

EXPERIMENT 5

According to our hypotheses and the results observed so far, we found that the impact of scarcity salience enhances product use creativity because of the reduction in functional fixedness. Thus if individuals are made to think in a less functionally fixed manner (such as by activating a general tendency to think about nontraditional product uses), they should exhibit increased product use creativity, irrespective of the resource availability. Experiment 5 tested this argument and employed a 2 (Resource Availability: Scarcity vs. Abundance) \times 2 (Nontraditional Functionality Mindset: Primed vs. Control) between-subjects design. The writing task and the bubble wrap task as used in experiment 4 were utilized to manipulate resource availability and to assess product use creativity, respectively. To induce a nontraditional functionality mindset, we presented half of the participants with five everyday products and highlighted their nontraditional uses before presenting them with the bubble wrap task (primed condition). The other half of the participants were presented with the same set of products but were not given any mention of their nontraditional uses (control condition). In this experiment, we also assessed participants’ current mood to examine if

mood played a role in the relationship between the resource availability and product use creativity.

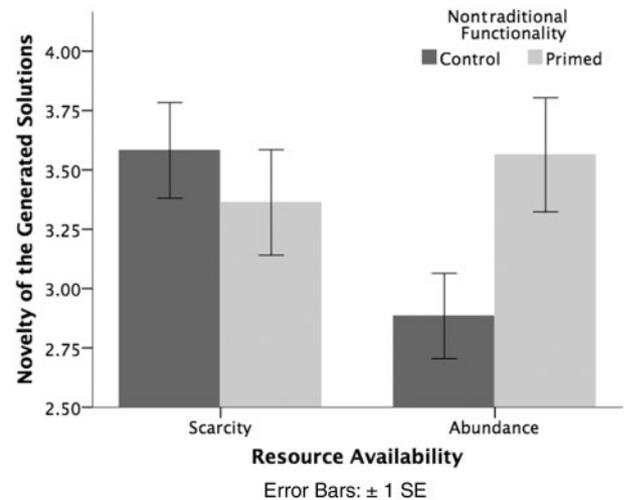
Method

A total of 84 undergraduate students (45 women) at the University of Illinois at Urbana-Champaign completed this study in exchange for extra credit and were randomly assigned to one of the four experimental conditions. As in previous studies, participants first wrote an essay either on growing up with scarce or abundant resources (five participants failed to complete the writing task as instructed and were not included in the analysis). Once they completed the writing task, the participants in the nontraditional functionality mindset primed condition were presented with five everyday consumer products, one at a time, each accompanied by a nontraditional function for that particular product (e.g., toothpaste: It can be used to clean car headlights; aluminum foil: It can be used as an effective dryer sheet). The participants were asked to indicate how different they thought the mentioned use was from the traditional use of that particular product on a 7 point scale anchored on "Not at all–Very much." Participants in the control condition were presented with the same set of products but without any mention of the nontraditional function and were asked to rate how long it might take them to decide whether or not to purchase each of the presented product on a 7 point scale anchored on "Very little time–Very long time." Next, all participants were asked to solve the same bubble wrap problem as used in experiment 4. Then, participants responded to the seven positive and eight negative mood items adapted from Zevon and Tellegen (1982) by indicating how they felt about these items on a 7 point scale (1 = Not at all, 7 = Very much). The experiment concluded with some demographic questions.

Results and Discussion

Novelty. To assess the novelty of the solutions generated by our participants in response to the bubble wrap problem, we hired 20 judges from an online panel and asked them to rate each solution on three items—innovativeness, novelty, and originality—on a 7 point scale (1 = Not at all, 7 = Very much). Eighteen judges returned the completed ratings. Following the same procedure as in previous studies, we used these ratings to calculate an overall novelty score ($\alpha = .98$) for each participant. A 2 (Resource Availability: Scarcity vs. Abundance) \times 2 (Nontraditional Functionality Mindset: Primed vs. Control) ANOVA revealed a significant interaction ($F(1, 75) = 4.42, p = .039; \eta^2 = .06$; see Figure 1). Replicating the results from previous studies, in the control condition, the solutions generated when resource scarcity versus abundance was salient were rated as more novel ($M_{\text{scarcity}} = 3.58, SD = .97; M_{\text{abundance}} = 2.88, SD = .76$;

FIGURE 1
NOVELTY OF THE GENERATED PRODUCT USE SOLUTIONS FOR BUBBLE WRAP (EXPERIMENT 5)



$t(75) = 2.34, p = .022$, Cohen's $d = .80$). However, when a nontraditional functionality mindset was primed, no difference was observed between the scarcity ($M = 3.36, SD = .97$) and abundance conditions ($M = 3.56, SD = 1.05; t < 1$). Further, contrast analysis confirmed that participants in the abundance condition generated the solutions that were rated higher on novelty when the nontraditional functionality mindset was primed versus not primed ($t(75) = -2.18, p = .032$, Cohen's $d = .74$). The nontraditional functionality manipulation (primed vs. control) did not produce a significant impact on the novelty of solutions generated for participants in the scarcity conditions ($t < 1$).

Appropriateness. To assess the appropriateness of the generated solutions, we hired another set of 15 judges and asked them to rate the solutions on the three appropriateness items—effectiveness, practicality, and usefulness—on a 7 point scale. These ratings were then used to calculate an overall appropriateness score ($\alpha = .99$). A two-way ANOVA yielded no significant main effects or interaction between resource availability and traditional functionality mindset ($M_{\text{scarcity nontraditional functionality}} = 4.21, SD = 1.00; M_{\text{abundance nontraditional functionality}} = 4.44, SD = 1.14; M_{\text{scarcity control}} = 4.48, SD = 1.02; \text{ and } M_{\text{abundance control}} = 4.96, SD = .79$; all F 's < 1).

Discussion. The observed results support our prediction that enhanced product use novelty caused by scarcity salience will be moderated when consumers are experimentally primed to think beyond a product's traditional functionality, providing further evidence for functional fixedness as the underlying mechanism driving the observed effect. Also, analysis of participants' current mood

did not return any significant main effect of our manipulation or the interaction for both positive mood index ($\alpha = .84$) or negative mood index ($\alpha = .90$; all F 's < 1), thereby indicating nonsignificance of mood in the setting of our study.

EXPERIMENT 6

Experiment 6 had two main objectives. First, it tested whether the effect of scarcity salience on consumer creativity generalizes beyond the product usage context to a product design context. Additionally, as a final test of the proposed functional-fixedness account, experiment 6 examined whether explicitly fixating participants' attention on the traditional functionality of a product would attenuate the impact of scarcity salience on product use creativity. We employed a 2 (Resource Availability: Scarcity vs. Abundance) \times 2 (Traditional Functionality: Salient vs. Control) between-subjects design, where resource availability was manipulated through a different task than used in previous experiments. In particular, we utilized more naturally occurring stimuli: We asked participants to engage in an online search to obtain scarcity- versus abundance-related images. Salience of a product's traditional functionality was manipulated through the instructions for the focal design-related task. Specifically, we asked participants to generate design ideas for an improved computer keyboard. Under the traditional functionality salient condition, the participants were explicitly reminded of the typing function of a keyboard, whereas in the control condition there was no mention of the typing function.

Method

A total of 82 undergraduate students (41 women) at Carnegie Mellon University completed this study in exchange for extra credit and were randomly assigned to one of the four experimental conditions. Participants first completed an online search task that asked them to search the Internet and look for pictures that demonstrated either resource scarcity or resource abundance. The specific instructions required participants to find five such pictures and copy and paste the online links in the provided spaces on the computer-based survey. After pasting each link, participants were instructed to spend half a minute reflecting on the featured picture by thinking about a real-world context that they might find themselves in a similar situation. Two research assistants, blind to the conditions, were presented with all the pictures downloaded from the links provided by the participants, and they indicated how much they thought each of the picture demonstrated abundance ($r = .88$) and scarcity ($r = .83$), on 7 point scales anchored by "1 = Not at all" and "7 = Very much." All five links reported by one participant were found to be nonworking at the time of analysis and hence this participant's data were

excluded for this analysis. As expected, the pictures associated with the links reported in the scarcity condition were rated to be significantly higher in demonstrating scarcity ($M = 5.12$, $SD = .87$ vs. $M = 2.46$, $SD = 1.36$) and lower in demonstrating abundance ($M = 1.84$, $SD = .53$ vs. $M = 4.80$, $SD = 1.54$), as compared to the pictures in the abundance condition ($F(1, 79) = 135.62$, $p < .001$, Cohen's $d = 2.57$; $F(1, 79) = 111.64$, $p < .001$, Cohen's $d = 2.33$; respectively).

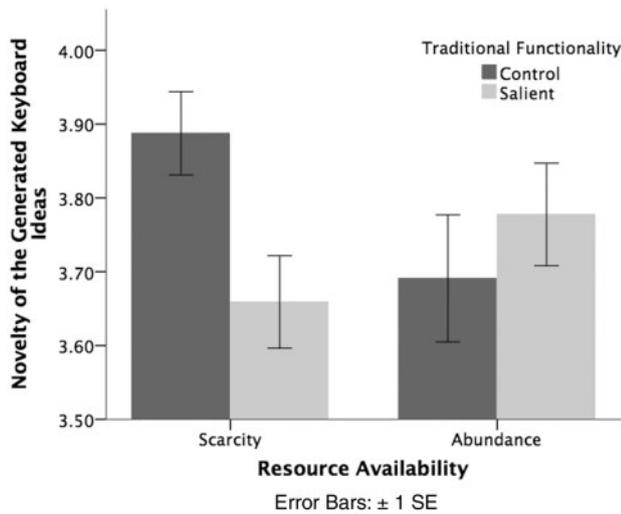
After completing the picture task, all participants were presented with the second ostensibly unrelated task, which asked them to generate design ideas for an improved computer keyboard. We manipulated the salience of the traditional functionality of the keyboard (i.e., typing) through the instructions for completing this ideation task. In particular, the instructions read, "We would like you to think about a product, i.e. a computer keyboard, similar to the one you are using right now to do the typing, and imagine that you are given an opportunity to improve it. In this task we would like you to come up with creative ideas for an improved computer keyboard. Your ideas can be geared toward either new features or a completely new product. Please refrain from listing ideas that may be virtually impossible." The instructions used in the control condition were otherwise identical except that the phrase "similar to the one you are using right now to do the typing" was absent. Finally, all participants indicated how they felt on four mood items adapted from [Zhu, Billetter, and Inman \(2012\)](#), each on a 7 point scale, and answered the demographic questions.

Results and Discussion

A total of 323 design-related ideas were generated by all of the participants. No difference was observed for the number of ideas generated across four conditions ($M_{\text{scarcity, functional fixedness salient}} = 3.89$, $SD = 1.88$; $M_{\text{abundance, functional fixedness salient}} = 4.18$, $SD = 1.99$; $M_{\text{scarcity, control}} = 3.87$, $SD = 2.07$; and $M_{\text{abundance, control}} = 3.79$, $SD = 1.90$; all t 's < 1).

Novelty. To assess the novelty of these design-related ideas, we invited 15 judges (14 judges returned the completed ratings) from the same population as our participants and asked them to rate all 323 ideas on innovativeness, novelty, and originality on a 7 point scale (1 = Not at all; 7 = Very much). Following the same procedure as used in experiment 3, an overall novelty score ($\alpha = .61$) was calculated for each participant. A two-way ANOVA conducted for this novelty score indicated a significant interaction between resource availability and traditional functionality ($F(1, 78) = 5.20$, $p = .025$, $\eta^2 = .06$; see [Figure 2](#)). Replicating the results from previous studies, under the control condition (i.e., when the traditional typing function of a keyboard was not made salient), the participants in the

FIGURE 2

NOVELTY OF THE GENERATED KEYBOARD IDEAS
(EXPERIMENT 6)

scarcity condition ($M = 3.89$, $SD = .27$) generated the ideas that were rated to be more novel as compared to the ideas that were generated by the participants in the abundance condition ($M = 3.69$, $SD = .36$; $t(78) = -2.04$, $p = .045$, Cohen's $d = .63$). However, when the traditional functionality of keyboard (i.e., typing) was made salient, no difference was observed in the novelty of the ideas generated between the scarcity ($M = 3.66$, $SD = .27$) and abundance conditions ($M = 3.78$, $SD = .33$; $t(78) = 1.20$, $p > .20$). Further contrast analysis confirmed that participants in the scarcity condition generated less novel ideas when the traditional functionality was made salient versus when it was not ($t(78) = 2.33$, $p = .022$, Cohen's $d = .85$). The traditional functionality manipulation (salient vs. control) did not produce a significant impact on novelty of the keyboard ideas for the participants in the abundance condition ($t < 1$).

Appropriateness. Next, to assess the appropriateness of the generated ideas, we asked a separate set of 15 judges to rate all of the ideas independently in terms of appropriateness (effectiveness, practicality and usefulness) on a 7 point scale. As done previously, these ratings were used to calculate an overall appropriateness score for each participant ($\alpha = .82$). A two-way ANOVA conducted for the appropriateness index showed a marginally significant interaction between resource availability and traditional function salience ($F(1, 78) = 2.99$, $p = .088$, $\eta^2 = .04$). Further contrast analysis showed that no difference was present in the appropriateness of the ideas between scarcity and abundance conditions under control condition ($M_{\text{scarcity}} = 4.10$, $SD = .40$; $M_{\text{abundance}} = 4.26$, $SD = .42$;

$t(78) = 1.06$, $p > .25$) or when traditional functionality was salient ($M_{\text{scarcity}} = 4.38$, $SD = .54$; $M_{\text{abundance}} = 4.17$, $SD = .54$; $t(78) = -1.38$, $p = .172$). However, analysis of the other two contrasts showed that the ideas generated by the participants under the scarcity condition were rated as marginally more appropriate when traditional functionality was salient versus when it was not ($t(78) = -1.86$, $p = .066$, Cohen's $d = .59$). No difference was observed between the control and the traditional function salient condition when the ideas were generated under the abundance condition ($t < 1$).

Discussion. The results of experiment 6 provide additional process evidence by showing that explicitly fixating participants' attention on the traditional functionality attenuates the impact of scarcity on product use novelty. In particular, we find that under the control condition (i.e., when traditional functionality of a product was not salient), the participants in the scarcity versus abundance condition generated more novel ideas to improve the featured product. However, when traditional functionality of a product was made salient, that is, the participants were fixated on that functionality, they generated less novel ideas irrespective of the resource availability levels. Additionally, as in experiments 5, no significant differences in either the positive mood index ($r = .64$) or the negative mood index ($r = .74$; both F 's < 1) were found across the scarcity or abundance conditions, suggesting that it is unlikely that the impact of scarcity salience on novelty is driven by mood-based alternative explanations.

It is noteworthy that we found a marginally significant difference across the two scarcity conditions in terms of appropriateness: When participants were explicitly fixated on the traditional functionality of a product, they generated more appropriate design ideas. While ex ante we did not theorize a conceptual difference between these two conditions, we speculate that the relationship between scarcity and creativity may not always be limited to novelty. It is possible that scarcity makes creators push themselves more on the appropriateness dimension when the novelty dimension is inhibited through functional salience. It is also notable that the difference in novelty across the scarcity control condition ($M = 3.89$) and the abundance salient condition ($M = 3.78$) did not reach statistical significance ($t(78) = -1.18$, $p = .24$). The product design task used in this study, instead of the product use contexts employed in previous studies, might have led to this statistically nonsignificant effect of scarcity on novelty. We elaborate more on the possible boundary conditions of our effects in the general discussion section.

GENERAL DISCUSSION

Whereas prior research indicates that context-specific constraints may increase creativity within the constrained

local environment, previous work has not examined how an overall perception of resource constraints, such as perceived scarcity of physical resources, may produce a context-independent influence on creativity in an unrelated consumption domain. This is an important question to address because consumers are frequently exposed to scarcity cues in daily decision environments, and these encounters could impact their mindset and carry over to subsequent events where creativity may be called for. The current research fills this gap and examines how a general sense of scarcity versus abundance activated in a prior unrelated context may influence consumer creativity in a subsequent product usage context.

Drawing from prior work, we propose that scarcity salience reduces functional fixedness, which consequently enhances product use creativity. Across six studies, we demonstrate consistently that scarcity versus abundance leads to more novel product usages, without compromising the appropriateness of the consumption solutions, in both divergent thinking (experiments 1, 3–6) and convergent thinking (experiment 2) contexts. A meta-analysis examining the reliability of the effect across our studies further confirmed a significant impact of resource availability on the novelty dimension of product use creativity ($z = 5.08$, $p < .001$; Maner et al. 2003; Rosenthal 1991). Further we uncover the underlying mechanism, showing that the effect of scarcity salience on product use creativity is mediated by functional fixedness (experiments 3 and 4) and moderated by an experimentally induced focus on nontraditional (experiment 5) and traditional product functionality (experiment 6). We also extend the effects of scarcity on consumer creativity beyond the product usage context to a product design context (experiment 6).

The present research offers several theoretical contributions. First, while various theories suggest a possible negative impact of resource availability on creativity, the current work advances these multiple lines of literature by providing empirical evidence for this proposed connection in well-controlled experimental settings. Specifically, the notion that abundance might inhibit creativity has been broadly suggested in different research streams: the materialism literature showing that the centrality of material possessions hinders intellectual and spiritual development (Belk 1985; Burroughs and Rindfleisch 2002; Kasser 2003; Richins and Dawson 1992), the literature on consumption and society arguing that modern mass production gives rise to the harried leisure class (Linder 1970; Schor and Holt 2000), the historic writings on how overconsumption might lead to the failure of complex and wealthy societies (Diamond 2005; Tainter 1990), and the technology literature suggesting more sophisticated technology can usurp human motivation and skills (Mick and Fournier 1998). Additionally, extant research has proposed that scarcity might facilitate creativity, such as the work on how homeless and subsistence consumers survive through constant innovation (Hill 2001; Rosa et al. 2012). However, the

possible negative correlation between resource availability and creativity, as well as the underlying mechanism driving such a linkage, has not been adequately demonstrated or understood through controlled experimental studies. The experiments reported in the current article thus take on a great sense of importance by both providing an initial empirical demonstration that scarcity (vs. abundance) enhances consumer creativity in the product usage contexts, and by offering process evidence why this occurs.

Second, the current research adds theoretical understanding to the creativity literature (Burroughs and Mick 2004; Dahl and Moreau 2007; Mehta and Zhu 2009; Moreau and Herd 2010) by demonstrating a context-independent linkage between resource constraints and consumers' product use creativity. While previous research has shown that inducing context-specific constraints in the creative process leads to more creative ways of solving problems within the constrained local environment, the current work extends these findings by demonstrating that the existence of a general sense of scarcity may activate a constraint mindset that persists to enhance consumers' creativity in an unrelated, unconstrained product usage domain. This finding is notable as we observe that people move away from functional fixedness and think beyond traditional uses of a product even when no immediate constraints exist for usage of the subject product. Moreover, our work extends the existing creativity literature by examining the effect of resource scarcity in an understudied real-life consumption domain of product use creativity, which differs from the simple adoption of new and innovative products and instead entails origination and production of new uses of existing products (Hirschman 1980; Ridgway and Price 1994).

Third, this research adds to the existing scarcity literature (Laran and Salerno 2013; Roux, Goldsmith, and Bonezzi 2015; Sevilla and Redden 2014; Shah et al. 2012; Zhu and Ratner 2015) by shifting attention away from investigating the quantity and frequency of consumption (e.g., the amount of products supplied, acquired or used), to exploring the impact of scarcity on consumption quality (e.g., the novelty and appropriateness of product use solutions). The finding that a general sense of scarcity activated in a prior context can affect product use creativity in subsequent, unrelated consumption environments supports the emerging view that there is a context-independent connection between perception of scarcity and consumer judgment and decision making (Griskevicius et al. 2011; Laran and Salerno 2013; Shah et al. 2012; Zhu and Ratner 2015). In addition, the finding that the results in the control condition parallel those in the abundance condition suggests that by default, consumers in our studies perceive that resources in the world in general are abundant rather than scarce. These results are consistent with the sociological perspective of "abundance psychology" suggesting that as the means of mass production become mastered, people in modern industrialized societies have moved away from a

scarcity mindset and instead take abundance for granted (Adams et al. 2012; Côté 1993, 1996; Riesman 1950).

Further, the results from the current research consistently demonstrate that scarcity increases the novelty of product use solutions without compromising on the appropriateness of product use solutions. These findings are in line with the literature on poverty and innovativeness that argues having a positive expectation regarding the likelihood of attaining a desired outcome that appropriately solves the problem at hand serves a crucial role in making subsistence consumer innovation safe and productive (Rosa et al. 2012). These results are also consistent with the findings from prior creativity literature showing that task-relevant constraints can enhance novelty in that particular task domain without reducing the appropriateness of the solutions (Moreau and Dahl 2005; Sellier and Dahl 2011). However, the relationship between scarcity and creativity may not always be limited to novelty, and it is possible that scarcity may make the creators push themselves more on the appropriateness dimension when the novelty dimension is inhibited through functional salience (as seen in the results of the experiment 6). It is also possible that the relationship between novelty and abundance may not be linear, such that extreme levels of abundance might foster breakthrough innovation. For example, while our research focuses on product use creativity, more radical innovations that require constant, costly experimentations might benefit from formidable and abundant resources. Future research may focus on further exploring the boundary conditions when abundance might increase creativity.

The current work also opens up other avenues for further research. For example, the scarcity manipulations employed in the current research focused on a general sense of resource availability, which was activated through rather subtle manipulations such as a writing task or a picture search task. Future research could broaden the examination to explore how physiological manipulations of resource scarcity versus abundance (e.g., hunger vs. satiety) may affect creativity. It is possible that the results exhibit a U-shape pattern with lower creativity at high levels of hunger and satiety, and higher creativity at medium levels of hunger. Future investigations on how time constraints (Burroughs and Mick 2004), leisure time (Dunst and Leet 1987), and emotional resources such as social support (Brotheridge and Lee 2003) may affect product use creativity could also potentially yield important insights.

Additionally, current work primarily focuses on product use creativity, which is an instantiation of consumer creativity in the product use context. Thus, in line with previous research, the current work examines two primary dimensions of creativity: novelty and appropriateness. Future research could further explore the impact of a general sense of resource availability on other dimensions such as aesthetics (e.g., liking, aesthetic appeal) and technical goodness (e.g., organization, neatness; Amabile 1979, 1982). It

seems plausible that while scarcity enhances novelty, abundance might have a more positive effect on aesthetics and technical goodness. Moreover, the current work can be extended to understand the effect of scarcity on the adoption of new innovative products as well as the performance of other general everyday tasks that require creativity, such as solving creative puzzles or generating social media content.

Finally, present findings have implications for marketers who thrive on employees' and consumers' ability and desire to be creative (Mehta et al. 2012), such as those in home decor and fashion industries (Burroughs and Mick 2004; Burroughs et al. 2008). Our research indicates that highlighting abundance (e.g., presenting abundant rather than scarce supply of the available items) could backfire, leading the designers or consumers in the focus group to be less creative. Our research suggests that in design studios or focus groups, marketers should activate a general sense of scarcity rather than abundance.

We conclude with a consideration of the evolutionary implications of the present findings. As we become a more abundant society, do our average creativity levels decrease? Findings from recent research support this proposition. In accordance with our line of reasoning, the analysis of the Torrance Tests of Creative Thinking performance data over the past five decades indicates that in spite of the rise in IQ scores, creative thinking scores have significantly decreased since 1990, especially for kindergarteners through third grade students (Kim 2011). It is possible that augmented abundance in the late half century has been contributing to the decrease in creativity. Thus although it may seem generally adaptive to employ traditionally established means and previously successful solutions when the supply of resources is abundant, this impact of resource availability on functional fixedness will sometimes come at a cost.

DATA COLLECTION INFORMATION

The first author supervised the collection of data for experiment 2 through Mechanical Turk during the fall of 2014, and the collection of data for experiments 1, 4, and 5 at the University of Illinois at Urbana-Champaign during spring 2014, fall 2013, and spring 2014, respectively. The second author supervised the collection of data for experiments 3 and 6 by research assistants at Carnegie Mellon University during the spring and summer of 2011, and the collection of data for the pilot study by research assistants at Johns Hopkins University during fall 2012. All data were primarily analyzed by the first author in discussion and consultation with the second author.

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