The Influence of Variety and Scarcity on Children's Decision Making

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Psychology)
in the University of Michigan
2018

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Dedication

To my parents, Marian and Wayland Echelbarger, who taught me to be curious.

Acknowledgements

This dissertation would not exist if not for Susan A. Gelman, my primary advisor, who entertained and nurtured my many interests. I will forever be indebted to her. I also thank my committee members Henry M. Wellman, Scott I. Rick, and Stephanie D. Preston for their invaluable feedback and investment in both me and my work.

Though this is my dissertation, the research reported on reflects the contributions of many research assistants with whom I have had the great pleasure to work. I also thank those research assistants who dedicated their time and efforts to assist with related projects not reported on here. Countless thanks go to: Zahraa Ahmad, Shahrooz Ali, Jennifer Ashley Asong, Sandra Bajc-Dimitrov, Diarra Brooks, Allison Brown, Leah Butler, Nicole Cuneo, Zahra Dawson, Jasen Garborg, Abbie Ginis, Gabrielle Graves, Melissa Hall, Taylor Hautala, Julia Hopkins, Ergest Isak, Avery Katz, Ethan Kenney, Zaina Khoury, Dany Kotlyar, Melissa Kreutz, Paru Krishna, Tanvi Kulkarni, Jakub Kuras, Chelsea Lee, Coral Lu, Kristina Ljucovic, Sarah Mageed, Laura Maihofer, Ashta Narain, Paula Pericas, Cathy Perry, Ariel Ragin, Juhi Rattan, Haley Rough, Aiya Saad, Stephanie Sigale, Sarah Snay, Zaria Starfeldt, Liesl Stemas, Kira Surber, Aisha Tabor, Rachel Taylor, Daniel Tachna-Fram, Chitrangada Thakore, Emma Ward, Anna Wendorf, Kaitlyn Wilson, Samantha Wilson, Gizem Yagci, and Kit Yin Wong. I especially thank Sarah Snay and Emma Ward for assuming several project-related responsibilities, making it possible for me to focus on my dissertation work this past year. I also thank Natalie Davidson, Merranda McLaughlin, and Lily Uribe for answering my many questions and making sure I knew how to navigate my way through the lab and its resources.

In addition to the many hours invested by my research assistants, the research reported on here would have not been possible without the support of the University of Michigan Living Lab Program. Thank you to Craig E. Smith for bringing the model to Ann Arbor and growing the program to include multiple sites. Thank you, also, to the Ann Arbor Hands-On Museum (Mel Drumm, Lorrie Beaumont, and Nichole Wright) and the University of Michigan Museum of Natural History (Kira Berman, Brittany Burgess) for generously supporting my work.

Outside the lab, I received excellent teaching mentorship from E. Margaret Evans, Jennifer Trapp Myers, and Ioulia Kovelman. From them, I learned not only how to teach, but how to mentor students and research assistants in ways that would promote their learning and nurture their curiosities. Thank you for helping me be a better teacher and researcher. In addition, I thank Darren Gergle for trusting me to carry out a study with a strange population of participants—children. From him, I learned how to manage multiple arms of a study, which prepared me to tackle complex projects during my graduate studies. I also thank Michal Maimaran for her support throughout our collaboration on variety seeking.

Throughout my time at Michigan, I also benefited from many great friendships. I thank my cohort for their helpful feedback and constant encouragement: Sammy Ahmed, Nkemka Anyiwo, Emma Beyers-Carlson, Kim Brink, Fernanda Cross, Arianna Gard, Amira Halawah, Tyler Hein, Jasmine Manalel, Lauren Tighe, and Neelima Wagley. I also thank my lab mates, past and present: Maria Arredondo, Jasmine DeJesus, Rachel Fine, Selin Gulgoz, Danielle Labotka, Kristan Marchak, Ariana Orvell, and Steven Roberts. Beyond my cohort and the lab, I thank Paige Safyer and Rachna Reddy for their friendship and keen interest in dogs.

Logistically, this dissertation and my graduation would not be possible without the Psychology program's great support staff. Special thanks go to Linda Anderson, Conni Harrigan,

Adrienn Hunt, Tim Keeler, Megan Leonard, and Brian Wallace. I also thank Wendy Peebles from the Institutional Review Board for streamlining the research process and being available to address last-minute requests (especially for this dissertation!). Collectively, you have all answered no fewer than one thousand questions since I first arrived.

To even get to this point, I am heavily indebted to several amazing women. First, I thank Nadya Modyanova for taking a chance and hiring me as a research assistant, and planting the seed that this path would be possible. Second, I thank Justine Cassell for arming me with the skills necessary to navigate this path and always being available to help me get back on course. Third, I thank Mabel L. Rice for training me in how to approach questions critically and thoughtfully, underscoring the importance of interdisciplinary work. Fourth, I thank Susan A. Gelman (again) for harnessing my quirks for good and showing me how to effectively pursue my ideas. Fifth, I thank my mother, Marian Echelbarger, for being my best advocate and reminding me that the best path between two points is not always linear.

Lastly, I thank those closest to me. Thank you to my parents, Wayland and Marian Echelbarger, for their unwavering support. Thank you to my partner, Gabriel Torres, for injecting much-needed humor into the graduate school process. Finally, thank you to Henry and Fenway for being the (dog) companions I needed to be the best human I could be.

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Abstract

What basic cues are available from a young age to determine item value? How do these cues influence evaluative decisions about items (including how to distribute them to others)? The work described in this dissertation begins to address these questions, in a series of seven studies with 943 child and adult participants.

In Chapter 2, I report three studies testing whether children (4-12 years) and adults show a direct motivation to select scarce and varied sets of items (i.e., select items for the sake of obtaining something scarce and/or something varied). In this series of studies, participants saw sets of novel items and selected one (Scarcity task) or two (Variety task) that they would like for themselves and/or someone else; no additional information beyond relative availability was provided. Results revealed a clear, early-emerging preference for variety. In contrast, no clear preference for scarce items was observed, suggesting that a preference for scarce items is acquired later and/or contextually-dependent. This latter finding is particularly informative given an oft-made assumption that scarcity increases item value.

In Chapter 3, I report four studies designed to reveal the mechanisms underlying a variety preference. In Study 4, I tested whether children (6-9 years) and adults valued varied sets more than non-varied sets monetarily, which would suggest that a preference for variety is rooted in the added value it confers. Results revealed that participants indeed placed a higher value on varied compared to non-varied sets. However, results from Study 5 with children (6-9 years) and adults suggest that the added value assigned to variety is not due to variety per se, but likely to

the diminished utility of additional units of the same item in non-varied sets (i.e., additional units of an item are less valuable than the previous). In Studies 6 and 7, I tested whether children (4-9 years) and adults would forego an additional unit of a preferred item in order to obtain a varied set of foods (e.g., if carrots are preferred to broccoli, will a participant forego a second carrot to select broccoli and thus obtain a varied set of foods?). Results revealed that in the absence of a preference for one food over another, participants selected varied food sets more than non-varied food sets, thus conceptually replicating results from Studies 1-3. In contrast, when one food item was preferred over another, participants did not preferentially select varied food sets. Together, these results suggest that a preference for an individual item can override a preference for variety.

Overall, these seven studies shed light on how children 4-12 years determine item value using two basic cues, scarcity and variety, and inform our understanding of the strength and limits of a variety preference in childhood. More generally, results from the present work demonstrate that young children systematically use variety as a cue to value, which has implications for our understanding of children as consumers more broadly.

Chapter 1: Introduction

Children are faced with the major task of learning how to engage in economic exchange, as exchange is foundational to being a functioning member of society. For adults, exchanges are ubiquitous not only in economic contexts (buying, selling, trading), but also relevant within legal contexts (e.g., bribes, fines, dissolving partnerships) and social interactions (e.g., gift-giving, reciprocating favors, or teaming up to provide support for a community member in need; see Fiske, 1991). In short, determining when, how, and how much to offer in exchange for goods is an important and complex puzzle, and children will spend years figuring out how to engage in these processes effectively. Nonetheless, although children lack sophisticated understanding of economic principles and the larger social structures in which they are based, they begin to engage in economic exchange from an early age. Preschool children trade cards, toys, or snacks with one another, and may even engage in simple economic transactions (e.g., getting an allowance or buying small items at the store). In all of these contexts, children (and adults) are required to determine the value of the individual items that are the basis of that exchange (i.e., item value is required for determining which exchanges are fair or reasonable, and which are not). Although this may seem like such a basic prerequisite skill that it hardly needs mention, a closer examination of the problem reveals that determining individual item value can be a complex calculation.

As adults, we regularly incorporate many different sources of information into our determinations of item value. For example, we often consider item popularity and adjust value

based on whether an item is in high or low demand. At the same time, we may also consider the relative availability of an item. Items easy to obtain may be valued less than items more difficult to obtain. Similarly, the effort required to create or procure an item may influence its value. Items difficult to create or obtain may be valued more than items easier to create or obtain. More often than not, it is likely that we incorporate many pieces of information to converge on a value for an individual item. For example, if someone is interested in determining the value of a diamond ring in a gold band, they may consider the ring's history, to consider how much sentimental value it would have for its owner; they may consider its style, to determine if it matches their own identity as a self-styled traditionalist; they may consider the reputation of the designer, to determine its potential resale value; they may consider how difficult it was to create, to consider what would be reasonable recompense to the artisan; they may consider the source of the stone, to judge the moral implications of supporting the diamond-mining industry; and they may turn to the market to identify the current price per ounce of gold (a computation associated with supply and demand) and then make adjustments based on the ring's quality and our desire to sell. These sorts of complex valuation processes may not be available to young children, especially given their difficulties understanding and incorporating market forces such as supply and demand into determinations of value (Leiser & Halachmi, 2006; Siegler & Thompson, 1998; Thompson & Siegler, 2000).

This dissertation asks whether and when in development children make use of cues to determine item value that are very basic—so basic that they can be gleaned directly without having to appeal to any of the sorts of factors described above (e.g., history, style, source, designer, creative effort, financial markets, etc., all of which would rely on information to which children have relatively little if any access). By taking a developmental approach, I can discern

when in development children make systematic use of cues readily available in the context to determine item value. It is possible that early on, children's valuations reflect whim and are thus neither predictable nor stable. It is also possible that children's valuations are stable but reflect idiosyncratic experiences or personal preferences (e.g., selecting items on the basis of their favorite color, or those that remind them of objects they already own). In contrast, however, there may be meaningful, predictable cues that young children use systematically to determine value. Two candidate cues include scarcity and variety. *Scarce* items are relatively less available than others in a given context (e.g., given 1 red marble and 5 blue marbles, the red marble would be scarce). *Varied* items are those that differ within a set (e.g., given a choice of 2 marbles among 3 red and 3 blue marbles, a varied set would be 1 red and 1 blue). By preschool age, children have acquired the skills necessary to determine when items are scarce (i.e., they can detect whether there is more or less of something compared to something else) and when sets are varied (i.e., they can detect when items differ vs. when they are the same) (Odic, Pietroski, Hunter, Lidz, & Halberda, 2013; Shipley & Shepperson, 2006).

Though scarcity and variety have received much attention in the adult literature, there is surprisingly little evidence on the use of these cues in childhood. In addition, prior work on scarcity with adults yields inconclusive results. Whereas some reports suggest that scarce items have inherent value due to their scarcity (e.g., Brock, 1968; Cialdini, 2008; Lynn, 1991; Mittone & Savadori, 2009) other reports suggest that scarce items are valued only under certain market conditions (e.g., when they are scarce because they were popular and thus sold well) (e.g., Verhallen & Robben, 1994; Worchel, Lee, & Adewole, 1975). These mixed results may reflect the fact that scarcity can signal both added value and a lack of value (e.g., at the grocery store, truffles are scarce and expensive because they are difficult to produce; beets may be similarly

scarce, but due to low demand, and thus are priced much lower). Contrastingly, prior work on variety shows that adults are motivated to obtain variety for the sake of doing so (e.g., McAlister & Pessemier, 1982; Kahn, 1995; Ratner, Kahn, Kahneman, 1999). Motivations to select variety for the sake of obtaining it include managing satiation (i.e., limiting boredom associated with an item; maximizing utility) and managing uncertainty (i.e., preparing for future unknown needs by diversifying selections) (Kahn, 1995; McAlister, 1982).

The present studies

The present studies examine children's use of scarcity and variety over development. Given the utility of variety, and the fact that variety is informative in and of itself, I predicted that preference for variety would emerge early in development, as evidenced by higher rates of selection and greater valuation of varied vs. non-varied sets of items. Contrastingly, given the relative uninformativeness of scarcity (e.g., scarcity can signal greater value when caused by high demand and thus supplies selling out, but it can signal lower value when caused by low demand and thus lower rates of production), I predicted that preference for scarcity would be lower or slower to develop, as evidenced by lower rates of selection and lower valuation of scarce vs. non-scarce items.

Across these dissertation studies, I focus on children 4-12 years of age, with added emphasis on children 6-9 years. This range captures children with and without schooling experience, where explicit instruction on economic issues may be formalized. For example, economic instruction begins in kindergarten in the state of Michigan (Michigan Department of Education, 2018). In addition, children across this range dramatically increase in their understanding of market forces such as supply and demand, which could influence use of variety and/or scarcity as cues to value. Adults are included as a comparison group to assess the nature

and stability of results across time. By taking a developmental approach to the study of scarcity and variety, the research reported in this dissertation has implications for the robustness of assumptions that have been made in the literature (e.g., that scarcity automatically confers higher value), and permits testing different theories for the patterns that have been obtained (e.g., motivations to select variety), most of which have so far been based on findings with adults. Much of the prior work on the use of scarcity and variety as cues to value focuses on how these cues influence adults' decision making. It is unclear whether children make use of these cues in similar ways, or whether use of these cues develops over time.

To test children's preferences for scarce and varied sets of items (Studies 1-3; Chapter 2), I asked children to select among sets each comprising two kinds of items differing in their relative availability. To limit the use of a priori preferences for certain features (e.g., color, size), items were unfamiliar and novel, and items within sets were the same color. In this way, I could better isolate the influence of scarcity (relative availability) and variety on selections for the self and others, and test whether scarce items and varied sets were selected more than non-scarce items and non-varied sets. Results revealed that children and adults showed a strong and consistent preference for varied sets, whereas they showed little to no preference for scarce items. These data are published in the *Journal of Experimental Child Psychology* (Echelbarger & Gelman, 2017).

Given the robust selection of variety observed in Studies 1-3, I further tested the strength and limits of this preference. In Studies 4-5 (Chapter 3), children indicated how much people would pay for different sets comprising the same items used in Studies 1-3. Requiring monetary valuations allowed me to directly assess value in a way not possible in Studies 1-3. In Study 6 (Chapter 3), I tested whether children would forego a preferred item to obtain a varied set. Study

6 offers an even stronger test of the variety preference because participants selected among consumable (food) items where additional units of the same item were likely to be devalued less than durable items (e.g., one can make use of multiple food items in a single sitting, whereas with durable items such as a cup, one can often use just one at a time). Thus, by using consumable items, I could test whether the results observed in Studies 1-3 extended to a different type of item (i.e., consumable vs. durable). Lastly, Study 7 (Chapter 3) served as a control study with adults, testing whether the order in which preference were elicited influenced variety selections.

As an interdisciplinary project—one bridging psychology, marketing, and behavioral sciences—this dissertation offers, to my knowledge, the first test of children's direct motivations to select scarce and varied sets of items (i.e., selections made for the sake of obtaining something scarce or varied, and not a consequence of some other factor, such as popularity). Taken together, results from these seven studies provide the first evidence that preference for variety emerges early (as early as 4-5 years), whereas preference for scarcity does not (at least when assessed via minimal context), and that this preference is associated with added monetary value in childhood. In addition, children's systematic use of variety, as observed across multiple contexts, offers at least one avenue by which they can determine item value, contributing to what we know about children and exchange. Contrastingly, children's relative inattention to scarcity suggests that the oft-made assumption that scarcity confers higher value is tenuous at best. Findings across all studies point to several exciting opportunities for future work.

Chapter 2: The Value of Variety and Scarcity Across Development

A fundamental task that children face is determining the value of items that they encounter. The ability to determine item value has implications for how much effort to devote toward obtaining or retaining an item, determining what constitutes a fair distribution of resources, and choosing whether or not to engage in disputes. It is thus important to understand how children determine item value, and specifically which cues they use at different points in development. Certainly for adults, value is influenced by numerous factors that reflect domain-specific knowledge, including an item's function (e.g., a functional clock has higher value than a broken clock), one's current needs and desires (e.g., a bottle of water has higher value when one is thirsty than when one is not), and market forces (e.g., a property has greater value when the housing market is on an upswing). Importantly, however, additional cues to value may be gleaned simply and straightforwardly from the distribution of items in a given context, even without consideration of domain-specific knowledge. Two such cues include variety and scarcity.

Variety refers to differences among items within a set. For example, a gift bag containing a keychain and a mug is more varied than one containing either two keychains or two mugs. Adults tend to seek out and prefer variety (e.g., Maimaran & Wheeler, 2008; Mittelman, Andrade, Chattopadhyay, & Brendl, 2014; Ratner et al., 1999; Read & Loewenstein, 1995; Simonson, 1990; see Kahn, 1995 for review), although there are different explanatory accounts of this preference. McAlister and Pessemier (1982) note that variety seeking can be a motivation

in and of itself (direct), or it can emerge as a result of some other motivation (derived). Direct motivations that have been proposed include a hedge against future uncertainty and utility maximization (Kahn, 1995). By obtaining varied items, we can better equip ourselves to manage future needs, which are by definition unknown. Furthermore, variety allows us to maximize utility (or "manage satiation"), in that repeated consumption of similar items can result in decreased utility for each subsequent item (Fishbach, Ratner, & Zhang, 2010; McAlister, 1982). Both hedging against uncertainty and utility maximization have clear evolutionary advantages and thus may be available from early in development.

Although a preference for variety is well-established in adults, much less is known about if/when this preference emerges in childhood. Previous work explored individual differences in variety seeking in the food domain (Nicklaus, Boggio, Chabanet, & Issanchou, 2005), finding that children use variety to guide their choices (Just, Lund, & Price, 2012; Roe, Meengs, Birch, & Rolls, 2013). However, previous work has not tested whether variety, in and of itself, is a preference. For example, although children are more likely to consume more varied snacks (e.g., apple, peach, pineapple) than uniform snacks (e.g., pineapple), this could reflect that varied snacks are more likely to include a more favored food. In other words, increased consumption in the context of variety may reflect the greater value of particular items (derived value) rather than a value placed on variety per se (direct value).

Scarcity refers to the relative infrequency of an item, whether or not it is unique (the only one of its kind). For example, if a set of prizes includes five keychains and one mug, the mug would be scarce and unique; if the set includes four keychains and two mugs, the mugs would be scarce but not unique. As with variety, a preference for scarcity could be derived or direct. Commodity theory suggests that scarcity has direct value: "any commodity will be valued to the

extent that it is scarce, unavailable, or difficult to attain" (Brock, 1968, p. 246). Some of the derived mechanisms that result in scarcity selections include a preference for unique (Snyder & Fromkin, 1980), popular (e.g., Verhallen 1982; Verhallen & Robben, 1994; Worchel et al., 1975), higher-priced (Lynn, 1991), or authentic items (Frazier, Gelman, Wilson, & Hood, 2009; Newman, Disendruck, & Bloom, 2011), as well as a desire to signal an owner's uniqueness or status (Gierl & Huettl, 2010). Although there is some evidence that direct motivations result in scarcity selections (e.g., adults in Worchel et al., 1975, preferred scarce cookies to abundant cookies; see Mittone & Savadori, 2009, for review), scarce items do not always receive greater value (Sehnert, Franks, Yap, & Higgins, 2014), and the strength of this preference is often weaker than derived motivations, such as the preference for popular items.

Although much less is known about children's use of scarcity, recent work found that children prefer scarce items under conditions that we would characterize as reflecting a derived motivation. For example, preschoolers prefer items with distinctive (rare) histories (Gelman, Frazier, Noles, Manczak, & Stilwell, 2015) and prefer to allocate rare (scarce) items to preferred puppets (although scarcity was confounded with variety) (Chernyak & Sobel, 2016). We are aware of only one study demonstrating a direct motivation for scarcity in children: namely, preschoolers preferred the scarce choice when the two types of items in a set were visually distinct from one another (e.g., red vs. green apples), although not when they were visually similar (e.g., two similar kinds of crackers; the authors term this a "visual minority effect"; Maimaran & Salant, 2016). Interestingly, this scarcity preference was obtained in preschoolers but not adults. Altogether, then, there is intriguing initial evidence that children may use scarcity to guide their valuations and choices, although the breadth and consistency of this preference is unknown.

Present Research

The present research is designed to examine whether and when children prefer scarcity and variety, with adults as a comparison group. As noted earlier, it is important to explore which principles guide valuations and to determine when preferences for different items emerge. By doing so, we can know better what is most basic in human choice behaviors, and ultimately, economic judgments. We focus on direct motivations for variety and scarcity, rather than derived motivations—that is, a preference for variety and/or scarcity per se, unconfounded with other factors. Therefore, we provide a simple choice, asking participants to view sets of novel items, consisting of two different kinds of items in sets of six. In the Scarcity task, participants had an opportunity to select either a scarce item or an abundant item; in the Variety task, participants had an opportunity to select either two varied items, or two non-varied items. On both tasks, all items were unfamiliar in order to limit pre-existing preferences or real-world knowledge. Further, we provided no additional information about the items (including their identity, function, or origins), their distribution (no reasons were provided or even implied for why some items were more or less scarce), or the context of the selection (neither scarcity nor variety were highlighted in any way).

The sparse nature of this task has the advantage of allowing us to test whether the relative availability of the items per se influences participants' choice behavior. In order to understand how different cues are weighted, and how different cues uniquely influence decisions, we must first understand how they are used independent of each other. Prior work, particularly as it relates to scarcity, typically either confounded these preferences or included additional cues which may have accounted for the results. Thus, we opted for the current design using novel items. At the same time, this raises the important question of whether, and if so how, the present

results would extend to more complex, real-world settings. In the General Discussion we return to this point.

We manipulated the relative availability of each of the two types of items in each set by including three ratios: 5:1, 4:2, and 3:3. For the Scarcity task, 5:1 trials provide one uniquely scarce item, 4:2 trials provide two scarce items but no uniquely scarce item, and 3:3 trials do not permit a test of scarcity (as there are no scarce items). For the Variety task, 5:1 trials permit participants to select either varied or non-varied items, when selecting variety includes selecting the scarce item. For 4:2 trials, participants can again select varied or non-varied items; however, selecting non-variety could include either two scarce items or two abundant items. Finally, for 3:3 trials, participants can select varied or non-varied items, and there is no scarce item. Thus, across these three ratios, we are able to examine preferences for uniquely scarce items (5:1), scarce items more generally (4:2), and variety (5:1, 4:2, and 3:3). Importantly, by including 3:3 trials in the Variety task, we are able to deconfound any preference for variety that may be due to a scarcity preference (e.g., variety selection in the 5:1 case could in actuality be due to a scarcity preference), as no scarce item is present during these trials.

Predictions

Both variety and scarcity may signal item value to young children. First, both cues are readily gleaned from simply observing sets of items, even wholly novel items. Second, prior research demonstrates that by preschool age, children are capable of detecting both relative quantity (scarcity) and degree of similarity (variety), when considering sets of items (Odic et al., 2013; Shipley, & Shepperson, 2006). Third, neither cue incorporates contextual influences like market forces, which can be difficult for young children to understand (Leiser & Halachmi, 2006; Siegler & Thompson, 1998; Thompson & Siegler, 2000). However, despite the availability

of these cues early in development, we posit that variety and scarcity may function quite differently from one another.

Variety is hypothesized to be a powerful cue even early in childhood, given arguments concerning adults' motivations for selecting variety (i.e., hedging against uncertainty, managing satiation), and the clear evolutionary advantages associated with those motivations. In contrast, we hypothesized that scarcity, in and of itself, would not signal value to young children. Our basic reasoning is that the meaning of scarcity is highly variable, depending on its underlying cause. Although scarcity signals positive value in many contexts (e.g., popular goods may be bought faster and thus become scarce), scarcity can also signal *lack* of value (e.g., less desirable items may be less often produced and thus be scarce), or even no relation to value (e.g., a store may have accidentally ordered more of one kind of pencil than another, yielding differences in quantity but no differences in value). Thus, although high-value items may be scarce (e.g., the first edition of a Shakespeare folio), it is also the case that high-value items may be abundant (e.g., there are many more copies of *Meet the Beatles* than there are of *Paris*, Paris Hilton's debut studio album).

In Study 1, we explicitly tested whether children (in age groups ranging from 4-12 years) and adults prefer scarcity and variety. If participants view scarce items as more valuable than non-scarce items, then they should select scarce items for themselves significantly above chance. Similarly, if participants view varied items as more valuable than non-varied items, they should select varied items for themselves significantly above chance. If a preference for variety is foundational and early emerging, whereas a preference for scarcity is more context-dependent, then across participants, variety should be selected at a higher rate than scarcity. In Study 2, participants selected items for both themselves and someone else. By introducing another

(unknown) recipient, we reasoned that the context would prompt participants to engage in social comparison (Sheskin, Bloom, & Wynn, 2014; Steinbeis & Singer, 2012) and thus maximize benefits for themselves at the expense of others. Consequently, we expected that in Study 2, selections based on scarcity and variety would increase. Finally, Study 3 serves as a control condition for Study 2, by testing whether children and adults prefer scarcity and variety for someone else, without the social comparison. Exploring preferences for scarcity and variety in this way will inform our understanding of how children evaluate the value of items around them.

STUDY 1

Methods

Participants

Participants included 97 children 4 to 12 years of age, subdivided into four age groups: 4-5 years (n = 24, M = 4.95 years, SD = 0.55 years, 12 females, 12 males), 6-7 years (n = 28, M = 7.08 years, SD = 0.55 years, 18 females, 10 males), 8-9 years (n = 24, M = 8.89 years, SD = 0.59 years, 12 females, 12 males), and 10-12 years (n = 21, M = 11.24 years, SD = 0.73 years, 12 females, 9 males). According to parent report, the majority of children were White (85%). Participants also included 48 adults (M = 35 years, SD = 10 years, 28 females, 20 males; 85% White). Sixteen additional children 3-5 years of age (M = 3.96 years, SD = 0.70 years, 6 females, 10 males) participated in a pretest only. An additional 3 children were excluded due to experimenter error. Two adults were excluded for failing attentional control trials.

Children were recruited and tested in a lab space at a local museum and library in the Midwest United States. Adults were recruited through Amazon Mechanical Turk (MTurk). To be eligible to participate, adult MTurk workers must have obtained “Master Worker” status, have had an approval rating greater than or equal to 95, have completed at least 1000 approved tasks,

and have been located in the United States. All children received a small thank-you gift for participating. Adults were compensated $0.50, a competitive rate for a task of this length.

Materials

Materials included photographs of 24 novel items taken from the Novel Objects and Unusual Names Database (Horst & Hout, 2016). Although novel, these items were photographs of actual objects (including a variety of tools, toys, and other artifacts). In addition, 16 familiar items (e.g., piggy bank, bucket, umbrella) were used in the warm-up, taken from online image sources (Brady, Konkle, Alvarez, & Olivia, 2008, 2013). Novel items were divided into 12 pairs. Items within pairs were edited to be the same color, to avoid selections based on a preference for a particular color; six colors were used across the 12 pairs (red, orange, yellow, green, blue, purple). The familiar items were used in four warm-up trials.

Because the study included displaying items in a matrix, we pretested two orientations to determine if a 2x3 matrix or a 1x6 matrix would be easier for children to scan for relative numerosity. Specifically, children were asked to indicate which item in each set was more frequent ("Are there more Xs or Os, or are there the same?") for the ratios 5:1 and 4:2. Children were slightly, though non-significantly, more accurate on 2x3 matrices than 1x6 matrices (87.50% vs. 82.80%; $t[15] = 1.86$, $p = .083$). We thus used the 2x3 matrix for all item sets. Pictures of objects were affixed to laminated pages using Velcro®. Each experimental trial included six total tokens of two novel items types (i.e., each page had six pictures total; see Figure 1).

Design

Participants selected either one or two items per trial for themselves, in counterbalanced blocks. Within each block, participants saw two trials each of the following ratios: 5:1, 4:2, 3:3.

Trials within blocks were randomized using pre-generated orders (Excel RAND function). The presentation of item pairs in each ratio was counterbalanced such that, across participants, item pairs appeared equally in each block and each ratio (e.g., 5A:1B, 1A:5B, 4A:2B, 2A:4B, 3A:3B, 3B:3A, where A and B are different item types). The location of scarce items was counterbalanced across item pairs. Scarce items appeared in either the upper right hand or lower left hand corners of the matrices, in order to make it easier for participants to detect them (once in each location per ratio per block, as depicted in Figure 1). Note that when selecting one item, it was not possible to select a scarce item during 3:3 trials, and thus they were not analyzed. However, we included such trials to make the sets of items identical across conditions and studies.

Procedure

Children. After receiving parental consent and providing verbal assent, each child met with an experimenter individually and was told that they were going to look at some pictures and make some choices. Children were instructed to choose one or two items (depending on the block) for themselves and place them in the bowl: "Choose one thing that you would like for yourself" or "Choose two things that you would like for yourself." This required children to detach the pictures from the pages in the book (as pictures were attached by Velcro®). Children were corrected if they selected the wrong number of items but otherwise received no feedback, on either warm-up or test trials.

Children first completed two warm-up trials to ensure that they were comfortable selecting the number of items required, and were comfortable leaving items unselected. During warm-up trials, the number of pictures affixed to each page differed depending on the number of items being selected in that particular block. When selecting one item, three familiar items were

affixed to each warm-up page (two trials total); when selecting two items, five familiar items were affixed to each warm-up page (two trials total). Items were placed in a collection bowl situated near the child.

Following the warm-up, children received 12 trials, 6 per block. The locations of each choice were recorded to determine which items were chosen.

Adults. Adults completed an electronic survey analogous to that which children received, using the same items, pairs, and orientations. Although adults were not required to complete warm-up trials, they were required to successfully answer two attention trials (e.g., select the letter P).

Results

The analyses examined whether and when children and adults preferred scarcity and variety. One set of analyses examined scarcity and variety for 5:1 and 4:2 trials. The 3:3 trials were assessed separately to determine whether any preference for variety extended to contexts where no scarce item was present. This was important to test, because in the 5:1 and 4:2 trials, selections of a varied set may reflect a preference for the scarce item. For each participant, we counted the number of trials that a scarce item was chosen during 5:1 and 4:2 trials when selecting one item, and the number of trials that varied items were selected (one of each item type) during 5:1, 4:2, and 3:3 trials when selecting two items. For each ratio, there were two trials, and thus two opportunities to choose scarce or varied items. Scores for each trial-type ranged from 0 to 2. Once scores were tallied, we calculated proportions for each ratio in each condition (range: 0-1).

Scarcity and Variety Compared Directly

We conducted a repeated measures ANOVA with ratio (5:1, 4:2) and task (Scarcity,

Variety) as the within-participants factors, and age group (4-5, 6-7, 8-9, 10-12, Adults) as the between-participants factor. This analysis yielded main effects of task, $F(1, 140) = 88.88$, $p < .001$, $\eta_p^2 = .39$, and ratio, $F(1, 140) = 11.38$, $p = .001$, $\eta_p^2 = .08$. However, these main effects are interpreted in the context of two interactions that emerged: task × age group, $F(4, 140) = 4.08$, $p = .004$, $\eta_p^2 = .10$, and ratio × age group, $F(4, 140) = 2.64$, $p = .036$, $\eta_p^2 = .07$. Overall, participants selected varied sets (.80) more than scarce items (.52). A Bonferroni correction for multiple comparisons was used for each post-hoc analysis, resulting in a more stringent alpha level of .01 (.05/5 age groups). Post-hoc analyses revealed that this difference reached significance for children 6-7 years (.94 vs. .51), children 8-9 years (.80 vs. .49), and Adults (.85 vs. .47) (ps < .001), but not for children 4-5 years (.64 vs. .50) or 10-12 years (.76 vs. .62) (ps = .054 and .057, respectively). Further, scarce and varied items were selected more during 5:1 trials (.70) than 4:2 trials (.62); however, post-hoc analyses revealed that this ratio difference only reached significance for children 10-12 years (.81 vs. .57; $p < .001$).

We next explored at what ages participants' selection of scarce and varied items significantly differed from chance. Given the task × age group interaction, and given that chance comparisons differ by ratio (see below), we tested selections against chance by ratio, task, and age group. Given the structure of the task as a choice between two types (A or B), with no variation among the individual items within each type, we calculated chance on a type-level basis.[1] Alpha levels were set to .01 to account for multiple comparisons.

[1] Chance could be calculated in either of two ways, depending on whether we assume that participants viewed their choices as between two types (A or B) or as between six individual items (e.g., A_1, A_2, A_3, A_4, A_5, B_1). We adopted the type-level analysis, as it takes into account the structure of the task (presenting a choice between two types of items, with no individual variation within each type). Generally, the type-level analysis provides a more conservative test of whether participants' selections are above-chance, so that we can be confident in drawing conclusions about above-chance performance, if found. Additionally, in an unpublished study with children 4-9 years of age (Echelbarger & Gelman, 2016), we presented a test of scarcity that controlled for chance level by presenting children on each trial with the same stimuli that were used in the present Study 1, but then asking children to identify which of two items from each set (one of each item-type) people would pay more for. This

For 5:1 selections, chance was calculated as .50. Participants did not select scarce items significantly above chance with the exception of children 10-12 years ($p < .001$). Contrastingly, participants selected varied items significantly above chance in four of the five age groups (ps < .001); the one exception was children 4-5 years ($p = .026$). Selections during 4:2 trials were tested against .50 (scarcity) and .33 (variety). Participants did not select scarce items significantly above chance; however, varied items were selected significantly above chance in all age groups (all ps < .005) (see Figures 2 and 3). In the Discussion we consider how to interpret these distinct patterns.

Variety in the Absence of Scarcity

We next tested whether the preference for variety extended to contexts where scarce items were not present. We conducted an ANOVA with age group (4-5, 6-7, 8-9, 10-12, Adults) as the between-participants factor, and no age differences were found. Participants selected varied items significantly above chance (.33), all ps < .001 (see Figure 3).

Discussion

The results of Study 1 support our hypothesis that variety, but not scarcity, is a foundational preference. First, and most importantly, when the two strategies were compared directly to one another, variety preferences were overall elicited at a significantly higher rate than scarcity preferences. All ages showed this tendency, which was statistically significant among 6- to 7-year-olds, 8- to 9-year-olds, and adults. Furthermore, variety was generally above-chance, whereas scarcity was rarely above-chance.

Thus, despite the value of scarcity in many contexts, when items were wholly unfamiliar

method equates the type-level and individual-level calculations of chance, such that from either perspective chance is 50%. Analyses revealed that irrespective of ratio, children's choices hovered around 50%—consistent with the findings reported in the present study (comparisons to chance for all ps > .25). We conclude, therefore, that chance-rate responding on this task was not an artifact of focusing on type-level vs. individual-level analyses.

and reasons for the scarcity were not provided, scarcity by itself was not a reliable cue used consistently by children or adults when selecting objects. The lack of a scarcity effect cannot be due to children not noticing the difference between the items as, in contrast, both children and adults preferred varied to non-varied items. This preference emerged irrespective of the relative availability of the two items, demonstrating that the preference for variety did not reduce to a scarcity selection. The early emergence of this preference demonstrates that variety is preferred even in the absence of knowledge about the items themselves. Ratio did emerge as a relevant factor, as participants selected scarce items and varied sets more when an item was maximally scarce (during 5:1 trials); however, ratio was not used consistently by all age groups.

STUDY 2

One potential limitation of Study 1 was that participants were asked to select items only for themselves. It is therefore possible that the lack of consistent scarcity preference was due to the absence of any motivation to do otherwise. In the absence of others, people may be less motivated to select based on scarcity, because items can conceivably be chosen at any time (Cialdini, 2008). In other words, the open-ended selection context may have led participants to downplay the importance of the relative availability of items, instead encouraging them to focus on items' distinctive attributes (e.g., shape, parts, possible function). In contrast, when others are involved, people may be more motivated to select scarce items before others are able to do so. Relatedly, when others are present, people may engage in social comparison, and thus be motivated to compare their choices to those of another person, a process that could heighten attention to the relative availability of items. For both these reasons, we predicted that requiring participants to select items for themselves and someone else might result in increased attention to the relative availability of items. This process may differentially prime scarcity, such that scarce

items become more valuable and/or desirable. Accordingly, in Study 2, we tested whether selections change when participants make choices both for themselves and for another person such that they select scarce and varied items more for themselves to ensure that they are better off than the other person.

Methods

Participants

Participants included 96 children aged 4 to 12 years, subdivided into four age groups: 4-5 years (n = 24, M = 5.03 years, SD = 0.52 years, 16 females, 8 males), 6-7 years (n = 26, M = 7.09 years, SD = 0.63 years, 9 females, 17 males), 8-9 years (n = 24, M = 8.92 years, SD = 0.58 years, 13 females, 11 males), and 10-12 years (n = 22, M = 11.35 years, SD = 0.94 years, 14 females, 8 males). Based on parent report, the majority of children were White (73%). Participants also included 49 adults (M = 39 years, SD = 12 years, 27 females, 22 males; 94% White). An additional 2 children were excluded: one for being too old (experimenter error) and another for not understanding the task. Six adults were excluded for failing attentional control trials, and one for not finishing the task. Children were recruited and tested in a lab space at a local museum and at an after-school program in the Midwest United States. Adults were recruited through MTurk, using the same criteria as in Study 1. All children received a small thank-you gift for participating. Adults were compensated $1.00, since the task was longer than that in Study 1.

Materials

The same materials from Study 1 were used, with one exception: two collection bowls (rather than one) were situated near children.

Design

Participants selected one or two items per individual, in counterbalanced blocks. On each

trial, participants selected items for themselves (Self) and someone else (Other). The order in which items were selected (i.e., Self-first vs. Other-first) was also counterbalanced across participants.

Procedure

For children, the procedure was the same as in Study 1 with one exception: children heard, “Choose one thing that you would like for yourself (someone else) and one thing that you would like for someone else (yourself)” and “Choose two things that you would like for yourself (someone else) and two things that you would like for someone else (yourself).” Children did not receive any information about “someone else” and did not receive any feedback on their selections. Adults completed an electronic survey analogous to that children received, using the same items, pairs, and orientations.

Results

The analyses examined participants' selection of scarcity and variety for themselves (Self) and someone else (Other). As before, scarcity and variety were assessed jointly for 5:1 and 4:2 trials, and 3:3 trials were assessed separately. For each participant, we counted the number of trials that a scarce item was chosen during 5:1 and 4:2 trials when selecting one item for each recipient, and the number of trials that varied items were selected (one of each item type) during 5:1, 4:2, and 3:3 trials when selecting two items for each recipient. For each ratio, there were two trials, and thus two opportunities to choose scarce or varied items. Scores for each trial-type ranged from 0 to 2. Note, however, that during 5:1 trials, it was not possible to select a scarce item for both recipients on the same trial. Once scores were tallied, we calculated proportions for each ratio in each condition (range: 0-1).

Scarcity and Variety Compared Directly

We conducted a repeated measures ANOVA with recipient (Self, Other), ratio (5:1, 4:2), and task (Scarcity, Variety) as the within-participants factors and age group (4-5, 6-7, 8-9, 10-12, Adults) and order (Self-first vs. Other-first) as the between-participants factors. This ANOVA yielded main effects of task, $F(1, 135) = 130.20$, $p < .001$, $\eta_p^2 = .49$, ratio, $F(1, 135) = 115.64$, $p < .001$, $\eta_p^2 = .46$, and recipient, $F(1, 135) = 15.87$, $p < .001$, $\eta_p^2 = .11$. These main effects are interpreted within the context of several interactions: task × age group, $F(4, 135) = 6.19$, $p < .001$, $\eta_p^2 = .16$, task × ratio, $F(1, 135) = 37.22$, $p < .001$, $\eta_p^2 = .22$, ratio × age group, $F(4, 135) = 2.59$, $p = .040$, $\eta_p^2 = .07$, and ratio × recipient, $F(1, 135) = 13.39$, $p < .001$, $\eta_p^2 = .09$. First, as in Study 1, participants selected varied sets (.62) more than scarce items (.44). A Bonferroni correction for multiple comparisons was used for each post-hoc analysis, resulting in a more stringent alpha level of .01 (.05/5 age groups). Post-hoc analyses revealed that this difference reached significance for all age groups except the youngest children (4-5 years) (all other *p*s < .001). Second, as predicted, scarce items and varied sets were selected for the Self (.59) more than Other (.48), though this was found only during 5:1 trials (.53 vs. .33) ($p < .001$). Thus, when items are maximally scarce, children and adults prefer to select them for themselves, rather than for someone else. Third, varied sets and scarce items were selected more during 4:2 trials (.64) than 5:1 trials (.43), which was expected given that varied sets and scarce items could only be selected for one recipient during 5:1 trials. This result also indicates that when scarce and varied items are available to select for both recipients, participants did just that. We also found that children 6-7 years (.48) and 8-9 years (.46) selected more scarce items and varied sets than adults (.38) during 5:1 trials (*p*s < .01). Finally, the task × ratio interaction revealed that the difference in selections of scarce items vs. varied items was greater during 4:2 trials (.49 vs. .78) than 5:1 trials (.39 vs. .47), again because scarce items and varied sets could only be selected for one

person during each 5:1 trial (see Figures 4 and 5).

As before, we were interested in the ages at which children selected varied and/or scarce items significantly above chance for themselves and someone else. In order to conduct comparisons to chance, we focused on the first trial per item set (either self or other), as it is the only on the first trial that chance levels are equivalent across items and conditions. That is, in order to test whether selections of scarce items were significantly above chance, we separately tested selections to the self first and someone else first. As in Study 1, we tested selections against chance by ratio, type, age group, and recipient. Comparisons to chance were based on types not individuals (see Footnote 1). Thus, scarcity selections were tested against .50 and variety selections were tested against .50 (5:1) and .33 (4:2). Alpha levels were set to .01 to account for multiple comparisons.

Consistent with results from Study 1, children and adults selected scarce items at chance with only one exception: when selecting items for someone else during 5:1 trials, adults selected scarce items significantly *below* chance ($p = .009$). Turning to variety selections, children and adults selected varied items at chance during 5:1 trials (when only one recipient can obtain variety) with only two exceptions: when selecting for themselves, children 6-7 years selected varied items significantly above chance ($p = .006$), and when selecting for someone else, adults selected varied items significantly below chance ($p < .001$). Finally, when selecting on 4:2 trials, children 6-12 years and adults selected varied items for themselves and someone else significantly above chance (all ps $< .02$); however, children 4-5 years did not.

Variety in the Absence of Scarcity

In order to assess variety preference in the absence of scarcity, we conducted a repeated measures ANOVA with recipient (Self, Other) as the within-participants factor and age group (4-

5, 6-7, 8-9, 10-12, Adults) and order (Self-first vs. Other-first) as the between-participants factors. This ANOVA yielded a main effect of age group, $F(4.\ 135) = 9.07$, $p < .001$, $\eta_p^2 = .21$, and two interactions: recipient × order, $F(1, 135) = 10.84$, $p = .001$, $\eta_p^2 = .07$, and recipient × age group × order, $F(4, 135) = 3.03$, $p = .02$, $\eta_p^2 = .08$. The results are interpreted within the context of the three-way interaction, and post-hoc analyses (Bonferroni-corrected using an adjusted alpha level of .01) revealed that when selecting items for someone else first, the children 6-7 years selected more scarce items and varied sets for themselves than they did for someone else ($p = .005$) (see Figure 5). When testing against chance (.33), we found that children 6-12 years and adults selected varied items significantly above chance (ps < .01) with one exception: children 6-7 years did not select varied sets for someone else significantly above chance ($p = .014$). As before, children 4-5 years did not select varied items significantly above chance.

Discussion

Results from Study 2 suggest that social comparison did increase the desirability of maximally scarce items, but that scarcity per se was still at best only weakly preferred. Moreover, adults were actually averse to selecting scarce items for someone else, doing so significantly below chance. Nonetheless, even under these comparative conditions, the scarce item was never selected for the self above chance. During 4:2 trials, when there were two scarce items and thus participants were able to select scarce items for both themselves and someone else, we obtained no self-other differences, with selection of the scarce item at chance levels for both children and adults (with the few noted exceptions). In summary, scarcity did become more salient under conditions of social comparison, when participants were forced to select only one person to receive the scarce item (5:1 trials).

Contrastingly, both adults and children consistently selected variety more for themselves

than for someone else when one of the items was maximally scarce (during 5:1 trials). However, when able to select variety for both themselves and someone else (during 4:2 and 3:3 trials), children 6-12 years and adults tended to do just that, at similarly high levels. Further, when comparing selections against chance, we found that children 6-12 years and adults consistently selected varied items for themselves above chance, and consistently selected varied items for others when items were not maximally scarce (4:2 and 3:3 trials). Children 4-5 years did not consistently select varied items significantly above chance, even when able to do so for both recipients, perhaps reflecting the greater information-processing demands of a task that required children to make four selections per trial.

STUDY 3

In Study 1, participants selected items for only themselves, and in Study 2, participants selected items for themselves and someone else. As reported above, the context of Study 2 led to relatively higher selections of scarcity and variety for self than for other. However, in order to determine whether it was social comparison (self *vs.* other) that yielded higher rates of selection, it is also important to conduct a baseline study to determine the rates at which scarce and varied items are assigned to the self *or* other (i.e., in the absence of social comparison). Specifically, such a comparison is needed to determine whether social comparison per se yielded such effects, or if instead the effects reflect differences in making choices for these different recipients. This was the purpose of Study 3, in which participants were asked to select items for someone other than themselves only. If the self-other differences in Study 2 were the result of social comparison increasing attention to scarcity and variety, then the self-other differences in Study 2 should not be replicated when comparing responses to the self (from Study 1) to responses to other (from Study 3). In contrast, if it simply is the case that participants avoid allocating scarce and varied

items to someone other than themselves, then a comparison of Study 1 results to Study 3 results should reveal significant self-other differences even in the absence of direct social comparison.

Methods

Participants

Participants included 96 children aged 4 to 12 years, subdivided into four age groups: 4-5 years (n = 25, M = 4.97 years, SD = 0.52 years, 10 females, 15 males), 6-7 years (n = 25, M = 6.85 years, SD = 0.49 years, 14 females, 11 males), 8-9 years (n = 24, M = 8.99 years, SD = 0.63 years, 12 females, 12 males), and 10-12 years (n = 22, M = 11.09 years, SD = 0.74 years, 12 females, 10 males). Participants also included 51 adults (M = 40 years, SD = 12 years, 31 females, 20 males). An additional 21 children were excluded: 7 due to experimenter error, 10 due to a gender imbalance, and 4 for other reasons including: attentional issues, observing other children complete the task, and parental interference. Eight adults were excluded: 2 due to experimenter error, 2 for failing attentional control trials, and 4 for not finishing the task. Children were recruited and tested in a lab space at a local museum and at an after-school program in the Midwest. Adults were recruited through MTurk, using the same criteria as Study 1. All children received a small thank-you gift for participating. Adults were compensated $0.50, a competitive rate.

Materials

The same materials from Study 1 were used.

Design

The design followed that from Study 1 with one exception: participants selected one or two items for someone else (Other), and not for the self.

Procedure

For children, the procedure was the same as in Study 1 with one exception: children heard, “Choose one thing that you would like for someone else” or “Choose two things that you would like for someone else.” As in Study 2, children did not receive any information about “someone else” and did not receive any feedback on their selections. Adults completed an electronic survey analogous to that children received, using the same items, pairs, and orientations.

Results

The analyses examined participants’ selections for someone else based on scarcity and variety, with a primary focus on how performance in Study 3 compared to that of Study 1. Scarcity and variety were assessed jointly for 5:1 and 4:2 trials. However, 3:3 trials were assessed separately as before. For each participant, we counted the number of trials that a scarce item was chosen during 5:1 and 4:2 trials when selecting one item, and the number of trials that varied items were selected (one of each item type) during 5:1, 4:2, and 3:3 trials when selecting two items. For each ratio, there were two trials, and thus two opportunities to choose scarce or varied items. Scores for each trial-type ranged from 0 to 2. Once scores were tallied, we calculated proportions for each ratio in each condition (range: 0-1).

Scarcity and Variety Compared Directly

We conducted a repeated measures ANOVA with ratio (5:1, 4:2) and type (Scarcity, Variety) as the within-participants factors, and age group (4-5, 6-7, 8-9, 10-12, Adults) as the between-participants factor. This analysis yielded a main effect of task, $F(1, 142) = 138.00$, $p < .001$, $\eta_p^2 = .49$. Participants selected varied items (.82) more than scarce items (.48). No other significant factors emerged.

We next explored at what ages children selected varied and/or scarce items significantly above chance. As before, we tested selections against chance by ratio, type, and age group. Also as before, scarcity selections were tested against .50 and variety selections were tested against .50 (5:1) and .33 (4:2), and our alpha level was set to .01. Participants did not select scarce items significantly above chance; however, varied items were selected above chance for each ratio and age group (all *p*s ≤ .001) (see Figures 2 and 3).

Variety in the Absence of Scarcity

As before, we conducted an ANOVA with age group (4-5, 6-7, 8-9, 10-12, Adults) as the between-participants factor. There was no effect of age and varied sets were selected above chance within each age group (.33; all *p*s < .001; see Figure 3).

Study 1 vs. Study 3

Finally, we tested whether there was any effect of recipient across the two studies. That is, we tested whether the proportion of scarce and varied items selected for the self (Study 1) *or* other (Study 3) differed for any ratio. To do so, we assessed 5:1 and 4:2 trials jointly, and assessed 3:3 trials separately as above with age group (4-5, 6-7, 8-9, 10-12, Adults) and study (Self vs. Other) as the between-participants factors. These analyses yielded no significant effects or interactions involving study.

Discussion

The purpose of Study 3 was to examine participants' use of scarcity and variety when selecting items for someone else, and to compare those selections to those made for the self in Study 1. Results indicated no effect of study, for either scarcity or variety. That is, in the absence of social comparison, children and adults selected scarce and varied items for themselves and someone else at comparable levels. This contrasts with the self-other differences obtained in

Study 2. In Study 2, when self and other were in conflict for either the scarce item or a varied set of items, selections of scarcity and variety were higher for self than other when items were maximally scarce. Thus, the results of Study 3 indicate that self-other differences observed in Study 2 were due to social comparison, which increases attention to scarcity and variety.

General Discussion

The purpose of this research was to determine whether and when children and adults prefer variety and scarcity. By asking participants to select from arrays of novel items, and providing no information about the items other than their relative availability, we were able to test whether they have a direct preference for varied and scarce items, above and beyond features of the objects themselves. We predicted that children and adults would prefer varied sets of items, given the benefits associated with obtaining variety (i.e., hedging against uncertainty and managing satiation). In contrast, we predicted that children and adults would less often use scarcity, as scarcity itself does not necessarily signal higher value (e.g., a scarce item can be scarce due to popularity or low demand). Both of our predictions were largely supported. Overall, the results indicated a robust and consistent preference for variety across different ratios and different selection contexts in children and adults. In contrast, we found little support for a direct scarcity preference at any age. To our knowledge, these data are the first to demonstrate that children make use of variety to guide their selections of items, and that scarcity is relatively less often used. Importantly, this result does not reflect an inability on the part of young children to differentially select items of greater perceived value to the self. Children's distribution of items reflects the value they place on such items (e.g., Blake & Rand, 2010). Rather, the result indicates that scarcity per se does not have intrinsic value, at least in the contexts studied here.

Additionally, we also obtained evidence regarding the influence of multiple recipients in

the preference for scarcity and variety. When participants were required to select items for themselves and someone else (Study 2), self-other differences did emerge for both scarcity and variety when items were maximally scarce (the 5:1 ratio). Specifically, participants selected scarce items for themselves more than they did for someone else. This was the only condition in which scarcity emerged as a preference. However, given that adults who selected for themselves first did not select scarce items above chance, but those who selected for someone else first selected scarce items for that other person significantly below chance, it may be that there is a stronger aversion to giving away scarce items than there is a preference for choosing scarce items. Such a result is consistent with motivations to ensure that others do not obtain more than we do, even if it comes at a cost to us. Nonetheless, the influence of uniquely scarce items requires further attention, as based on our analyses, they are treated differently than non-uniquely scarce items (e.g., scarce items during 4:2 trials).

Turning to the effect of multiple recipients on variety, we found that both adults and children selected varied items for themselves more than they did for someone else when only one recipient could obtain variety (the 5:1 ratio). In contrast, when not in the context of multiple recipients—that is, when participants were asked to select items for a single recipient (Studies 1 and 3)—we found no differences in selections made to the self or someone else, for either scarcity or variety. The inclusion of another recipient also appears to increase attention to scarcity, resulting in increased selections of scarce items for the self ("profit maximizing") or decreased selections of scarce items for another ("profit minimizing"). We speculate that this effect may be stronger in the context of different kinds of goods, given that 6- to 8-year-old children prioritize different features when distributing luxuries vs. necessities to others (Rizzo, Elenbaas, Cooley, & Killen, 2016). For example, children may be more inclined to give away a

scarce necessity to someone in need, as compared to giving away a scarce luxury that is not needed.

These data indicate that scarcity is not a simple context-free cue to object value; on this task, scarcity without context has little value to either children or adults. Interpreting the results in this way supports the notion that a preference for scarce items may typically result from one or more derived mechanisms (e.g., uniqueness, popularity, authenticity). For example, Sharma and Alter (2014) showed that adults who viewed themselves as less financially well off sought scarce items more than adults who viewed themselves as more financially well off, particularly when the items were less available to others. Similarly, in a meta-analysis conducted by Lynn (1991), a greater psychological need for uniqueness was associated with greater valuations of scarce items. Finally, adults are sensitive to the reasons why an item was scarce. For example, Verhallen and Robben (1994) found that an item that was scarce because it was popular was preferred to an item that was scarce due to accidental loss. As another example, Gierl and Huettl (2010) found that the value of scarce items was an interaction of the reasons for the scarcity—low supply vs. high demand—and whether or not the product was used for conspicuous consumption. Thus, future work should manipulate the reasons that items are scarce to determine if children are similarly sensitive to these reasons and whether they influence children's valuations of scarce and non-scarce items.

One could argue that perhaps we did not observe a scarcity preference because items within pairs were the same color. Recall that this design decision was based on a wish to minimize children's selections based on a preference for a particular color. Nonetheless, we conducted a supplementary experiment with 49 adults (M = 34 years) to determine if they would be more sensitive to scarcity when items differed by color rather than shape. Using the same

design as the Self condition of Study 1 and a subset of the novel items, we found that adults, again, did not prefer scarce items for themselves during either 5:1 (M = .56) or 4:2 trials (M = .48).

One could also argue that we did not observe a scarcity preference because the sparse nature of the task was too far removed from the realities of actual selection contexts (though note that children encounter similar sorts of object displays when selecting a prize at a carnival, dentist office, or developmental psychology laboratory). Recall that the purpose of the research was to assess whether varied and scarce items were selected for the simple sake of obtaining varied and scarce items. It would have been difficult to assess whether these cues were used independent of other factors had we provided participants with more information concerning the items (e.g., function, value) or their relative distributions (e.g., one was more popular than the other). In spite of this, we still observed a strong effect of variety, which is consistent with our prediction that a variety preference is early emerging and people are directly motivated to obtain it. The relative lack of a scarcity preference suggests that scarcity itself is not used consistently with minimal context; however, this does not preclude scarcity being consistently used in other contexts.

The present findings do not suggest that children fail to use scarcity to make decisions or economic judgments; indeed, prior evidence demonstrates otherwise. Rather, our findings suggest that they rarely use it as a preference in and of itself. For example, in a study conducted by Hay and colleagues, 2-year-olds were sensitive to the relative availability of toys, as evidenced by their increase in sharing when duplicate toys were available (Hay, Caplan, Castle, & Stimson, 1991). Kenward and Dahl (2011) also found that at 4.5 years, children prefer to distribute more items to a helping puppet rather than a hindering puppet when items were not

plentiful. We also know that children attend to the quality of items when making decisions concerning how to distribute them. For example, Blake and Rand (2010) showed that by 3 to 6 years, children allocate stickers of higher value differently than stickers of lower value, and Shaw and Olson (2013) showed that children 6 to 8 years consider item value when rectifying inequalities. In a more recent study, Chernyak and Sobel (2016) demonstrated that preschoolers allocate stickers differently depending on which puppet they prefer—specifically, they allocated rare stickers to preferred puppets. However, allocations of scarcity were confounded with variety, as children tended to allocate equally to each puppet (resulting in varied stickers for the preferred puppet). Finally, Sheskin and colleagues (2016) found that children through 10 years of age prefer to allocate items by quantity but not quality (i.e., they allocate more preferred items to themselves) when in competition for them. However, they also found that when not in competition for items, children between 6-8 years allocate based on quantity and quality, demonstrating that a preference for the self can supersede a preference for quality equality. Taken together, these findings demonstrate that children are sensitive to the relative availability and quality of an item, and thus, if scarcity were valued in and of itself, this should have emerged within our age range.

In contrast to the relative lack of a scarcity bias, we found that a preference for variety emerges early in childhood, as evidenced by the selection of varied items above chance by children as young as 4-5 years. Importantly, this preference held up for the most part across the different ratios, different age groups, when selecting for different recipients (Self *or* Other), when selecting for multiple recipients (Self *vs.* Other), and when selecting novel items. This early-emerging preference may reflect the evolutionary benefits of obtaining varied sets (e.g., “I don’t know what I’ll need tomorrow, so I’ll take one of each item today”), mentioned previously.

These interesting findings more generally require further exploration. It is still unclear what comprises a variety set for children. It might be that any perceptible difference yields a variety preference, or perhaps a functional difference is required. It is also unclear what value, psychological or monetary, children place on variety itself.

Conclusions

The present research contributes to our understanding of factors influencing the valuation of items that children encounter. When given minimal information about items, children and adults prefer variety to guide their choices, yet scarcity has little (if any) value. Thus, a robust, general, and early-emerging preference for variety contrasts with a relative lack of preference for scarcity per se, even among adults. These findings point to several opportunities for future research. Does the preference for variety translate into higher monetary valuations, above and beyond the value of the individual items themselves? What contextual and/or causal factors move children and adults to place higher value on scarcity? How do judgments based on one's own preferences influence the sorts of resource distributions children and adults may be called upon to make? These are exciting questions for further inquiry.

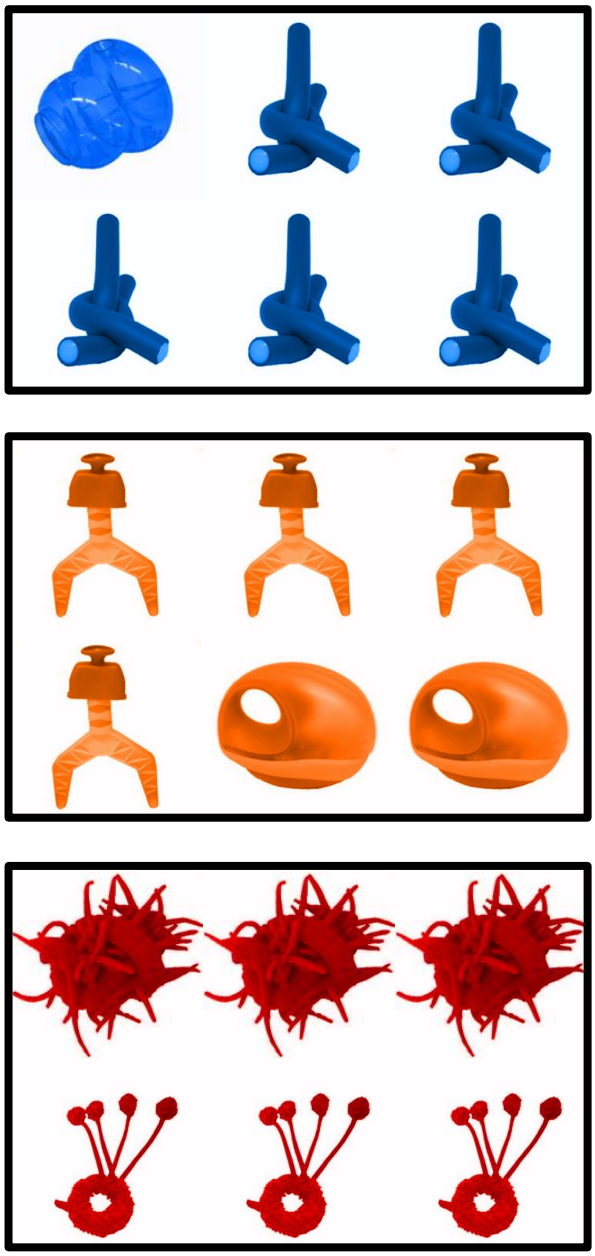

Figure 1. **Sample novel item pairs (Studies 1-3).** Sample novel item pairs presented to participants during 5:1, 4:2, and 3:3 trials. Reprinted from Echelbarger and Gelman (2017).

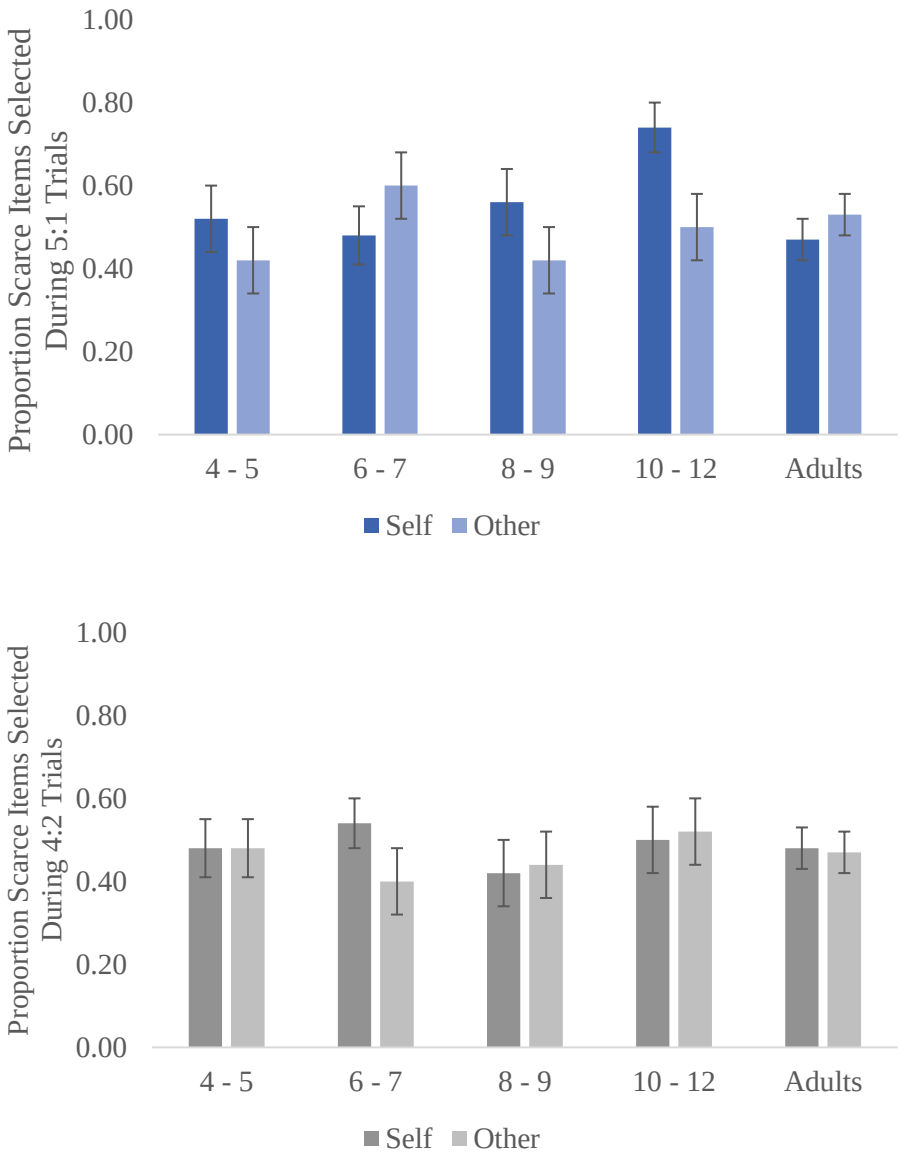

Figure 2. **Scarce items selected for Self (Study 1) and Other (Study 3).** Proportion of scarce items selected during 5:1 trials (top) and 4:2 trials (bottom) by age group. Reprinted from Echelbarger and Gelman (2017).

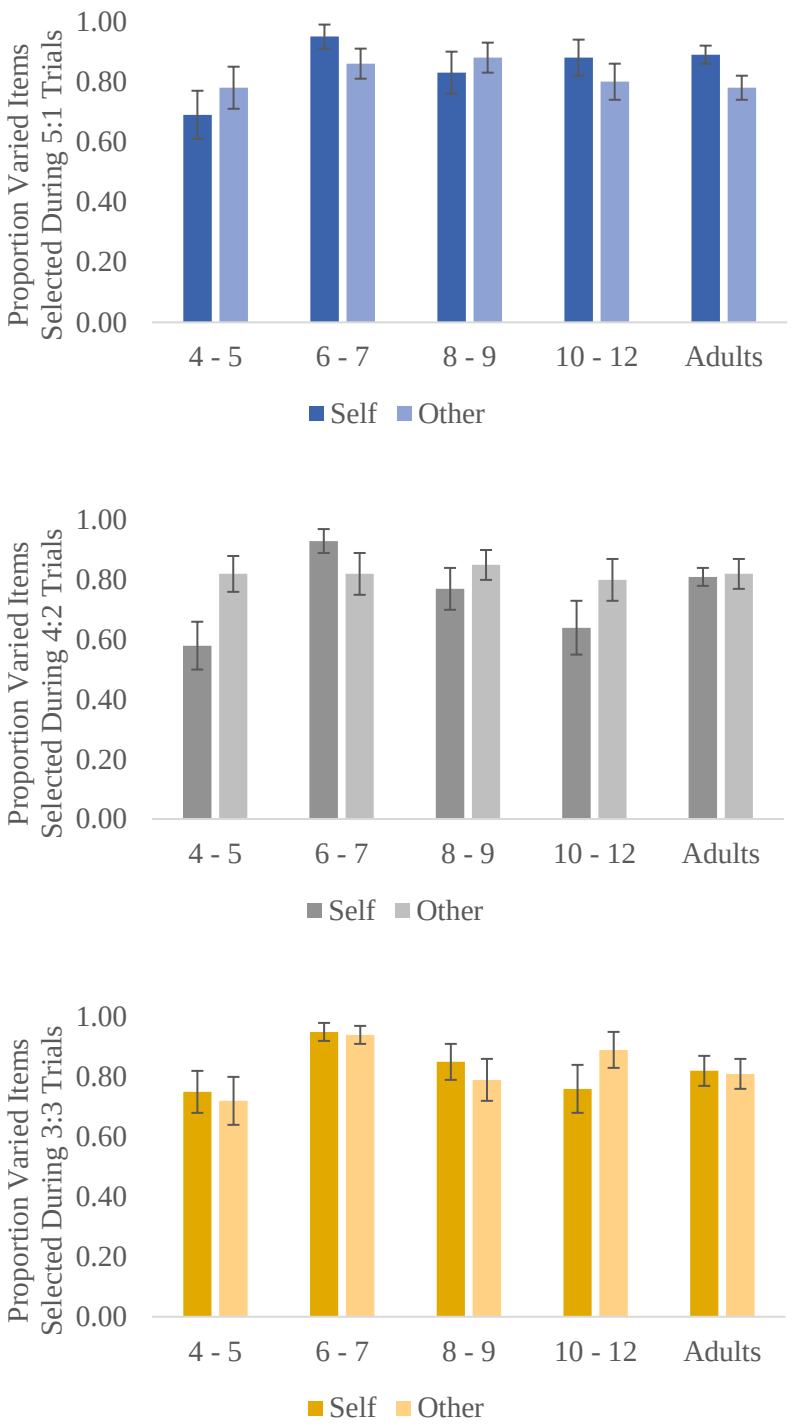

Figure 3. **Varied sets selected for Self (Study1) and Other (Study 3).** Proportion of varied sets selected during 5:1 trials (top), 4:2 trials (middle), and 3:3 trials (bottom) by age group. Reprinted from Echelbarger and Gelman (2017).

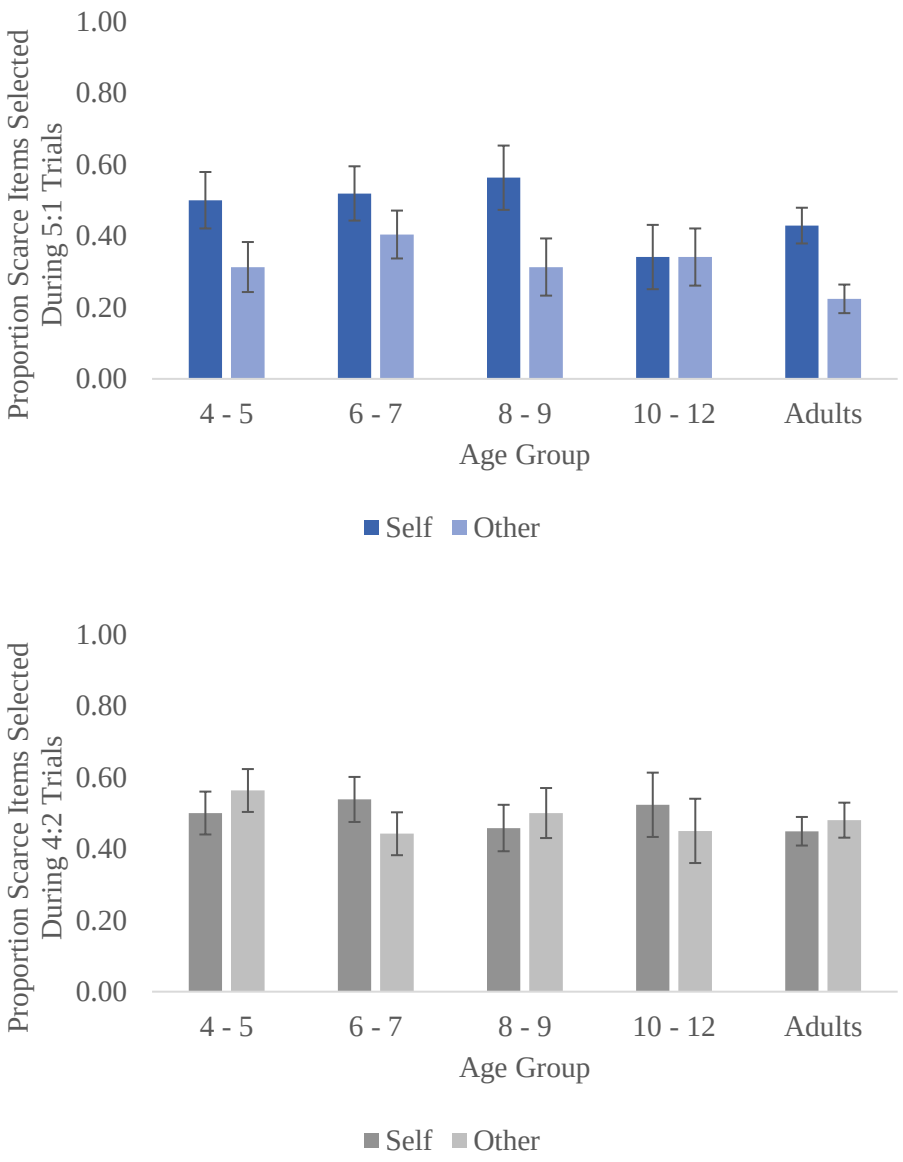

Figure 4. **Scarce items selected for Self + Other (Study 2).** Proportion of scarce items selected during 5:1 trials (top) and 4:2 trials (bottom) for each recipient by age group. Reprinted from Echelbarger and Gelman (2017).

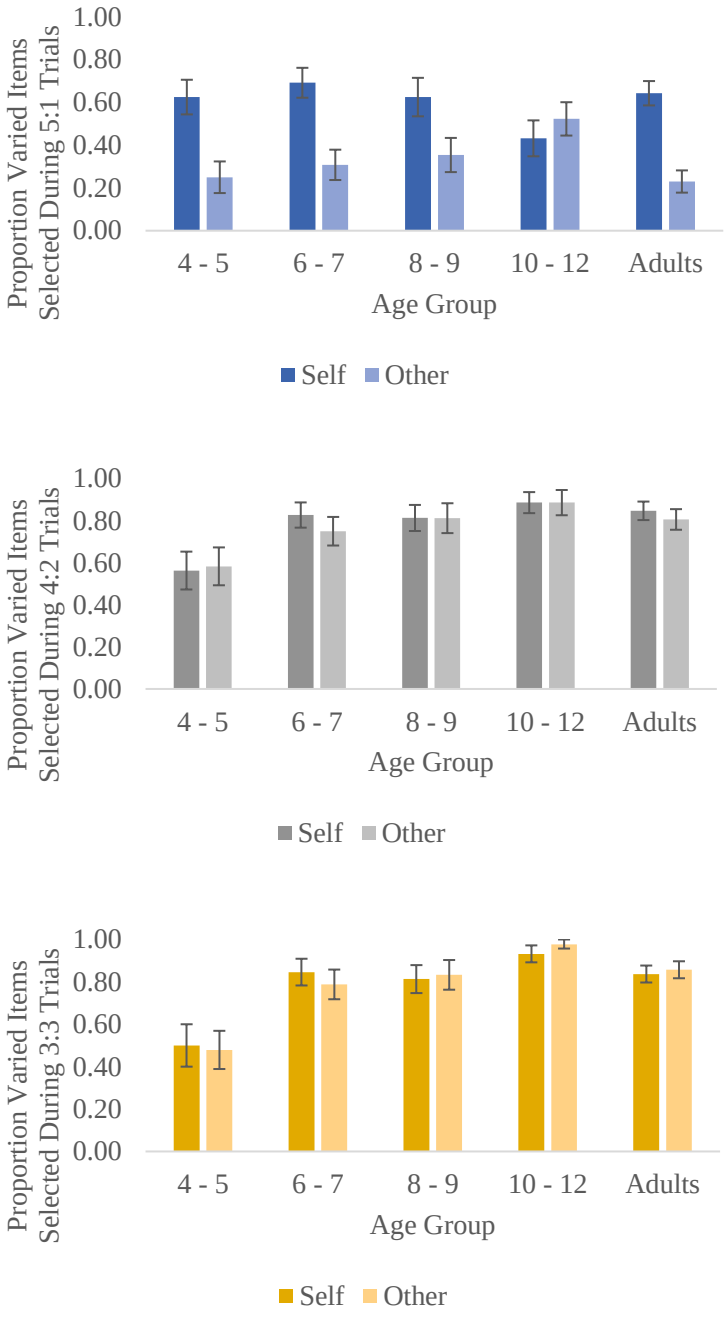

Figure 5. **Varied sets selected for Self + Other (Study 2).** Proportion of varied sets selected during 5:1 trials (top), 4:2 trials (middle), and 3:3 trials (bottom) for each recipient by age group. Reprinted from Echelbarger and Gelman (2017).

Chapter 3: Children's Use of Variety to Guide Decision Making

Don't put all your eggs in one basket. (folk idiom)

Variety seeking is a well-studied phenomenon in adults (see Kahn, 1995 for review). Work exploring this phenomenon has shown that adults will forego preferred experiences to achieve variety (Ratner et al., 1999), and that the desire to satiate some goal (e.g., quench thirst) is also associated with increased variety seeking (Goukens, Dewitte, Pandelaere, & Warlop, 2007). Two related explanatory accounts have been proposed to motivate this preference for variety: utility maximization and hedging (Kahn, 1995; McAlister, 1982).

Given motivations to maximize utility (e.g., happiness, benefit), a person may seek out variety to guard against diminishing utility that an additional unit of some item (or experience) may offer. For example, when deciding what to buy, you may opt to purchase two different types of blouses rather than two of the same blouse. Doing so may increase satisfaction in your purchase as you can guard against boredom that may arise due to repeatedly wearing the same blouse. As a result, you may feel happier about both your purchases and the resulting outfits incorporating those blouses. Also, because the future is inherently unknown, a person may be motivated to hedge against this uncertain future and diversify their selections. For example, when traveling, you may decide to pack for a range of possible activities (e.g., dinners requiring business-casual attire, outdoor activities requiring athletic wear) rather than one single type of activity. By doing so, you have increased the likelihood that you are better prepared for future unknown needs that may arise. Though conceptually distinct, utility maximization and hedging

are not incompatible—both can operate simultaneously to influence selections. Under either account, people not only should select variety over non-variety, but also should place greater monetary value on variety.

Recall that in Chapter 2, children as young as 4-5 years preferred varied sets (one each of two different items) to non-varied sets (two of the same time), which is consistent with the hypothesis that variety seeking is a foundational preference present early in life. In fact, children, who within this age range tend to show an aversion to inequality (e.g., Blake & McAuliffe, 2011; Fehr, Bernhard, & Rockenbach, 2008; Shaw, Choshen-Hillel, & Caruso, 2016; Shaw & Olson, 2012), selected varied sets for themselves even when it was not possible to select a varied set for someone else. Children's selection of varied sets for themselves in a context where they would otherwise seek to distribute equally demonstrates that children are willing to depart from equality when obtaining variety is at stake. Thus, this early, robust preference for variety requires further exploration as we need to better understand the mechanisms underlying children's selections. By doing so, we can also better understand the developmental origins of adults' motivation to seek out variety.

Present Research

The purpose of the research in Chapter 3 is to explore the nature of children's motivations to seek out variety, by asking for monetary valuations of varied and non-varied sets. Results from Chapter 2 suggest that children as young as 4-5 engage in direct variety-seeking behavior (i.e., that variety is a preference elicited on the basis of encountering varied item sets, and does not require additional information or rationale; McAlister & Pessemier, 1982). However, an alternative explanation for the selection of variety in Studies 1-3 may be that it reflected a decision-making strategy directed at dealing with indecision. Recall that in Studies 1-

3, the two item types in each set (A and B) were novel and comparable to one another, for which children may have had no particular a priori preference. If participants felt that their choice was a difficult one—that is, if there was no preference for A or B, due to the similarity and/or unfamiliarity of these items—then they may have adopted the strategy of "splitting the difference" by selecting one of each type. In this case, variety is not being sought for the sake of obtaining it; rather, it results from a strategy to avoid a difficult decision. Thus, additional evidence is needed to understand the underlying mechanism(s) giving rise to children's (and adults') selections of variety, and in particular to determine if this is a direct motivation (i.e., to obtain variety for the sake of doing so).

To discern underlying mechanisms, I tested whether children (and adults as a comparison group) assign monetary value to varied sets (Studies 4 and 5). Study 4 compares the value of varied sets to non-varied sets (e.g., AB vs. AA or BB), whereas Study 5 compares the value of varied sets to the individuals that comprise those sets (e.g., AB vs. A or B). If participants at a given age are directly motivated to select variety, then they should place higher monetary valuations on varied sets vs. non-varied sets—consistent with both maximizing utility and hedging. Furthermore, if participants are hedging, then they should place higher monetary valuations on varied sets than the sum of the components of those sets. However, if a variety preference, as observed in Studies 1-3, reflects indecision, then varied sets should receive no higher monetary valuations than non-varied sets in either study design. Following Studies 4-5, I test the implications of a variety preference for choices involving less-preferred items (Studies 6 and 7). Specifically, Studies 6 and 7 test whether participants will forego a preferred item in order to obtain variety. Together, Studies 4-7 provide insights into the robustness of variety-seeking, including the mechanisms underlying variety preferences. These studies more clearly

test a variety preference in ways (via valuations and selections) that Studies 1-3 could not.

STUDY 4

In Study 4, I test whether children (and adults) place higher monetary valuations on varied vs. non-varied sets. In general, there are three possible outcomes—variety could be valued more than non-variety, on par with non-variety, or less than non-variety (this last outcome is included for completeness and is not predicted). If participants are directly motivated to select variety, then variety should yield a monetary boost. This monetary boost could be due to utility maximization, whereby subsequent units of similar items are devalued, or due to hedging, whereby variety receives an absolute boost. However, if parents are simply avoiding making a difficult decision, variety should yield no monetary boost and be valued on par with non-variety.

Here I walk through more concrete examples involving the different possible outcomes: (a) Despite a preference for variety, there may be no monetary effect, such that the value of a varied set is equivalent to the value of the sum of the component elements (e.g., two balls = $10; two Frisbees = $14; one ball + one Frisbee = $12). (b) Given a preference for variety, varied sets may be given a higher value, either relative (two balls = $10; two Frisbees = $14; one ball + one Frisbee = $13, which is higher than the average of the value of the two non-varied sets) or absolute (e.g., two balls = $10; two Frisbees = $14; one ball + one Frisbee = $15, which higher than the value of either of the two non-varied sets). (c) Despite a preference for variety, there may be a monetary cost to it (e.g., two balls = $10; two Frisbees = $14; one ball + one Frisbee = $11). (Note that this third possibility is not expected, given the previously demonstrated variety preference, but it is included for the sake of completeness).

Items from Studies 1-3 are used to allow for the clearest interpretation of those studies in light of Study 4 results. However, unlike Studies 1-3, children are 6-9 years rather than 4-12

years. Early testing revealed that children 4-5 years had difficulty passing the pretest assessing whether they could provide accurate valuations (described below). Children 10-12 years were included for exploratory purposes in Studies 1-3 and are not included here. Should children (and adults) place higher valuations on varied vs. non-varied sets, then I have clearer evidence that children directly prefer variety rather than use variety as a means to avoid a difficult decision.

Methods

Participants

Participants included 80 children subdivided into two age groups: 6-7 years (n = 44, M = 7.06 years, SD = .61 years, 22 females, 22 males) and 8-9 years (n = 36, M = 8.83 years, SD = .49 years, 17 females, 18 males, 1 unreported), and 28 adults (M = 19.47 years, SD = 1.18 years, 16 females, 12 males). An additional child was excluded for not finishing the task. Parents identified their children as White (71%), Asian (10%), Multiracial (9%), and other (5%); the remaining parents did not identify their children's race. Adults identified themselves as White (71%), Black (11%), or Asian (18%). Children were recruited from laboratory spaces in museums in a university city in the midwestern United States; adults were recruited from a university Psychology subject pool in the same city. Children were compensated with a small thank-you gift; adults received course credit.

Materials

Materials included photographs of 24 novel items (e.g., tools, toys) from the Novel Objects and Unusual Names Database (Horst & Hout, 2016). Items were divided into 12 pairs, and items within pairs were edited to be the same color. Six colors were used for the 12 pairs: red, orange, yellow, green, blue, purple. In addition, four photographs of cookies (two whole and two with bites taken out of them), four photographs of shoes (two clean shoes and two shoes

covered in paint), one photograph of a backpack, and one photograph of a television were included.

Design

Each experimental trial included twelve tokens of two novel items presented in a 3 x 4 array. Within each trial, participants saw two items in one of two ratios: 6:6 (Equal) and 10:2 (Scarcity). Children were assigned to either the Equal (n = 36) or Scarcity (n = 44) condition; adults completed both. The Equal condition served as a test of the value of variety when it is not in competition with other factors (such as relative frequency). In contrast, the Scarcity condition provides a stronger test of the value of variety, as for some sets variety was placed in competition with scarcity. The location of items during Equal trials was counterbalanced within and across participants (top vs. bottom). Scarce items appeared in one of two locations—upper left, lower right—to make it easier for participants to detect them. The presentation of the trials themselves was randomized using Qualtrics. Because participants were required to provide valuations of sets given the total population of items, the location of the sets was counterbalanced across trials (AA, BB, AB). For each ratio, the varied set appeared in each location (left, center, right) two times. Finally, the location of each item within the varied set (top, bottom) was also counterbalanced across participants. See Figure 6 for sample Equal and Scarcity trials.

Procedure

Children. Children first received parental consent and provided assent, then met with an experimenter individually. Children first completed the pretest designed to test whether they could provide accurate valuations (see Gelman et al., 2015, for a similar method). In this pretest, children first identified which of two kinds of items people would pay more for (cookie vs. cookie with bite taken out; clean shoe vs. shoe with paint on it). After indicating which items

people would pay more for, children were then asked how much people would pay for each item. Children received feedback on their selections of items people would pay more for (e.g., if a child indicated that people would pay more for the cookie with a bite taken out of it, they were told that actually people would pay more for the other cookie because it is whole); children received no feedback on their actual valuations. To be included in the study, children must have correctly placed a higher value on the whole cookie and the clean shoe.

After completing the pretest, children then completed either the Equal (6 trials) or Scarcity (6 trials) condition. At the outset of the experimental task, children were oriented to a backpack and a television and their associated values provided by someone else earlier that day (i.e., "Earlier today, I asked someone how much people would pay for this backpack and this TV. They said that people would pay $50 for this backpack and $957 for this TV. Now I'm going to ask you some questions."). This warm-up was included to introduce children to the format of the task. Due to collecting data in museum spaces where constraints are placed on task length, children completed only one condition whereas adults completed both. Children were instructed to look at the computer and point to each item. This ensured that children attended to each item in the array. They were then directed to look at three sets of items and asked how much people would pay for each set. Children provided valuations from left to right. Participants were required to provide whole dollar amounts, to decrease task demands on children. However, in instances where children provided partial dollar amounts (e.g., $4.50), they were instructed to indicate how many dollars people would pay for the set.

Adults. After providing consent, adults completed both conditions. Adult did not receive the pretest.

Results

For each participant, I calculated the mean value offered for each of the test pairs (AA, BB, AB), and then log (base 10) transformed the values. When novel items were equally represented (6:6), the values of the same-item pairs (e.g., AA, BB) were averaged and log transformed. When one novel item was scarce (10:2), the values of the same-item pairs were calculated separately (e.g., Same-Scarce, Same-Non-scarce). Varied set calculations were the same across both conditions. In an additional analysis, I collapsed across values provided for same-item pairs in the Scarcity condition, following the calculation procedure used for same-item pairs in the Equal condition.

I first tested whether there were effects of age and pair-type on participants' valuations when the two novel items were represented equally (6:6). A repeated measures ANOVA with pair-type (Variety, Same) as the within-participants factor and age group (6-7, 8-9, Adults) as the between-participants factor yielded only a main effect of pair-type, $F(1, 61) = 13.90$, $p < .001$, $\eta_p^2 = .19$. Participants placed a higher value on varied sets compared to same-item sets (.99 vs. .93, which equates to \$9.77 vs. \$8.51; see Figure 7). No other significant results were obtained.

I next tested whether this finding extended to valuations in the Scarcity condition, by collapsing across same-item sets (same scarce, same non-scarce). A repeated measures ANOVA with pair-type (Variety, Same) as the within-participants factor and age group (6-7, 8-9, Adults) as the between-participants factor yielded a main effect of pair-type, $F(1, 69) = 5.71$, $p = .020$, $\eta_p^2 = .08$. Participants placed a higher value on varied sets compared to same-item sets (*M*s = 1.00 vs. .96, which equates to \$10.00 vs. \$9.12). No other significant results were obtained.

Lastly, I tested whether the result observed above held across all sets when broken out by pair type in the Scarcity condition. A repeated measures ANOVA with pair-type (Variety, Same-Scarce, Same-Non-scarce) as the within-participants factor and age group (6-7, 8-9, Adults) as

the between-participants factor yielded a main effect of pair-type, $F(2, 138) = 6.36$, $p = .002$, $\eta_p^2 = .08$, and a pair-type × age group interaction, $F(4, 138) = 2.86$, $p = .026$, $\eta_p^2 = .08$. To account for multiple comparisons, the alpha level was set to .017 (.05/3 age groups). Although participants overall placed a higher value on varied sets (1.00) compared to same-non-scarce (.91) sets ($p = .002$), this result was not observed in all age groups. Children 6-7 years valued variety (1.07) more than same-scarce (.96) sets ($p = .014$), whereas adults valued variety (1.07) and same-scarce (1.10) more than same-non-scarce (.94) sets ($ps \leq .006$). Children 8-9 years valued all sets similarly (see Figure 7).

Individual response patterns. I next tested whether response patterns differed as a function of condition and age to determine whether variety was valued more than non-variety consistently within and across groups. Specifically, each participant was classified as showing one of three patterns, for scores collapsed across trials: Variety > Same, Variety = Same, or Variety < Same. When items were equally represented (6:6), 11 children 6-7 years valued varied more than same-item sets (7 showed the reverse pattern, and 1 valued the types of sets equally); 13 of children 8-9 years valued varied more than same-item sets (2 showed the reverse pattern, and 2 valued the types of sets equally); 12 of 28 adults valued varied more than same-item sets (3 showed the reverse pattern, and 13 valued the types of sets equally). These frequencies were significantly different from the expected distribution, $\chi^2(4, N = 64) = 18.16$, $p = .003$. Adjusting the alpha to .006 to account for multiple comparisons (.05/9 tests) reveals that more adults than expected valued the sets equally ($p < .001$). No other differences reached significance.

Turning to trials where one item was scarce (10:2), 16 children 6-7 years valued varied more than same-item sets (5 showed the reverse pattern, and 4 valued the types of sets equally); 11 children 8-9 years valued varied more than same-item sets (8 showed the reverse pattern, and

0 valued the types of sets equally); 10 of 28 adults valued varied more than same-item sets (3 showed the reverse pattern, and 15 valued the types of sets equally). These frequencies, too, were significantly different from the expected distribution, $\chi^2(4, N = 72) = 21.25$, $p < .001$. Adjusting the alpha to .006 to, again, account for multiple comparisons reveals that fewer children 8-9 years and more adults than expected valued the types of sets equally ($p \leq .002$). No other differences reached significance.

Discussion

Overall, children and adults placed higher valuations on varied compared to non-varied sets, and did so at similar levels. Importantly, this result suggests that variety selections in Studies 1-3 were not simply due to avoiding making a difficult decision. However, when one of two items was relatively scarce, I observed a developmental shift in the evaluation of the scarce item: children placed higher valuations on sets including non-scarce items, whereas adults placed higher valuations on sets including scarce items. Such a result may reflect adults' better understanding of the influence of market forces (e.g., supply) on price, which children have difficulty with (e.g., Leiser & Halachmi, 2006; Siegler & Thompson, 1998; Thompson & Siegler, 2000). Though results were consistent across conditions, it should be noted that the overall effect was small. The added value associated with variety was consistent but slight and roughly translates to $1.12 (after calculating difference in log values of same-item and varied sets across conditions).

The higher value placed on variety in the Equal condition across age groups provides the clearest evidence that varied sets confer a higher value than non-varied sets (though note that adults were more inclined to value the sets equally compared to children). At the same time, the data from the Scarcity sets shows that variety is not valued uniquely above other factors, since

relative availability also plays a role: varied sets are valued equivalently to sets with two abundant items (for children) or to sets with two scarce items (for adults). The developmental shift towards valuing scarce-item sets more than non-scarce items sets requires further exploration; however, it does show that, in children and adults, added value associated with variety is influenced by relative availability. Finally, it is important to note that although the task required participants to provide whole dollar amounts, and thus was not sensitive to small differences in value (e.g., the difference between $10 and $11 is 10%; however, the added value assigned to variety may be 2%), we nonetheless obtained differences as a function of variety. Such sensitivity might be greater if participants were permitted to provide smaller monetary units.

STUDY 5

Though the results of Study 4 demonstrate that children and adults place higher monetary valuations on variety, they leave open the mechanism. Specifically, the added value may be associated with diminished value assigned to additional units of the same items (consistent with maximizing utility) or may be due to added value assigned to different set types (consistent with hedging). For example, if a participant valued two of one item (AA) at $10, two of a second item (BB) at $14, and a varied set (AB) at $13, this could be because variety per se has increased value, but alternatively it could be because the same-set pairs include unequal values (e.g., the first A is valued at $6 and the second is valued at $4). Disentangling the value of an individual item from the value of the pair is needed to reveal the mechanism underlying the preference for variety itself. Thus, the purpose of Study 5 is to determine whether participants place a premium on variety itself. If this is the case, then if Item A is valued at $5 and Item B is valued at $6, then the set Item A + Item B would be assigned a value greater than $11. If this result is not obtained,

then the value associated with variety may be due to other processes, such as diminished value assigned to the second item in same-set pairs. Thus, Study 5 tests whether children and adults assign a premium to variety sets above and beyond the value of the individual items comprising the variety set.

Methods

Participants

Participants included 66 children subdivided into two age groups: 6-7 years (n = 32, M = 6.77 years, SD = .49 years, 17 females, 15 males) and 8-9 years (n = 34, M = 8.93 years, SD = .58 years, 20 females, 14 males), and 34 adults (M = 19.25 years, SD = .83 years, 19 females, 15 males). An additional six children were excluded for the following reasons: two for not passing the pretest, two for not completing the study, one due to attentional issues, and one due to experimenter error. Parents identified their children as White (80%), Black (2%), Asian (6%), Multiracial (5%), and other (2%); the remaining parents did not identify their children's race. Adults identified themselves as White (68%), Black (9%), Asian (15%), Multiracial (6%), and other (3%). Children were recruited from a laboratory space in a university city in the midwestern United States; adults were recruited from a university Psychology subject pool in the same city. Children were compensated with a small thank-you gift; adults received course credit.

Materials

Materials included the same novel item pairs as used in Study 4. Children completed the same pretest, including the same items.

Design

Each experimental trial included three choices: Item A, Item B, and Item A + Item B. Thus, participants provided valuations of two individual items and one combination set that

included both items. In contrast to Study 4, the population from which the items were drawn was not provided (i.e., no array including twelve tokens of the two novel items was provided; see Figure 7). This design decision was made for three reasons: (a) To simplify the task (i.e., the absence of the array reduces processing demands), (b) To tease apart the relative value of AB (together) vs. Item A + Item B (individually); having fewer items should make the distinction more acute (i.e., fewer of each item may highlight the value of variety, as there are fewer comparisons to consider), and (c) Each trial still included the same ratio of items as presented in the Equal condition in Study 4. As in the prior study, the varied set appeared in each location two times (left, center, right), resulting in all participants completing six trials. Across participants, the items used, and the location of the items (top vs. bottom) in the varied set, were counterbalanced. See Figure 8 for a sample trial.

Procedure

The same procedure for children (including entry criterion based on a pretest) and adults as described in Study 4 was used.

Results

As in Study 4, the values of the sets were averaged and then log transformed. The values of the single-item choices were summed within each trial and then averaged across trials, whereas the varied sets were simply averaged across trials. To test whether participants place a premium on variety compared to the value assigned to the items that comprised the varied set, I compared the value of the three choices. A repeated measures ANOVA with choice-type (Variety, Single-Item) as the within-participants factor and age group (6-7, 8-9, Adults) as the between-participants factor yielded only a main effect of age group, $F(2, 97) = 3.54$, $p = .033$, $\eta_p^2 = .07$. To account for multiple comparisons, the alpha level was again set to .017 (.05/3 age

groups). Children 8-9 years overall valued the choices at lower levels than children 6-7 years (6-7: 1.29; 8-9: 1.00; Adults: 1.17; $p = .009$). No effect of choice-type nor interaction between choice-type and age group was observed. Children and adults assigned similar values to Item A + Item B independently as they did to Set AB (scores for the average of the individual items A and B vs. the set of A+B are as follows: 6-7 years: 1.38 vs. 1.21; 8-9 years: .99 vs. 1.01; Adults: 1.17 vs. 1.16; see Figure 9).

Discussion

In Study 4, participants placed a higher value on varied sets compared to non-varied sets. That is, Set AB was given a higher value than the average of Set AA and Set BB. Study 5 tested one possible mechanism underlying this added value—i.e., whether participants place a premium on variety itself. By presenting participants with three choices—Item A, Item B, and Set AB—I removed the possibility of a same-item decrement (i.e., diminishing return), thus enabling me to directly test whether children and adults place an absolute premium on variety itself. Results revealed that participants did not place a higher value on varied sets than would be expected based on their valuations of the individual items that comprised each set; thus, the conclusion that the added value associated with variety is due to some boost above and beyond the expected value is not supported.

This study demonstrates the limits of the value of variety, although it was not designed to directly reveal why. The possibility I favor is that the added value assigned to varied sets may be due to the diminished value assigned to additional units of the same item, rather than a premium placed on variety per se. However, this remains speculative, as I did not directly measure the relative values of Item A vs. Set AA. Furthermore, there are several aspects of the design that may have underestimated variety effects in this study. First, the null finding may be due to not

providing the population from which the items were drawn (a design difference across Studies 4 and 5). Without knowledge of item representation, it may have been harder for participants to determine value; however, this seems unlikely given that varied sets were valued more than non-varied sets even after collapsing across set type in Study 4's Scarcity condition (where one item was scarce relative to another, 10:2). Second, it is possible that the added value that would be assigned to a varied set in this context was too low to detect, given that participants were required to respond with whole-dollar amounts. For example, it would have not been possible for a participant to indicate that Item A = $1, Item B =$3, and Set AB = $4.25. In order for a variety premium to be detected here, the participant would have had to value Set AB at $5, yielding a 25% premium vs. 6% if valued at $4.25. However, this could not entirely explain the results, given the effect of variety in Study 4, which used the same method. Lastly, it is possible that participants treated the task as an arithmetic problem, and therefore simply added (or approximated) the value of Item A + Item B to arrive at their value for Set AB. Although this strategy was not employed in Study 4 (as I did obtain a variety boost in monetary value in that study), that more complex set of comparisons may have simply made it harder to "do the math."

STUDY 6

In Study 6, I further test the limits of a variety preference by examining whether children (and adults as a comparison group) will forego an additional unit of a preferred item to obtain a varied set. In this way, Study 6 moves beyond the prior studies in this dissertation to explicitly pit preference for an individual item against a preference for variety. Results from Studies 1-3 show that children and adults prefer variety irrespective of the relative availability of the items represented, and results from Study 4 suggest that this preference may be linked to the increased value assigned to those varied sets. Study 5 did not find a variety boost, but this may be due to

the availability of a different strategy (i.e., treating the task as an arithmetic problem). The purpose of Study 6 is to test whether a preference for variety extends to situations where one item is preferred to another (e.g., is Set AB preferred to Set AA or Set BB, even when there is a preference for Item A over Item B?). Selecting variety in this case requires foregoing a second more-preferred item in favor of a less-preferred item, providing a stronger test of one's commitment to obtaining variety.

To test participants' commitment to variety, I use consumable food items, which allows for a stronger test of a variety preference. As with many durable items, like a pen, a single token of that item may be sufficient. After all, people generally only use one pen at a time. In turn, selecting among durable items may amplify a preference for variety. Contrastingly, consumable items do not have this same limitation—there is value in consuming more than one cookie (or even selecting one cookie for now and one cookie for later). In addition, variety selections among durable items potentially have the added confound of increased functionality. That is, by selecting a varied set among durable items, individuals can obtain not only a varied set of kinds, but can also obtain a varied set of functions (e.g., selecting a pen and a marker allows someone to sketch and highlight). The functionality of food items, however, is relatively equated—foods within sets are intended to be eaten.

In order to provide a stronger test of variety, Study 6 included familiar items, for which participants may have an a priori preference. Recall also that Studies 1-5 included unknown, novel items matched in color and size; participants had little reason to prefer one item to another, as items within sets were similar and their functions were unknown. By minimizing the amount of information provided about the items, and maximizing their similarity, participants had little basis for forming a preference. Thus, there was no reason to expect that children (or adults) had

clear, stable preferences for one item over another. Given the inclusion of familiar items, I can test more directly whether a preference for variety overrides a preference for multiple units of a preferred item. For example, if a participant prefers carrots to broccoli, a stronger preference for variety may move a participant to select a varied set containing a carrot and a piece of broccoli over a set containing two carrots. If this trend is observed (i.e., foregoing an additional unit of a preferred item to achieve variety), then I will have further evidence that variety is directly valued. Alternatively, variety may be preferred in only those instances where one food item is not preferred to another—which would be consistent with results observed in Studies 1-3.

Finally, I ask participants to make choices rather than provide monetary valuations. By asking participants to make choices, I circumvent some of the issues identified previously regarding asking for monetary valuations (e.g., sensitivity concerns by requiring whole dollar amounts, excluding younger children because they are unable to provide consistent valuations, and preventing people from reducing the task to a math test). Lastly, the present study moves beyond prior work examining effects of variety on food selections in children (e.g., Just et al., 2012; Roe et al., 2013) by directly testing whether varied food sets are preferred to non-varied food sets.

Methods

Participants

Participants included 120 children 4-9 years subdivided into three age groups: 4-5 years (n = 41, M = 5.17 years, SD = .60 years, 25 females, 16 years), 6-7 years (n = 41, M = 6.93 years, SD = .59 years, 21 females, 20 males), and 8-9 years (n = 38, M = 8.94 years, SD = .63 years, 25 females, 13 males), and 41 adults (M = 19.17, SD = 1.14 years, 25 females, 16 males). An additional two children were excluded: one due to parental inference and one due to

experimenter error. Parents identified their children as White (58%), Black (3%), Asian (8%), Multiracial (11%), and other (5%); the remaining parents did not identify their children's race. Adults identified themselves as White (54%), Black (2%), Asian (32%), Multiracial (5%), and other (5%); the remaining adults did not report on their race. Eighteen additional children 4-5 years (M = 5.07 years, SD = .51 years, 6 females, 12 males; parents identified their children as White (61%), Asian (11%), and Multiracial (6%); the remaining parents did not report on their race) participated in a pretest only. Children were recruited from laboratory spaces in museums in a university city in the midwestern United States; adults were recruited from a university Psychology subject pool in the same city. Children were compensated with a small thank-you gift; adults received course credit. Children were compensated with a small thank-you gift; adults received course credit.

Materials

Materials included photographs of 12 paired food items displayed on a computer screen. The pairs included: carrot + broccoli, animal cracker + graham cracker, snack cracker + cheese cracker, gummy bear + marshmallow, and apple slice + orange slice. Sixteen food pictures were pretested to select a set of 12 items that even the youngest children (4-5 years) could correctly identify by sight. We selected those items that had the highest familiarity, as indicated by children either correctly labeling the item, or agreeing with a correct label provided by the experimenter. Familiarity of the 12 items included ranged from 83-100% (M = 94%, SD = 5%).

In addition to these 12 food items, photographs of two balls (two tokens of the same ball) and two pencils (one whole, one broken) were included in a warm-up task.

Design

Each experimental trial (six total) included one token each of two food items. Participants

were first asked to identify which of two food items they preferred, or whether they liked them about the same. The location of the individual food items was counterbalanced across participants (left, right). Participants were then asked to select a set of items they would like for themselves among three available. For this choice question, the placement of the varied set was counterbalanced within participants (left, center, right). The presentation of the trials themselves was randomized within Qualtrics. After the last trial, participants were asked why they selected the set that they did. This was done only after the last trial so as to not influence choices made on prior trials. These responses were included for exploratory purposes only and will not be discussed further. See Figure 10 for a sample trial.

Procedure

Children. Children received written parental consent and provided oral assent, then met with an experimenter individually. Children first completed a warm-up task designed to make sure they were comfortable expressing preferences. In this task, they were shown two items and asked to indicate which of the two they preferred for two trials. On one trial, children were asked to identify which of two balls (two tokens of the same ball) they liked better, or whether they liked them about the same. In another trial, children were asked to identify which of two pencils (one whole, one broken) they liked better, or whether they liked them about the same. The order of warm-up trials was randomized within Qualtrics.

After completing the warm-up task, children moved directly to the main task. For each of the six experimental items, they first were shown two items [A and B] and asked, "Which do you like better: [label for left item], [label for right item], or are they about the same?" On the next screen, children were shown three sets of items from which to choose [AA, BB, AB] and asked to "Choose one set that you would like for yourself." After the last trial, children were asked:

"Why did you choose this set?" For example, if a trial included an animal cracker and a graham cracker, a child would hear: "Which do you like better: the animal cracker, the graham cracker, or are they about the same?" Following the child's selection, they would then be asked to "Choose one set that you would like for yourself" and the sets would include: animal cracker + animal cracker, animal cracker + graham cracker, and graham cracker + graham cracker.

Adults. After providing consent, adults completed the same task as children.

Results

Total Variety Selections

As a first step, I tallied the number of trials on which participants selected a varied set, irrespective of whether they indicated a preference for one of the two items comprising any one of the six sets. I then conducted a one-way ANOVA testing whether variety selections differed by age group (4-5, 6-7, 8-9, Adults). Results revealed that the selection of varied sets did not differ by age group, $F(3, 157) = .08$, $p = .972$, $\eta_p^2 = .00$. Children and adults selected varied sets at similar rates (4-5: 2.41; 6-7: 2.41; 8-9: 2.55; Adults: 2.51; Overall: 2.47). I next tested whether participants selected varied sets significantly above chance (where chance = 2), collapsing across age groups given the lack of age group effect. Results revealed that, overall, participants selected varied sets significantly above chance, $t(160) = 3.84$, $p < .001$; however, when tested by age group, only children 8-9 years and adults selected varied sets significantly above chance (ps $\leq$ .035). See Figure 11 for variety selections by age group.

Variety Selections on No-Preference Trials

I tallied the number of trials on which participants indicated having no preference for one of the two items presented. Results from a one-way ANOVA revealed that the number of no-preference trials did not differ as a function of age group, $F(3, 157) = 1.21$, $p = .307$, $\eta_p^2 = .02$ (4-

5: 2.56; 6-7: 2.27; 8-9: 2.26; Adults: 1.95; Overall: 2.26).

I next calculated the proportion of trials on which participants selected varied sets given no preference. In order to be included in this analysis, participants must have indicated having no preference on at least one trial (n = 141; 88%). Results from a one-way ANOVA revealed no difference as a function of age group, $F(3, 137) = 1.14$, $p = .334$, $\eta_p^2 = .02$ (4-5: .66; 6-7: .77; 7-8: .72; Adults: .82; Overall: .74). See Table 1 for a complete overview of the proportion of different set-types selected on no-preference trials.

Lastly, I tested whether participants selected varied sets significantly above chance (where chance = .33), collapsing across age group given the lack of age group effect. Results revealed that, overall, participants selected varied sets significantly above chance, $t(140) = 13.11$, $p < .001$, and this result held up across all age groups (ps < .001). See Figure 12.

Variety Selections on Preference Trials

Turning to trials where preferences were identified, I first tallied the number of trials on which participants indicating having a preference for one of the two items. Results from a one-way ANOVA revealed no significant effect of age group, $F(3, 157) = 1.21$, $p = .307$, $\eta_p^2 = .02$ (4-5: 3.44; 6-7: 3.73 8-9: 3.74; Adults: 4.05; Overall: 3.74).

I next calculated the proportion of trials on which participants selected varied sets given an initial preference. In order to be included in this analysis, participants must have identified having a preference on at least one trial (n = 157; 98%). Results from a one-way ANOVA revealed that the proportion of varied sets selected after indicating a preference did not vary by age group, $F(3, 153) = .18$, $p = .912$, $\eta_p^2 = .00$ (4-5: .20; 6-7: .20; 7-8: .19; Adults: .23; Overall: .21). See Table 1 for a complete overview of the proportion of different set-types selected on preference trials.

As before, I tested whether participants selected varied sets significantly above chance (where chance = .33), collapsing across age group given the lack of age group effect. Results revealed that, overall, participants selected varied sets significantly below chance, $t(156) = -6.20$, $p < .001$, and this result held up across all age groups ($ps \leq .012$). See Figure 13.

Discussion

Overall, participants selected varied food sets significantly above chance, conceptually replicating results from Studies 1-3. In addition, when restricting the analysis to include only those participants who indicated having no preference on at least one trial, the proportion of varied selections was significantly above chance. That is, given indecision (or uncertainty), participants opted to diversify their selections rather than select sets comprising identical food items. This is particularly interesting because variety should have lower value in this context; additional units of the same food type retain their value more than that of many non-food items. Yet, participants still sought out variety at relatively high rates given no preference for either item available.

Of note, however, is the attenuation of the variety preference across this item category. Studies 1-3 included unfamiliar, novel items, which participants selected at relatively high rates irrespective of condition (i.e., distributing to self and/or other). When asked to make selections within a familiar category, variety was in competition with a priori preferences. Given an established preference, participants often selected same-item sets comprising only the preferred item, eliminating the strong preference previously observed for variety. Thus, Study 6 provides insight into the limits of a variety preference. Across the age range, participants' preference for a given item overrode their preference for variety. That is, participants did not forego an additional unit of a preferred food item to achieve a varied set.

STUDY 7

In Study 6, one could argue that requiring participants to indicate a preference before selecting among sets prompted participants to want to appear consistent, undermining the tendency to select variety. For example, if a participant indicated preferring a carrot to a piece of broccoli, then they may have felt compelled to select the set including two carrots rather than the varied set. To test whether requiring participants to first indicate whether they liked one of two items better contributed to the patterns obtained in Study 6, Study 7 systematically varied the order of the tasks. Thus, if participants sought to appear consistent after indicating a preference for one of two items, then variety selections should be greater when preferences are elicited after selecting among the available sets. Given the lack of age differences in Study 6, only adults were included in Study 7.

Participants

Participants included 103 adults (*M* = 34 years, *SD* = 9 years, 43 females, 58 males, 2 unreported) who characterized themselves as White (76%), Black (7%), Asian (4%), Multiracial (2%), and other (10%); the remaining adults did not report on their race. Adults were recruited through MTurk. An additional eight participants were excluded for starting but not finishing the task. To be eligible to participate, adult MTurk workers must have had an approval rating greater than or equal to 95, have completed at least 100 approved tasks, and have been located in the United States. Adults were compensated $0.60, a competitive rate for a task of this length.

Materials

The same materials from Study 6 were used.

Design

Participants were randomly assigned to one of two conditions: Order 1 (where

participants were asked to identify which of two items they liked better first) or Order 2 (where participants were asked to identify which of the two items they liked better after selecting among the sets comprising those items). All other aspects of the design remained the same as described in Study 6.

Procedure

In the Order 1 condition, the tasks were ordered as described in Study 6. In the Order 2 condition, participants first indicated which of three sets they would like for themselves (AA, BB, AB), and then indicated which of the two items they liked better (A, B) or whether they liked them about the same.

Results

Total Variety Selections

I tallied the number of trials on which participants selected a varied set, irrespective of whether they indicated a preference for one of the two items comprising any one of the six sets, and tested whether selections differed by condition. Results from a *t*-test revealed that the selection of varied sets did not differ by condition, $t(101) = 1.90$, $p = .061$. Participants in the two conditions selected varied sets at similar rates (Order 1: $M = 2.04$; Order 2: $M = 1.50$; out of 6 trials). I next tested whether participants selected varied sets significantly above chance (where chance = 2), collapsing across condition given the lack of condition effect. Results revealed that participants did not differ from chance, $t(102) = -1.68$, $p = .096$. Note, however, that when variety selections were tested against chance by condition, participants selected varied sets at chance in the Order 1 condition and significantly below chance in the Order 2 condition ($p = .010$). See Figure 11.

Variety Selections on No Preference Trials

In line with Study 6, I tallied the number of trials on which participants indicated having no preference for one of the two items presented. The number of no-preference trials was similar across conditions, $t(101) = .70$, $p = .483$ (Order 1: 1.33; Order 2: 1.13). I next calculated the proportion of trials on which participants selected varied sets given no preference. In order to be included in this analysis, participants must have indicated having no preference on at least one trial ($n = 58$; 56%). Results revealed that the proportion of varied sets selected after indicating no preference did not vary by condition, $t(56) = .44$, $p = .663$ (Order 1: .87; Order 2: .83). See Table 1 for a complete overview of the proportion of different set-types selected on no-preference trials.

Lastly, I tested whether participants selected varied sets significantly above chance (where chance = .33), collapsing across condition given the lack of condition effect. Results revealed that, overall, participants selected varied sets significantly above chance, $t(57) = 12.64$, $p < .001$, and this result held up across conditions (ps < .001). See Figure 12.

Variety Selections on Preference Trials

As above, I first tallied the number of trials on which participants indicated having a preference for one of the two items presented; the number of preference trials did not differ by condition, $t(56) = .04$, $p = .971$ (Order 1: 3.83; Order 2: 3.82). I next calculated the proportion of trials on which participants indicating having a preference for one of the two items presented. In order to be included in this analysis, participants must have indicated having a preference on at least one trial ($n = 103$; 100%). Results revealed that the proportion of varied sets selected after indicating a preference did not vary by condition, $t(101) = 1.64$, $p = .104$ (Order 1: .17; Order 2: .10). See Table 1.

Lastly, I tested whether participants selected varied sets significantly above chance

(where chance = .33), collapsing across condition given the lack of condition effect. Results revealed that, overall, participants selected varied sets significantly below chance, $t(102) = -9.53$, $p < .001$, and this result held up across conditions (ps < .001). See Figure 13.

Discussion

The purpose of Study 7 was to test whether adults' selections of varied sets differed depending on the order in which preferences for one of the two items in a set were elicited—i.e., whether they were asked prior to selecting among sets of items (Order 1), or whether they were asked following selecting among sets of items (Order 2). Results revealed that order condition did not influence any key results associated with variety selections, suggesting that the attenuation of the variety preference observed in Study 6 was not simply due to participants wanting to appear consistent in their selections. Though not significant, the difference in means was in fact the opposite direction of what would be predicted had a desire for consistency influenced variety selections. In addition, these results replicate those observed in Study 6, further underscoring the influence of individual item preferences on variety selections.

General Discussion

The studies in Chapter 3 were designed to explore the mechanisms underlying the variety preference observed in Studies 1-3, as well as the strength of the preference itself. To examine mechanisms, I designed tasks asking children (and adults as a comparison group) to provide monetary valuations of items and sets used in Studies 1-3 (Studies 4-5). To test strength, I manipulated key elements of the decision context including the relative availability of items included in sets (Study 4) and whether a preference for variety overrode a preference for a particular item (Studies 6-7). Overall, these studies are the first, to my knowledge, to examine children's direct motivations to select variety, and contribute to an established body of work

examining variety seeking in adults.

In Study 4, children (6-9 years) and adults placed higher monetary valuations on varied sets compared to non-varied sets. In this study, participants indicated how much people would pay for different sets of items given different populations from which the sets were drawn. In the Equal condition, participants provided valuations for sets that included two types of items that were equally represented in the population (6:6); in the Scarcity condition, participants provided valuations for sets that included two types of items differing in their relative availability (10:2). Though age differences were not observed in the Equal condition, a developmental shift occurred in the Scarcity condition—children 6-7 years placed a higher value on varied sets compared to non-varied sets including two scarce items (Same-Scarce) whereas adults valued these types of sets equally. In total, results from Study 4 demonstrate that variety does confer a higher value; however, it is not valued necessarily uniquely above other factors (e.g., relative availability) at least for older children and adults. More generally, this added value may motivate the selection of varied sets, particularly in cases where items are unknown or "all things are equal." Had the preference for variety in Studies 1-3 merely reflected participants' indecision (i.e., if someone is wavering between a choice of A or a choice of B, then the selection of the varied set can be a way of avoiding a decision), participants would have provided equal monetary values for varied and non-varied sets. Given that participants deemed that the varied set had extra value, this raised the question of why, giving rise to Study 5.

In Study 5, the added monetary value associated with variety appeared not to be a premium placed on variety itself. After asking children (6-9 years) and adults to place monetary valuations on individual items as well as sets comprising those individual items, results revealed that variety received no added monetary boost—the total values placed on individual items

comprising sets and the sets themselves were comparable. These results are consistent with the notion that added value associated with variety reflects diminished utility of additional units of the same item. At the same time, however, subsequent work is required to directly test this (e.g., assess participants' valuations of Item A vs. Set AA). Alternatively, it is possible that participants reduced the task to a simple arithmetic problem (A + B = ?) due to the simultaneous presence of all three choices. This alternative, too, should be addressed in future work (e.g., assess participants' valuations of Item A, Item, B, and Set AB sequentially—i.e., mixed in with other trials to reduce the likelihood that individual valuations can be recalled and tracked). Lastly, it is possible that packaging items together (i.e., bundling) to create varied sets yielded lower valuations of the items comprising the set given that bundling decreases variety selections (Mittelman et al., 2014). Subsequent work should directly test the influence of bundling on children's valuations of varied sets.

Turning to Study 6, results revealed that children (4-9 years) and adults selected varied sets above chance overall, consistent with results from Studies 1-3. However, there was a marked effect of whether one food item in a set was preferred to the other. When one item was not preferred to the other, both children and adults were much more likely to select sets comprising both food items available. In contrast, when one item was preferred to another, both children and adults rarely selected the varied set, instead typically selecting two instances of the preferred food item. Results from Study 7 with adults revealed that the order in which preferences were elicited (i.e., whether participants indicated which of two items they preferred before or after making selections among the sets comprising those items) did not affect selection of varied sets. This result suggests that the lack of a variety choice in Study 6 was not due to participants attempting to be consistent in their answers. Because adults should be most highly motivated to

maintain consistency given their more advanced metacognitive abilities, children were not subsequently tested because they are not predicted to show an order effect, consistent with adults.

Given the complexities of the variety preference, the present studies are limited in their explanatory power. For example, familiar consumable items were used in Studies 6 and 7, and it is possible that the attenuation of the variety preference reflects the use of this type of item. Therefore, it is an open question whether variety would be similarly selected had I used familiar durable items for which additional units of the same item may yield even less utility (i.e., the decrease in utility across two potato chips is likely less than the decrease in utility across two regular pens, because a person can eat two potato chips in a sitting but likely would need only one pen at a time). More generally, it is possible that variety seeking in childhood is higher for unfamiliar than familiar items. This, too, requires additional testing, as the present studies were not designed to disentangle the contributions of item-type to overall variety selections. Rather, items across studies were selected purposely to probe the limits and strength of the preference itself. For this reason, the present studies serve as a systematic entry into a larger line of work needed to fully understand the emergence and developmental course of variety seeking in childhood. Despite these limitations, Studies 4-6 reveal that variety valuation and selection are relatively stable irrespective of item type across the age range and into adulthood, as evidenced by few age group differences.

The early emergence and relative stability of a variety preference suggests that attention to variety may be evolutionarily advantageous, and perhaps not just for basic survival. Variety guards against boredom and may even support innovation. For example, people may create variation that did not exist previously (e.g., just consider the many types of cakes available at a

bakery). In this way, variety, at least loosely, promotes societal advancement—though this claim requires empirical support. Importantly, though, because the youngest children in the present studies were 4-5 years, and thus already had several years of experience, subsequent work should test whether attention to variety emerges even earlier in childhood. For example, attention to variety could be tested in infancy via preferential looking tasks.

Moving forward, I see three natural next steps. First, the mechanism underlying the added value associated with variety requires further testing. Though evidence from Studies 4-5 suggests that there is a value decrement associated with additional units of the same item, this was not empirically tested. Subsequent work should test whether this is the case—i.e., whether children (and adults as a comparison group) assign greater value to Item A + Item A compared to Set AA. Second, prior work with adults has shown that bundling decreases variety selections (Mittelman, et al., 2014). In Studies 4-6, I held the presentation of variety sets constant—variety was always represented as a set and not as the sequential selection of two items. It is possible that variety selections would be boosted, particularly in Studies 6-7, had participants been asked to select two items sequentially. Thus, subsequent work should manipulate the process by which sets are obtained (e.g., simultaneous vs. sequential selection) to determine when sensitivity to different selection schemes emerges. Lastly, because the present work was not designed to disentangle the effects of durable vs. consumable items on variety selections, additional work is needed to understand the strength of the variety preference across different item categories—including, but not limited to, durable vs. consumable items. For example, variety seeking varies as a function of hedonic vs. utilitarian product types such that source of the switching within these categories differs (i.e., sensory satiation leads to variety seeking with hedonic products whereas functional satiation leads to variety seeking with utilitarian products; Baltas, Kokkinaki, & Loukopoulou,

2017). Taken together, subsequent work in these areas will inform our understanding of children's direct and derived motivations to select variety.

As attention to variety seeking in childhood increases, it will be important to track the motivations for selecting variety in any one context, as work here and with adults demonstrates that variety selections are sensitive to a multitude of contextual influences. This will be especially important given the implications of this kind of work on the development of interventions to promote better decision making in children. For example, given children's preference for varied sets, variety has been proposed as one strategy to promote healthier eating in children (Albuquerque et al., 2017). Thus, better understanding when and why children prefer variety can yield actionable results that can be used to inform how we help children make decisions.

Conclusions

The present research adds to our understanding of the mechanisms underlying a variety preference as well as the strengths and limits of this preference in childhood. Across four studies, variety was shown to confer a higher value relative to same-item pairs and be selected in situations where preferences for items were similar. In general, findings across the age range (4-9 years) into adulthood were relatively stable, as evidenced by few age group differences, suggesting that the preference itself operates similarly across the lifespan. In light of these findings, there are several opportunities for future research. For example, is the added value associated with variety a result of a same-item decrement in same-item sets? Does the means by which a variety set is achieved influence variety selections? Does variety seeking vary across item categories? Lastly, how can variety be leveraged to help children (and adults) make better decisions? As these questions demonstrate, variety seeking in childhood is relatively unexplored,

resulting in much territory left to be discovered.

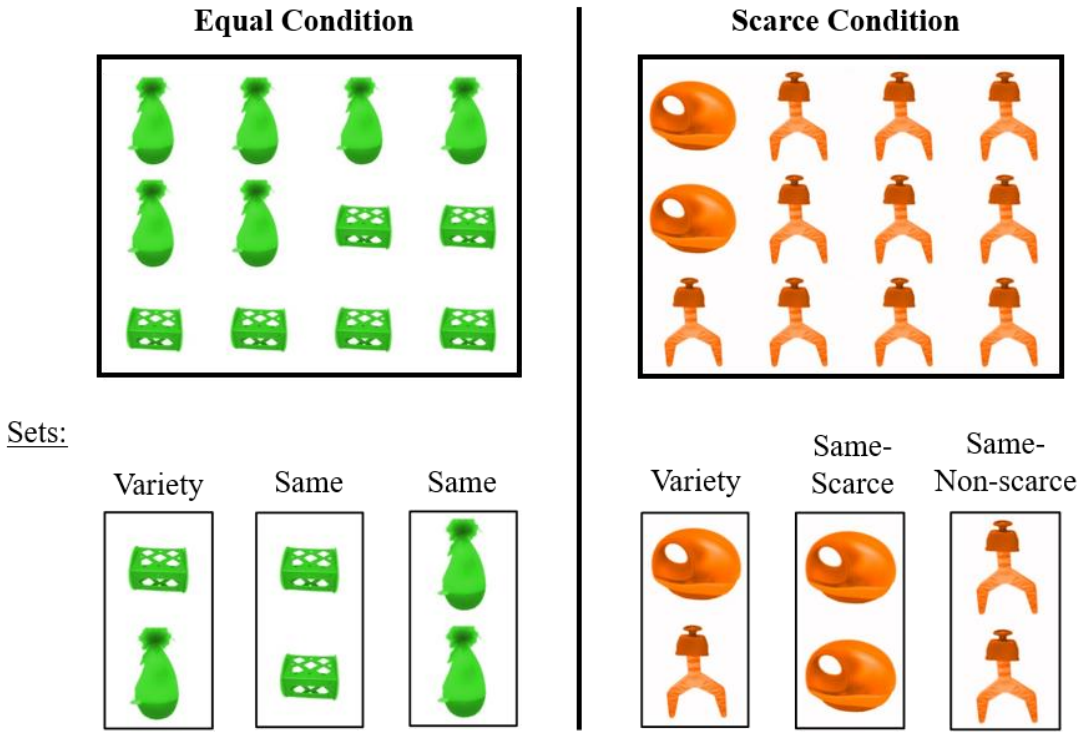

Figure 6. **Sample varied sets used in Equal and Scarce trials (Study 4).** Participants were first shown the complete set, then asked to determine how much people would pay for each set drawn from that complete set.

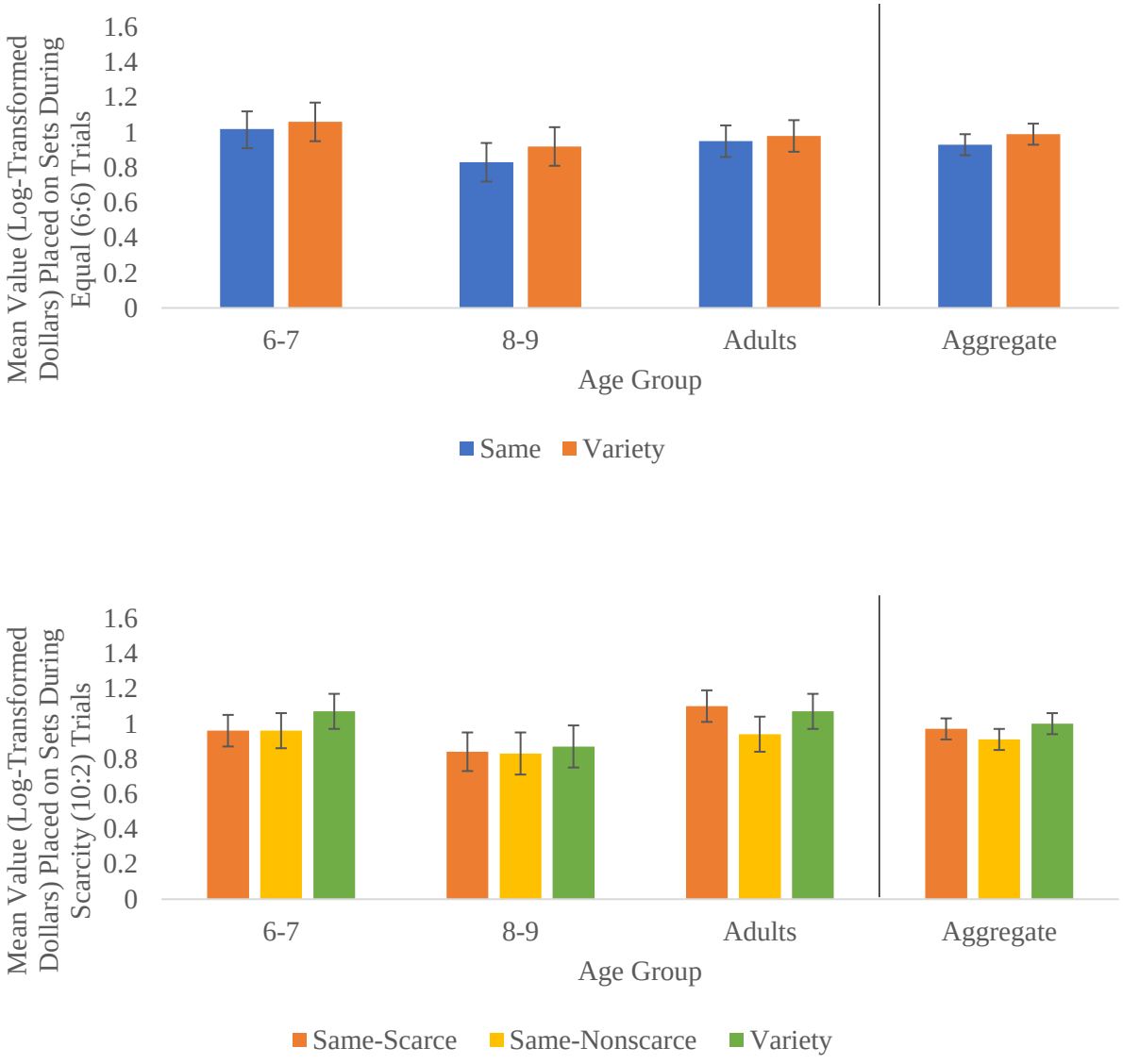

Figure 7. **Valuations placed on varied sets during Equal and Scarce trials (Study 4).** Mean values (log-transformed dollars) placed on sets during Equal (top) and Scarcity (bottom) trials by pair-type and age group.

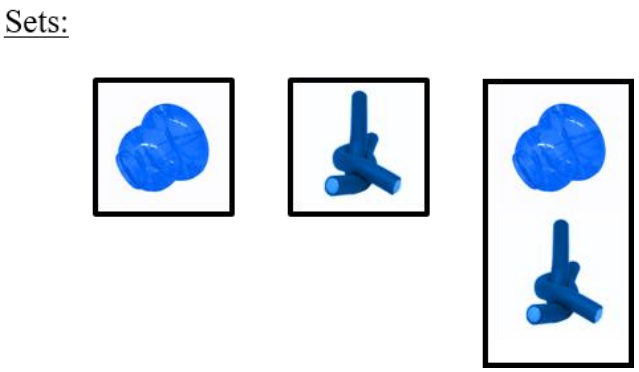

Figure 8. **Sample trial of individual items and varied set (Study 5).** Participants were asked to determine how much people would pay for each individual item and the varied set.

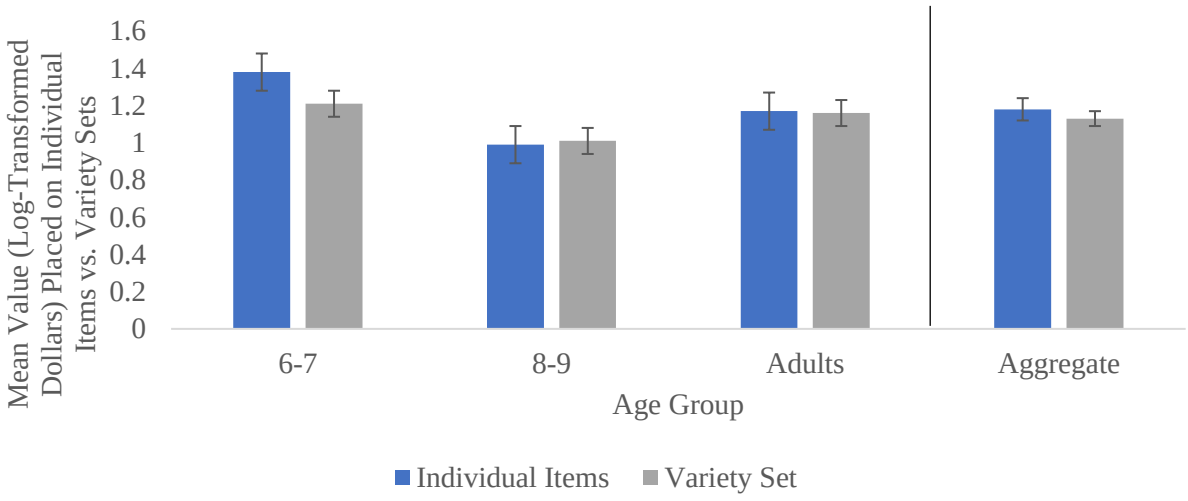

Figure 9. **Valuations placed on individual and varied sets of items (Study 5).** Mean values (log-transformed dollars) placed on individuals (A plus B) vs. sets comprising individual items (AB), by age group.

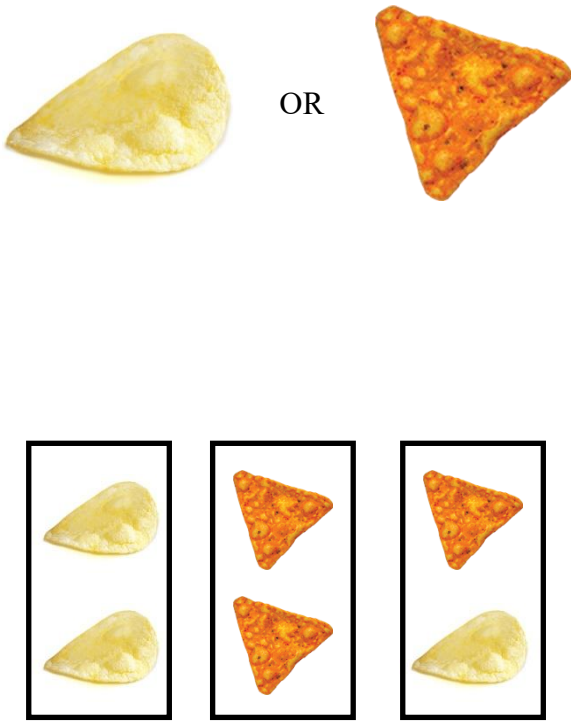

Figure 10. **Sample food trial (Studies 6-7).** Participants first identify which of two food items they prefer (or indicate that they are liked about the same). They then indicate which set of items would like for themselves.

Table 1

Proportion of set-type selections on no-preference and preference trials.

	No-Preference Trials	4-5 years	6-7 years	8-9 years	Adults	Overall
Study 6	**Variety Selections**	.66 (.40)	.77 (.34)	.72 (.41)	.82 (.34)	.74 (.38)
	Non-Preference Selections	.34 (.40)	.23 (.34)	.28 (.41)	.18 (.34)	.26 (.38)

	No-Preference Trials			Order 1	Order 2	Overall
Study 7	**Variety Selections**			.87 (.28)	.83 (.35)	.85 (.31)
	Non-Preference Selections			.13 (.28)	.17 (.35)	.15 (.31)

	Preference Trials	4-5 years	6-7 years	8-9 years	Adults	Overall
Study 6	**Variety Selections**	.20 (.30)	.20 (.25)	.19 (.22)	.23 (.24)	.21 (.25)
	Preference Selections	.70 (.35)	.76 (.25)	.80 (.22)	.76 (.24)	.75 (.27)
	Non-Preference Selections	.10 (.24)	.04 (.13)	.01 (.05)	.01 (.04)	.04 (.14)

	Preference Trials			Order 1	Order 2	Overall
Study 7	**Variety Selections**			.17 (.22)	.10 (.19)	.14 (.21)
	Preference Selections			.81 (.24)	.85 (.24)	.83 (.24)
	Non-Preference Selections			.02 (.09)	.05 (.13)	.04 (.11)

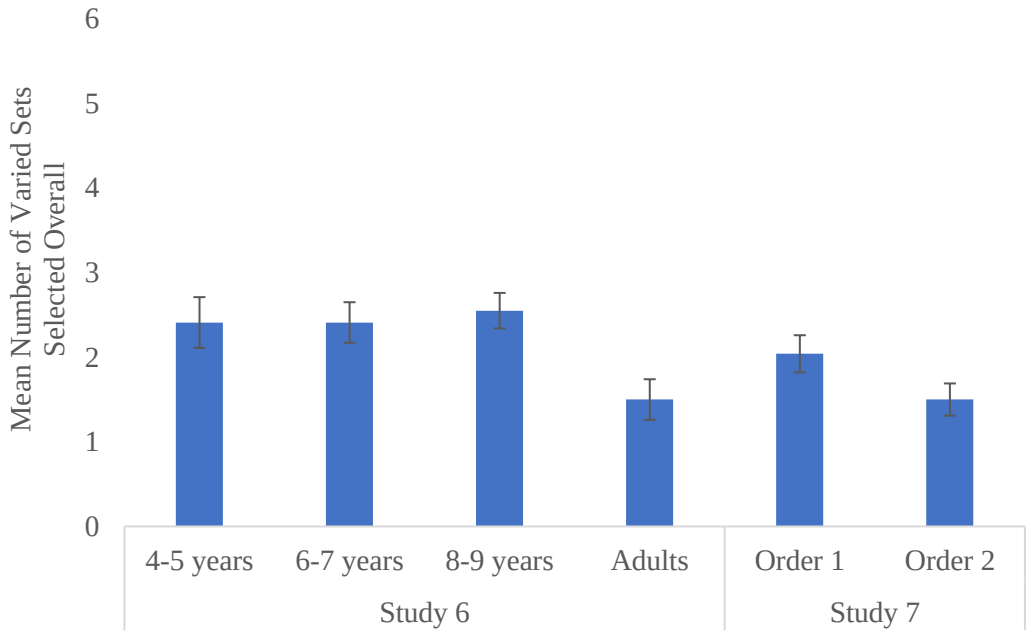

Figure 11. **Number of varied sets selected overall (Studies 6-7).** Mean number of varied sets selected overall by age group (Study 6) and condition (Study 7). Note that Study 7 only included adults.

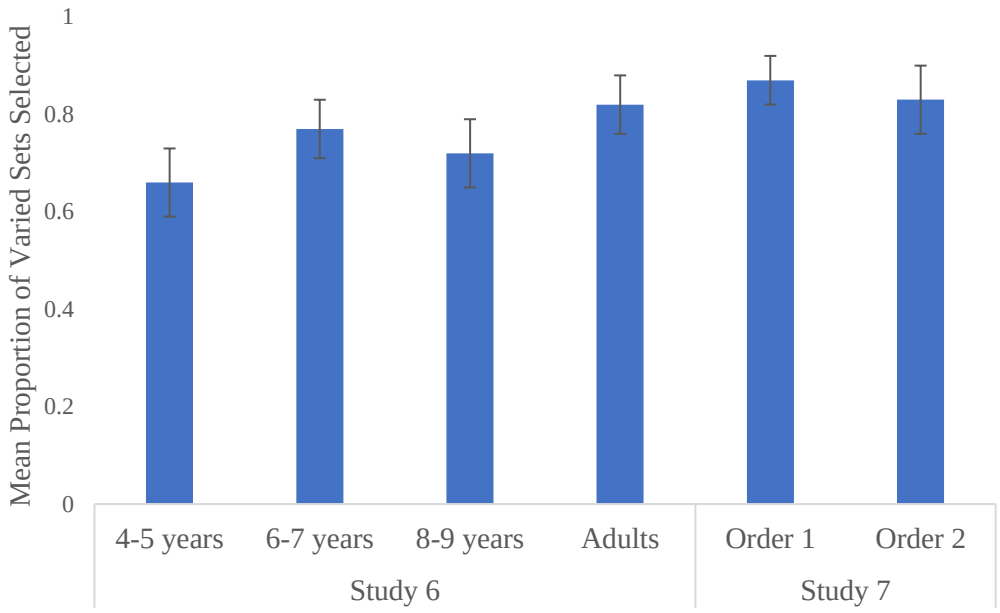

Figure 12. **Varied sets selected given no preference (Studies 6-7).** Mean proportion of varied sets selected given no preference indicated on at least one trial by age group (Study 6) and condition (Study 7). Note that Study 7 only included adults.

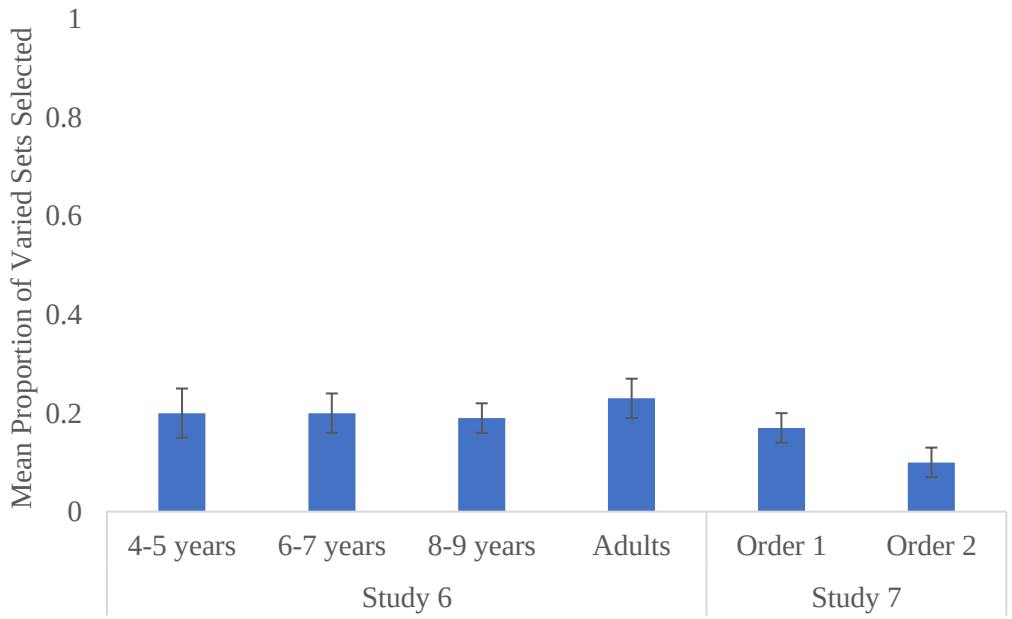

Figure 13. **Varied sets selected given a preference (Studies 6-7).** Mean proportion of varied sets selected given a preference indicated on at least one trial by age group (Study 6) and condition (Study 7). Note that Study 7 only included adults.

Chapter 4: General Discussion

Across seven studies, I tested children's and adults' direct motivations to select scarce items and varied sets. In Chapter 2, participants were asked to select one (Scarcity task) or two (Variety task) items from a set of two novel items that differed in their relative availability. Results revealed an early-emerging preference for variety but not scarcity, suggesting that variety has inherent value—i.e., variety is selected for the sake of obtaining it independent of other factors. In contrast, there was no early-emerging preference for scarcity per se, at least in this task. Additional work is needed to determine why participants in these studies showed little scarcity preference. One possibility is that items in Studies 1-3 were not scarce enough. Even when maximally scarce, scarce items were still represented at a ratio of 5:1. It is possible that participants would have been directly motivated to select scarce items had they been represented at a higher abundant-scarce ratio (e.g., 50:1). Similarly, because items were unfamiliar, their relative value and broader prevalence in the world were unknown. It is possible that participants would have been directly motivated to select scarce items had they had knowledge of the items' base rates and identities. Using unfamiliar items may have shifted participants' attention toward discerning the type/function of an item rather than its relative availability. Turning to context, it is possible that competition is required for a scarcity preference to emerge. Study 2 did not explicitly test whether competition yielded increased selection of scarce items. Instead, participants could have interpreted the two-person design (i.e., asking participants to select for themselves and an unknown other) as an opportunity to cooperate. In addition, because the other

person was unknown, participants were free to assume the other recipient's identity (e.g., participants could have assumed the unknown other was a friend or stranger). Lastly, it is possible that participants would have been motivated to select scarce items had they had knowledge of the source of the scarcity (e.g., items that are scarce due to popularity are preferred to items that are scarce due to unpopularity); however, this last point would not be consistent with a direct motivation to select scarce items, as the motivation is rooted in an external force.

Beyond the possibilities for which a scarcity preference may have not been obtained, children and adults behaved similarly across the present tasks. In the case of variety, this suggests that a preference for variety emerges early and may be consistent across the lifespan. For scarcity, however, the present results bring into question the oft-made assumption that scarcity in and of itself increases value (e.g., Mittone & Savadori, 2009). Scarce items were not selected at high rates, and in most cases selected at chance, suggesting that a general scarcity bias is not limitless.

In Chapter 3, I examined potential mechanisms underlying participants' preference for variety as well as the strength and limits of the preference itself. To test mechanisms, participants were asked to indicate how much people would pay for different sets of items. If participants valued variety and non-variety similarly, then the selection of varied sets in Studies 1-3 likely reflected indecision (i.e., "splitting the difference"). In contrast, if participants valued variety more than non-variety, then the added value associated with variety could be rooted in either utility maximization (whereby additional units of the same item are devalued) or hedging (whereby variety receives an absolute boost relative to the value of individual items). Results revealed that both children and adults assigned higher monetary values to varied sets compared to same-item sets, thus demonstrating that a variety preference is unlikely to reflect merely an

inability to decide among two choices. At the same time, however, the added value was not associated with a premium per se, as the value of a varied set was equivalent to the value of the sum of the component items. Rather, the source of the added value of variety is likely rooted in decreased value associated with subsequent units of the same items (i.e., the value of AA is worth less than two times A)—in line with proposals suggesting that variety offers opportunities to maximize utility (e.g., Kahn, 1995; McAlister, 1982).

Lastly, results from Chapter 3 revealed that the variety preference is limited. On sets for which participants preferred one food item to another, the preference for variety was reduced, suggesting that a preference for variety is strongest in contexts where items are equivalent in value. In this way, children and adults consider both variety and differential item value and flexibly privilege one factor (i.e., preference for an individual item vs. variety) over another. Subsequent work should examine whether and when children privilege variety over preference for an individual item. Overall, these dissertation data are the first, to my knowledge, to report on children's direct motivations to select variety and offer insight into how children determine item value.

A key goal of this dissertation is to understand the building blocks of value. Thus, these results have implications for our understanding of children as developing consumers. By taking a developmental approach to the study of consumer behavior, this line of work offers a unique opportunity to test the robustness of existing theories to development. For example, given that these studies reveal relatively few age group differences in performance, these data suggest that a basic variety preference may emerge relatively early and be unchanging. At the same time, I would expect additional factors that adults may use to determine value to change considerably with age. For example, adults have been shown to select variety as a means to appear more

interesting (e.g., Ratner & Kahn, 2002). At what age are children similarly motivated to select variety to appear interesting? Similarly, children may need more information to reason about the value (or lack of value) of scarce items. Children's attention to and use of information regarding scarce items requires additional empirical testing. For example, do children reason that items scarce due to being popular are more valuable than items scarce due to accidental loss? More generally, additional work is needed, as mentioned above, to conclude that children and adults are not directly motivated to select scarce items as they are variety. It may be the case that simply shifting from novel to familiar items would yield a scarcity bias (or shifting from a sparse context to a familiar context like a store), as the added information associated with knowing what items are may prompt participants to select those that are less available. For example, framing the same novel items used in Studies 1-5 as toys in a toy store may push participants to select scarce toys, as participants may infer that less-available toys are more popular or in higher demand. In this way, the context is familiar, even if the items are not, and participants can bring real-world knowledge regarding shopping and toy stores to bear on their decision making.

Overall, by approaching consumer behavior from a developmental perspective, we can better account for change over time and discern what is developmentally most basic. Behaviors associated with sophisticated processes in adulthood may actually be rooted in more basic capacities that come online in childhood. In contrast, behaviors that require additional knowledge and more sophisticated processing may emerge only in adulthood. In this way, the developmental approach allows for identifying mechanisms giving rise to behaviors and testing the influence of related cognitive capacities on children's decision making.

Limitations and Future Directions

Because the purpose of the present research was to test children's use of two possible

fundamental cues to value—scarcity and variety—the results are limited in their explanatory reach. Studies 1-5, in particular, were designed to assess direct motivations to use these cues, and thus provided as little information about the items as possible to isolate the effects of scarcity (relative availability) and variety per se on selections and valuations. For this reason, it is not possible to extend findings to contexts where more information is available to act on (e.g., information about for whom selections are being made, information about the source of the scarcity)—a conclusion supported by results from Studies 6-7, where variety was selected at a lower level when participants preferred one item to another compared to when they liked the food items similarly. Thus, when children (and adults) have more knowledge and familiarity with items, the use of scarcity and variety may increase or decrease as a result of competing preferences.

In addition, it is not entirely clear what should be concluded about scarcity and value. Selection was used as a proxy for value in Studies 1-3 and scarce items were selected at relatively low rates, especially when compared to variety selections. However, in Study 2, a self-other difference emerged when the scarce item was maximally scarce such that participants preferred to distribute the scarce item to themselves over someone else. Also, I observed a developmental shift in the valuations children and adults placed on varied sets that included one scarce item. These latter findings suggest that, at some level, children and adults were attending to relative availability (scarcity) in these tasks. However, if scarce items truly in and of themselves had greater value, I would expect greater selections of them in Studies 1-3. For this reason, subsequent work is needed to better understand the relation between variety and scarcity, and how preferences for one influence the other.

Another limitation concerns the shift to using consumable items in Studies 6 and 7. It is

possible that the lower levels of variety selections made in Studies 6-7 are a result of asking participants to select among consumable vs. durable items. Recall that the items used in Studies 1-5 were unfamiliar novel items with unknown functions, whereas the items used in Studies 6-7 were familiar food items. This shift in item category could have contributed to the overall decrease in variety selections, as subsequent units of similar food items arguably offer more utility than subsequent units of durable items (e.g., you cannot eat again a carrot you have already eaten, but you can use again a pen that you have used previously). Future work should directly compare scarcity and variety selections across product categories (e.g., consumable vs. durable; hedonic vs. utilitarian), particularly within participants, as results from this type of study offer the most direct test of the effects of different types of items. For example, the addition of information, such as knowledge of the items, may decrease selections of varied sets given a priori preferences, which would be consistent with results from Studies 6-7. In contrast, the additional information may increase selections of scarce items given participants' greater knowledge of base rates. However, before making generalizations, it would be necessary to test whether selections of scarce items and varied sets were influenced by item type. For example, participants may be more motivated to select consumable scarce items vs. durable scarce items—because once consumed, a consumable scarce item is simply no longer available (whereas it might be possible to obtain a scarce durable item at a later time). Similarly, participants may be more motivated to vary their selection of hedonic items vs. utilitarian items, depending on which needs should be met at any given time. In short, the influence of scarcity and variety preferences on children's decision making requires further investigation, as the present studies cannot directly compare selections across different item types (i.e., familiar vs. unfamiliar; consumable vs. durable; hedonic vs. utilitarian).

Beyond the type of item used, it is possible that bundling varied sets across Studies 4-7 resulted in an attenuated variety preference. Prior work with adults shows that adults are less likely to select variety when selections are made simultaneously vs. sequentially (Mittelman et al., 2014). In Mittelman et al. (2014), for example, participants who were asked to select two beverages either made one choice (simultaneous; choose a set of two items—i.e., choice options were bundled) or two choices (sequentially; choose one item, then choose another—i.e., choice options were unbundled). Results revealed that participants were more likely to select variety when making sequential choices than when making a simultaneous choice. In Studies 4-7, an effect of bundling could be realized as lower values placed on sets in Studies 4-5 and fewer varied sets selected in Studies 6-7. In these studies, the decision to bundle was made strategically. By bundling items, I could shift the focus of tasks in Studies 4-5 away from making selections to providing valuations, allowing participants to evaluate all choice options irrespective of their preferred set. Sets in Studies 6-7 were bundled to allow for comparisons to Studies 4-5. Nonetheless, subsequent work should directly test whether children are similarly sensitive to the process by which a varied set is achieved.

Another key consideration concerns the context in which participants were asked to make selections. For example, Ratner and Kahn (2002) found that adults select variety at higher levels when selections are public vs. private—due, in part, to wanting to "appear interesting." In the present research, children always made selections publicly (i.e., with an experimenter present), whereas this was not always the case with adults. Adults made selections privately (via online survey) in Studies 1-3 and Study 7, and made selections publicly (in a lab space) in Studies 4-6. The shift toward asking adults to make public selections was instituted to make the child and adult tasks more comparable. Importantly, however, results from Study 7 with adults suggest that

the public vs. private difference was inconsequential for these tasks—similar results were obtained for adults tested by an experimenter in Study 6 and adults recruited via MTurk in Study 7. Nonetheless, it would be important in subsequent work to test whether children's selections are sensitive to whether others have access to their decisions.

It is also important to note that participants were recruited from the United States. Children were recruited from a mid-sized Midwestern town (adults, too, in Studies 4-6), and given the limited representation of the sample, it is not possible to extend these findings across cultures, or even across contexts within the U.S. As Kim and Drolet (2003) found, levels of variety seeking differed cross-culturally—adults born in the United States (a historically more individualistic culture) sought more variety (as assessed via switching choice rules) than adults born in Korea (a historically more collectivist culture) who were living in the United States. Kim and Drolet reasoned that this difference was due to cultural motivations to either be unique (consistent with individualistic tendencies) or similar (consistent with collectivistic tendencies). Similarly, Kim and Markus (1999) found that selection of "unique" (i.e., scarce) items (e.g., uncommon- vs. common-colored pens) also differed cross-culturally. In their study, European American participants selected unique items more than Asian and Asian-American participants. Kim and Markus concluded that selections of items (e.g., scarce vs. non-scarce) reflect cultural norms more than characteristics of individual items (i.e., pen color), as selections offer one way through which people can express their culture. For this reason, Kim and Markus argued that the differences in selections across European American and Asian/Asian-American samples reflect adherence to different cultural norms. European Americans expressed endorsement of individualism through selecting unique items whereas Asian and Asian-American participants endorsed collectivism via selecting more abundant items.

Beyond cultural influences, choices of scarcity and variety may vary as a function of socioeconomic status, perhaps due to differential opportunities to save for the future vs. maximize opportunities for resources in the moment. For example, if an individual has few resources, they may prefer to choose additional units of items that they need at the present moment, forgoing the opportunity to select more varied items in anticipation of future unknown needs. In short, present (real) needs may trump future (possible) needs (Shah, Mullainathan, & Shafir, 2012; Shah, Shafir, & Mullainathan, 2015). Similarly, selecting scarce items may reflect an advantage associated with being able to forego more necessary abundant items. For example, in a context where scarce items are more costly, it may be more strategic to forego selecting a scarce item to obtain multiple abundant items. For this reason, it will be important for future work to disentangle the effects of culture and social context on both scarce-item and varied-set selections.

Lastly, the present research cannot directly disentangle effects of utility maximization and hedging on variety selections, as it was not designed to answer this question. Understanding direct motivations to select variety may offer opportunities to help children make better decisions (e.g., selecting healthier combinations of foods, diversifying their diets, etc.). At the same time, however, direct motivations to select variety may lead to less optimal decision making in some contexts (e.g., if offered a selection of desserts, a person may be motivated to eat more dessert than if offered just one type). For this reason, it will be important to harness direct motivations to select variety appropriately to promote better decision making. More generally, knowing how any of these and the above issues influence children's selections would inform how choices could be framed to help children. For example, if bundling influences children's selections, children could be prompted to plan out snacks daily rather than weekly (which could be the case

should their family grocery shop weekly). If asked to select snacks on a daily basis, children may be more inclined to vary their selections across the week. This could lead children to try out new foods and diversify their diet. This type of finding would be particularly timely given the increased attention to leveraging variety to promote health and well-being in childhood (e.g., Albuquerque et al., 2017).

Conclusions

The present research was designed to test children's use of two possible fundamental cues to value. Across six studies, children were shown to prefer and value variety across different items and choice contexts, whereas scarce items were relatively not preferred. When testing the strength and limits of a variety preference, I observed a shift away from variety when one item was preferred to another. Overall, results from these seven studies reveal that children as young as 4-5 years are directly motivated to select variety, that scarcity may not be inherently valued (at least in a non-competitive context with novel items), and that even children use variety as a strategy absent strong preferences to guide selections. With much work ahead, this area of research offers unique opportunities for researchers to greatly contribute to our understanding of not only the origins of value but also the developing child consumer.

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