An Evaluation of the Effects of the Number of Options within an Array and Time Constraints on an Individual's Preference for Choice-making Contexts

Mindy Cassano

A Dissertation Submitted to the Faculty of

The Chicago School of Professional Psychology

In Partial Fulfillment of the Requirements

For the Degree of Doctor of Philosophy in Applied Behavior Analysis

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Abstract

Previous research has found that choice in and of itself can be a reinforcer; however, research has also found there are limits to this, such as when there are too many choices. The current study, replicated and extended behavior-economic research using behavior-analytic methods by (a) determining the prevalence of preference for choice in a large number of adults, (b) evaluating large numbers of options on preference for choice and satisfaction, and (c) evaluating the effects of time constraints on an individual's preference for choice and satisfaction with those choices. Results showed that many participants preferred choice over no-choice contexts. One-third of the participants reached a breaking point during the choice overload phase and time constraint phase. Additionally, results indicated that it was more difficult to choose when there were more choices and when there was less time. These findings demonstrate that offering extensive amounts of options may have negative effects but suggest further research be conducted on more substantial contexts.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Catania (1975) stated that one can have "freedom" when alternatives are available and when individuals have options; however, this "freedom" may show to be paralyzing, in which a person does nothing at all or decides to give up their "right" to choose and allows someone else (or a computer) to choose for them. We live in a time where autonomy and freedom are highly valued and opportunities for self-determination are considered a sign of psychological well-being (Schwartz, 2000). Schwartz (2000) argued that autonomy, freedom, and self-determination can become excessive (overloaded) and too much freedom can be demotivating.

Research has shown that although many individuals seem to desire alternative choices; they do so by reducing their satisfaction levels (e.g., Iyengar & Lepper, 2000; Reed, Reed, Chok, & Brozyna, 2011; Reed, Kaplan, Brewer, 2012; Schwartz, 2000, 2004a, 2004b). Research has examined preference for choice comparing choice to no choice alternative and the number of items to choose from have varied across studies (Ackerlund Brandt, Dozier, Juanico, Laudont, & Mick, 2015; Fisher, Thompson, Piazza, Crosland, & Gotjen 1997; Karsina, Thompson, & Rodriguez, 2011; Miller, Kaplan, Reed, & White, 2017). Iyengar and Lepper (2000) evaluated whether more choices are better and if people really desire unlimited choices. Choice overload hypothesis states that when there is an increase in the number of selections, there may be a correlation to adverse consequences (Scheibehenne & Greifeneder, 2010). Some of these adverse consequences may be a decrease in satisfaction with the option chosen and/or a decrease in a motivation to choose. As previously discussed, there is some evidence showing that more choices can be psychologically detrimental; however, whether excessive choices effects preference for choice is still open. There is still not a cohesive understanding if whether having more selections can benefit preference for choice and when more choices can contribute to

negative emotional states and poor behavioral outcomes. This is important in applied settings as we don't want individuals to "give up" or end up choose nothing at all if there are too many choices and/or if they don't have enough time to make their decision. Miller et al. (2017) was the first attempt to evaluate choice overload using a behavior-analytic method and suggested further behavior analytic research on the effects of number and variety of options on choice behavior.

Purpose of the Study

The current study will replicate and extend previous research by using behavior-analytic methods to analyze decision making when given excessive numbers of choice and time constraints to make those choices; as well as, assess satisfaction ratings. This will be done by using a concurrent chain arrangement similar to Karsina et al. (2011). The findings will help to determine if more options are perceived as better to subjects. If people prefer more choices and what happens to a person's satisfaction when the number of choice options increase. This research will be conducted using a computerized program and participants will be given hypothetical choice options.

Research Question and Hypotheses

Research Question 1: Do people generally have a preference for choice?

$H_1$1: People do generally prefer to choose themselves.

Research Question 2: Does the number of options within an array affect an individual's preference for choice?

$H_1$2: As the number of options increases, people's preference for choice will shift from a preference to choose, to a preference to have a response chosen for them.

Research Question 3: Does the level of satisfaction decrease as the number of choice options increase?

$H_1$3: As the number of options increases, people's satisfaction with the choices that they made will change.

Research Question 4: What are the effects of having a time constraint on an individual's preference for choosing?

$H_1$4: Adding time pressure will change a person's preference for choice.

Research Question 5: What are the effects of having a time constraint on the level of satisfaction of those choices?

$H_1$5: Adding time pressure will change a person's satisfaction with their choice selection.

Scope of the Study

The scope of this study includes adults over the age of 18. Each participant was able to take the study in their own home, at their own pace, over a few days. It took approximately 60 to 120 minutes in total. During all phases, subjects were shown three colored boxes (blue, red, and yellow). After they picked one color, a series of symbols popped up on the next screen. There were four types of phases to be completed. The first type had a constant number of options to choose from (i.e., 4 symbols repeated). The second had different numbers of options to choose from that increased as the participant went through the presented questions (i.e., 8, 16, and so on). The third type was like the first and had a constant number of options to choose from. And the fourth type had a limited amount of time for the participant to make each choice. They were then asked 10 questions about their satisfaction throughout the study.

Definitions of Key Terms

Catania (2007/2013) defined *choice* as having two or more response options available at the same time. A dominance of one choice over another alternative in a sequence is called a preference hierarchy. *Concurrent-chain arrangements* have been used to study preference of

choice verses no choice using an initial link with two or more options, followed by associated terminal links in which the consequences arranged vary (Catania, 2007/2013). *Choice Overload Hypothesis* has been defined as "…provision of extensive choices may sometimes still be seen as initially desirable; it may also prove unexpectedly demotivating in the end" (Iyengar & Lepper, 2000, p.996). This hypothesis will be used to assess the *breaking point* at which a person switches choice preference context.

Summary

In summary, the desire to have alternative options is a current daily social norm which has increased greatly over the last 30 years (Haynes, 2009; Schwartz, 2004a). It is often believed that copious alternatives would increase an individuals' satisfaction with their experiences in finding products or activities that would best suit their interests and needs (Haynes, 2009). Paradoxically, recent researchers have suggested that large numbers of alternatives may have negative consequences; such as less satisfaction (Schwartz, 2004), choice regret (e.g., Reed et al., 2011), and lead the person to feel bad or not confident in the decision that they made (e.g., Iyengar & Lepper, 2000; Reed et al., 2012; Schwartz et al., 2002). This may seem counterintuitive. As Schwartz (2004) notes, ". . . the fact that some choice is good doesn't necessarily mean that more choice is better" (p. 3). Additionally, individuals are often faced with time-based pressure within choice-making opportunities which often leads to a decrease in quality of their decision in quality of their decision (Hahn, Lawson, & Lee, 1992), become more frustrating, less satisfied (Haynes, 2009). Presenting a restricted-time limit can enhance a person's uncertainty, contribute to second guessing, and may have negative psychological impacts (Schwartz, 2004a, 2004b).

Chapter 2: Literature Review

It is common belief that the more choices a person has, the better a person can manage their life, possibly due to perceived increase in autonomy or control (Leotti, Iyengar, & Ochsner, 2010). Through choice, we can control our environment either by increasing desirable aspects or decreasing aversive aspects of contexts/activities (Lefcourt, 1973). Perception of control has shown to be not only desirable, but also a biological and psychological *necessity* (Leotti et al., 2010). The results of some clinical, animal, and neuroimaging studies have shown that the need for control can be biological in nature. Leotti et al. (2010), and Catania (1975) stated that preference for stimulus arrangements with more alternatives may be due to both ontogenic (i.e., learning history of reinforcement throughout a person's life) and phylogenic (i.e., due to cultural or natural selection) factors. There may be a survival value (therefore phylogenic basis) through cultural or natural selection (Catania, 1975). For example, preferring different options/choices for water or food, opposed to fewer, would increase the likelihood an organism would survive if one of the options was no longer available.

So, what exactly is choice? Catania (2007/2013) defined choice as having two or more response options available at the same time. Furthermore, Catania discussed the question: is a choice something that is done before responding or is it the actual responding itself? If it is something that is done before responding, then it is a separate behavior and should be analyzed separately. Catania used the example of when a person is looking over a menu before ordering, they may list the alternatives and the pros and cons for each before choosing one item. A dominance of one choice over another alternative in a sequence is called a preference hierarchy, and concurrent-chain schedules are well suited for analyzing these preferences. A concurrent-chain arrangement is when stimuli associated with different schedules are presented concurrently

and selecting each may produce a different schedule or reinforcer (Catania, 2007/2013). Concurrent- chain arrangements have been used to study preference of forced choice verses free choice using an initial link with two or more options, followed by associated terminal links in which the consequences arranged vary (Catania, 2007/2013).

Catania (1975) stated that one may perceive to have more "freedom" when alternatives are available and when individuals have options. How much an individual or animal values freedom can be shown in how much they prefer the ability to be choose an alternative. However, this "freedom" may actually show to be paralyzing, in which a person does nothing at all. Schwartz (2000) uses an experience of when you go to a grocery store. We go shopping and see 100 different types of cereals on five different shelves. Should we get hot or cold cereal? Some cereals are sugar coated, others unsweetened; some with bran, others without. This one is $4.00, and the store brand is $3.00, but the store brand contains less contents than the name brand. This cereal is healthier, but will the kids eat it? The choices are overwhelming! Is there a point where a person sees "too" many options and walks away with nothing in order to avoid having to decide at all?

We live in a time where autonomy and freedom are highly valued and opportunities for self-determination is considered a sign of psychological well-being (Schwartz, 2000). However, Schwartz argues that autonomy, freedom, and self-determination can become excessive (overloaded) and too much freedom can be a kind of tyranny. He stated that modern American society's sense of freedom and the ideology of rational-choice theory (i.e., assumes people are rational choice makers) tends to result in people's dissatisfaction with their lives and sometimes ends in clinical depression.

Preference for Choice

Applied (Ackerlund Brandt et al. 2015; Fisher 1997; Karsina et al., 2011; Tiger, Hanley, Hernandez, 2006) and basic studies (Catania, 1975, 1980; Catania & Sagvolden, 1980) have shown that both humans and nonhumans often have preferences for two or more options which are called free choice contexts, and have also shown situations in which there was no clear preference, and other situations where preference was shown for only a single option (often called restricted choice). Marrer (2016) examined the choices of six undergraduate students who earned points in a computer game by selecting between restricted and free choice situations. When participants preference was established, the author then manipulated the point values to alter preference for choice to favor the nonpreferred choice arrangement. Marrer then assessed the durability of the new reinforced non-preference situation by returning to baseline fixed values. Last, the author aimed to see if a correlation existed between the performance of the participants and their self-rating using the Maximization and Regret Scales Results indicated that the participants who showed a preference for choice during baseline, also did so for the free choice situation, and no participants showed a preference from the restricted choice during baseline. In addition, that a history of reinforcement for one choice situation over another can affect preference when conditions are returned to baseline (Marrer, 2016). No clear statistical correlation was found between participant performance and scores on the Maximization and Regret Scales.

Ono (2004), examined free choice and forced choice using concurrent-chain schedules with pigeons. The preexposure arrangement conditions consisted of three pairs which are as follows: both terminal links had two keys which was free choice; both terminal links had one key which was forced choice; and last, there was a combination of free choice and forced choice

(Ono, 2004). During test conditions, the pigeon's preference shifted to the terminal links where they had no experience with following preexposure. Experiment 2 repeated the same procedure as experiment 1 except that the terminal link had intermittent reinforcers and included no combinational (free and forced choice) terminal link arrangement. The results here showed the same preference changes that occurred in the first experiment, but these changes did not appear immediately in the beginning of the test conditions (Ono, 2004). The data in this study suggested that previous experience is an important determinant of preference, even more than the difference between free choice and forced choice terminal links as a preference (Ono, 2004).

Skowronski and Carlston (1982) investigated the desire for choice and past choice experiences of 490 undergraduate students. Experiment 1 examined taste sequences and preferences. Sweet-tasting pills were considered positive outcomes and bitter-tasting pills were considered negative outcomes. There were two conditions: participants choice condition where the participants chose their sequence, and no choice where there was a predetermined sequence. The pills were manipulated so that some participants received more negative outcomes under choice than no choice conditions, others received more positive outcomes under choice than no choice conditions, and then some received equally positive outcomes under both conditions. All participants were exposed to both the no choice and choice trials and then asked to choose either choice or no-choice condition for their third set of trials and their expectations and perceptions were assessed. The authors also included control participants, intended to provide a baseline preference who received no practice trials at all and asked which condition they prefer for their choice trials. Results were that past experience with no-choice and choice did affect the participant's desire for choice and their perceptions (Skowronski & Carlston, 1982). Those

participants that were more successful during choice conditions were more like to select the final set of trials under the choice condition.

The purpose of experiment 2 was to determine if the subjective experience of no-choice and choice outcomes play an important role in the desire for choice as it is possible that the participants preference for the more rewarding conditions could be explained in terms of conditioning (Skowronski & Carlston, 1982). Therefore, to show that subjectivity plays a role in determining preference for choice, participants engaged in two conditions where no choice and choice were equally unsuccessful or equally successful in producing outcomes that were positive. Some participants experienced low success which was 5 sweets and 10 bitters and others experienced high success at 10 sweets and 5 bitters on both kinds of trials. Results showed that people do focus their success under conditions in which they can choose as there is a subjective perceived control; however, objective choice was ineffective in improving outcomes over no-choice both in the low-success or high-success conditions (Skowronski & Carlston, 1982). This desire for choice was found by the number of participants selecting to choose in the final trial (in experiment 1) and by the self-report measure in experiment 2.

Experiment 2 supports that the subjective judgements about the efficacy of choice and control, but it does not show that expectancies and control are mediators in the relationship between the preference for choice and experience (Skowronski & Carlston, 1982). Therefore, experiment 3 aimed to break the link between expectancies for future success and perceived control, thereby breaking the link between preference choice and experience. Experiment 3 methods was similar to experiment 2 except that some participants were told that the test trials might be different qualitatively from the practice skills. The other participants were given no information between the test and the preceding practice trials similarly to experiments 1 and 2.

Results were that when you break the link between past control perceptions and future expectancies, this weakens past outcome effects of their desire for choice (Skowronski & Carlston, 1982).

Influences of Choice on Responding

Fisher and Mazur (1997) reviewed basic-experimental studies that examined variables (i.e., rate, immediacy, and quality) that influenced choice responding. They discussed concurrent-operant arrangements where two or more response options are simultaneously available and connected with an independent schedule (terminal link). Using this arrangement allows experimenters to study whether one response was emitted over another and why. This is significant in applied research as there are almost always multiple response options in human environments and, as discussed earlier, many individuals seem to desire alternative choices; although, possibly reducing their satisfaction levels (e.g., Iyengar & Lepper, 2000; Reed et al. 2011; Reed et al., 2012, Schwartz 2000, 2004a, 2004b).

Concurrent-operant arrangements also provide a solid method of assessing individual preference between two or more reinforcers opposed to a single-operant arrangement, where only one reinforcer is available at a time (Fisher & Mazur, 1997). Having the opportunity to choose can yield a reinforcing effect as it is correlated with an individual's ability to access preferred stimuli. Also, choosing can have a reinforcing value that is independent to the chosen stimuli. Fisher et al. (1997) investigated the mechanisms underlying choice making in individuals with developmental disabilities through two experiments. During experiment 1, a concurrent-operant arrangement was used to determine preference for choice. Three concurrently available microswitches were available (e.g., choice key, no choice key, and a control key). If the participant responded on the choice key, two edible items to choose from were presented. If

they responded on the no-choice key, the experimenter delivered an edible item that they previously selected. If the participant responded on the control key, they were not presented with any edible item. The high-preference (HP) phase consisted of the same two highly preferred stimuli available on both the choice and no choice keys and a low-preference (LP) phase where the same two low preferred stimuli were available on the choice and no choice keys. The HP/LP phase consisted of one higher and one lower preferred item. The participant could choose between the higher and lower preferred item if the choice key was pressed and again the experimenter presented the same stimuli on a yoked schedule if the no-choice key was selected. Results indicated that all three participants preferred the opportunity to choose (Fisher et al., 1997).

Experiment 2 procedures were similar, but the experimenters assessed how strongly participants preferred choice over no-choice (Fisher et al., 1997). Presses on the choice key allowed the participant to choose but they had to choose between two LP items. Presses on the no-choice keys resulted in the experimenter choosing for them but with the selection half HP and half LP. Results of experiment 2 indicated that participants preferred having the choice option when the reinforcers in the conditions were the same (Fisher et al., 1997). However, they preferred the no-choice condition more over the choice condition when they received access to HP stimuli for pressing the no-choice key. This showed that the preference for HP reinforcers was more motivating than choice.

Tiger et al. (2006) determined the relative preference and reinforcing effects of choice contexts across two alternatives resulting in the same outcomes. The participants were one typically developing and five preschoolers with developmental disabilities. Study 1 used a concurrent-chain arrangement in which the initial link response led to three terminal links (e.g.,

choice of reinforcer delivery, an alternative no choice reinforcer, or no material reinforcer-control); all of which provided the same stimuli (Tiger et al., 2006). Each option (e.g., choice, no choice, and control) related to a different color worksheet for that option using the same labeling task. Five highly preferred edible items were placed behind the choice worksheet; one edible (identical to the edible in the choice option) was placed behind the no-choice worksheet; and an empty plate was placed behind the control worksheet. The participant was to select one of the three colored worksheets in the terminal link. Correct responses in the choice worksheet terminal link resulted in five edible items and praise which the participant could choose one. Correct responding in the no choice worksheet terminal link was access to one edible item and praise. Correct answers in the control worksheet terminal link resulted in only praise. The results of this study were five participants selected (and preferred) the choice option; however, preference for choice did not persist for two of them across the evaluation (Tiger et al., 2006). One participant actually preferred the no option. The study found that when outcomes across terminal links (e.g., choice, no choice, control) are identical, choice is preferred most. It is important to point out that the number of reinforcers in the choice option and no choice option was four versus one, which could have influenced participant's choice.

Schmidt, Hanley, and Layer (2009) addressed this limitation of Tiger et al. (2006) by examining whether different magnitude of reinforcers given across choice and no-choice context would result in preference for the choice context. Procedures were like Tiger et al. (2006) except the number of reinforcers (i.e., five edibles) offered behind the worksheets were equal across choice contexts. Results were most of the students still preferred choice (Schmidt et al., 2009).

Hayes, Kapust, Leonard, and Rosenfarb (1981) investigated preference for availability of food reinforcer alternatives using Rachlin and Green's (1972) concurrent-chain self-control

paradigm with pigeons. Each session consisted of 50 trials, 30 which were free trials (choice) and 20 which were forced trials (no choice). In the free trials, both the keys were white during the initial links. When the pigeon pecked on either key, both keys would blackout for one second. Then, one or both keys illuminated again to start a terminal link. If the peck on the initial link had been on the white key, the choice terminal link was accessible where one key turned red and the other turned green. A peck on the red key presented with immediate access to the food for T sec, followed by a blackout. T = the duration of access following the peck. If the pigeon pecked the green key, there would be a 4-sec blackout and then 4-sec of food, followed by 15 sec blackout intertrial. A peck on the other initial link white key presented the same sequence as just mentioned but only the green keys reinforcer conditions were produced following the terminal link. In the forced trials, only one key was illuminated n the initial link.

Results were that the pigeons selected the delayed access key in both links when the T was reduced to .25 seconds (Hayes et al., 1981). The authors found that this effect was not accounted for by the differences in the amount of food in the terminal links; by avoiding the immediate reinforcement key when it was not presented by a choice; or by avoiding a multi-key terminal link. The pigeons preferred the constraint over choice (freedom). Hayes et al. (1981) stated that the preference for choice is determined by the type of choices offered. It was interesting that the pigeons preferred constraints—limits or restrictions over choice. The findings of this basic study show that "freedom" is not always preferred (Hayes et al. 1981).

Although not always the case (as in Hayes et al., 1981), other researchers have found that there is a sense of freedom in one's ability to make his or her own choice. For example, Tiger and Reed (2015) stated that it is important for dependent populations to be provided choices in helping to maintain autonomy and express control. Choice-making opportunities may be

reinforcing in and of themselves based on phylogenic or ontogenetic origins (Catania, 2007; Tiger & Reed, 2015). Providing choices can result in increased academics, a reduction in problem behavior and an increase in compliance as such in, Tiger, Toussaint, and Roath (2010) study. Tiger et al. (2010) examined the effects of choice and no choice reinforcement with three children with autism across two single operant reinforcer assessments. The first assessment used a simple fixed ratio schedule and the second used a progressive ratio (PR) schedule. The PR schedule was used to quantify the strength of the preference for choice while systematically increasing the number of responses required for the individual to receive reinforcement. Results were higher rates of responding and higher breaking points (i.e., the last completed schedule before responding had ceased) in the choice sessions than in the no choice sessions for two of the three participants (Tiger et al., 2010). The PR schedule showed differential strength of choice making to enhance task responding. The fixed ratio assessment showed no differential effects. Overall, this study showed that having choice adds more value and reinforcing strength than having no choice.

Basic research has influenced applied studies in many ways. Tiger and Reed (2015) discussed how choice can be used for predicting high quality reinforcers and academic programing; how to understand response allocation in environments where there are multi-response choices; and how to systematically provide choice as a reinforcer.

Ackerlund Brandt et al. (2015) replicated and extended previous research on preference of choice with typically developing students. In addition, they sought to evaluate the history of differential outcomes associated with choice and no-choice and examined the correlations between preference for choice and age. Results were most of the students preferred to choose when child choice and experimenter choice resulted in the same outcomes (Ackerlund Brandt et

al., 2015). The results of the second study were preferences changed when child choice and experimenter choice had differential outcomes such that participants shifted to experimenter choice when the reinforcers were of higher quality. This had been shown in previous research (Fisher et al., 1997); however, differential history did not yield durable and reliable selection effects. The clinical implications for this research are using choice as an intervention to increase appropriate behavior and to reduce problematic behavior.

Karsina et al. (2011) investigated the effects of differential reinforcement for selecting a restricted choice and a free choice stimulus arrangement with seven participants. Karsina et al. (2011) conducted this study in efforts to determine if an experimental history of differential reinforcement may be in part responsible for preference for choice. More specifically, the authors used a computer-based game to evaluate the effects of a history of differential reinforcement for choice preference without programmed differential outcomes between the no-choice and choice outcomes. This was done using a multiple baseline across participants and a concurrent- chains arrangement. There were three sets of trials, each consisting of 40 trials, with the first 32 trials (i.e., 16 trials of restricted choice and 16 trials of free choice) of each set were used as exposure trials. The exposure trials presented with an initial free choice link (grey box stated “you select”) or the initial restricted choice link (grey box that stated “numbers generated”). These initial links were alternated every trial. In an array of eight numbers, participants selected any three numbers to enter into the blue box for the free choice arrangement. For the restricted choice arrangement, from an array of eight numbers, five random of the eight numbers were dimmed (in active to be clicked) and the participant was to put the left over three active numbers into the blue box. Reinforcement in the form of points was given on a variable ration schedule depending of the terminal link completion. The last eight trials of each

of the three sets were choice trials and both response options (i.e., “you select” and “numbers generated”) were presented to the participant on the screen. After the participant clicked on an option, the corresponding terminal link was immediately shown. The terminal links were the same as the terminal links in the exposure trials except that the reinforcement was now on a random-ratio schedule that corresponded to the variable-ratio schedule that occurred in the prior exposure trial. Random-ratio schedules were used because the number of exposures to the restricted choice and free choice terminal links could not be controlled during the choice trials. The participants were always able to see a running tally of the points earned.

The study findings were that in the initial sessions, none of the participants showed a consistent preference for restricted choice (Karsina et al. 2011). An increase in preference for free choice immediately during differential reinforcement of free choice selections and in the following sessions in the absence of the programmed differential outcomes was found. There were vast and sustained changes in choice preference for five of the seven participants indicating that a history of differential reinforcement for choice may influence choice preference. Overall, Karsina et al. (2011) findings show that a history of differential reinforcement can affect preference for choice; however, free choice arrangement only provided an array of eight selections for participants to choose three from, which can be considered a fairly small selection of choices. Much of the research on choice, especially on choice overload is with small sample sizes. Future research is warranted using larger arrays of choices, as well as larger sample sizes.

Choice Overload

Research has examined preference for choice comparing choice to no choice alternative and the number of items to choose from have varied across studies (Ackerlund Brandt et al., 2015; Fisher et al., 1997; Karsina et al., 2011; Miller et al., 2017). Tiger et al. (2006) evaluated

the influence of the number of items to choose from with children's choice selections. Three students participated that that showed persistence for choice found in study 1 as mentioned above. There were three terminal links, each connected with a different colored worksheet. The orange link corresponded with praise and four edible items in which the participant could choose from. The blue link corresponded to praise and a choice of two edible items (same edibles as in the orange link) to select from. The yellow worksheet (control) resulted in only praise. The quantity of the items to choose from was systematically manipulated from 4 to 16 (i.e., 4, 8, 12, 16 items). Results were that as the number of items presented to choose from increased, all the participants selected the corresponding terminal link (Tiger et al., 2006). That is, increasing the number of items enhanced their existing preference for choice. However, it is unknown if this phenomenon would have continued or would have had an inverse effect if the numbers of choices exceeded 16 items to select from. For example, it is possible that excessive choices (i.e., more than 16) may not prove to show the same results and should be further examined.

Although researchers have argued that there are psychological benefits of choice (Langer & Rodin, 1976; Zuckerman, Porac, Lathin, & Deci, 1978), there are some major concerns with this. Recently, researchers have suggested that large numbers of alternatives may have negative consequences, such as decreasing satisfaction of the decision, buyer's remorse, choice regret, and so on (Iyengar & Lepper, 2000, Schwartz et al, 2002; Schwartz 2000, 2004a, 2004b). In addition, researchers have hypothesized that although choice appears appear desirable, individuals can have difficulty managing complex choice (Dhar, 1997; Tversky & Shafir, 1992).

Iyengar and Lepper (2000) evaluated whether more choices are better and if people really desire unlimited choices. In the first experiment, consumers encountered a booth where they could taste from a display of 6 flavors (limited array) or a more extensive array of 24 flavors of

jam. The initial attraction to the booth and their purchasing behavior were analyzed. The study was conducted on two Saturdays and the two displays were alternated hourly in order minimize time-of-day effects. During initial testing, the consumers were able to taste as many jams as they wished. All the consumers that approached the booths received a $1 discount off any of the jams when purchasing. There were disguised condition codes listed on the coupon. If they wished to buy one of the jams, they then need to go to the relevant isle, shelf and select the jam of their choice and then purchased the item. This was done so regardless of the consumer contacting the tasting-booth, they still needed to go to shelf where the entire display of flavors was shelved. The numbers of customers who approached both booths were recorded, and an educated guess was made about the consumer's age, gender, and ethnicity. Results were that although the initial appeal of an extensive array was found to be appealing, individuals were more likely to purchase items when given a smaller array, than an extensive array (Iyengar & Lepper, 2000).

Experiment 2 included students in a psychology class that were offered the option to do extra credit with either a choice of 6 essay topics or 30 essay topics (Iyengar and Lepper, 2000). Results were college students were more likely to choose to complete an extra credit assignment and do a better-quality job when fewer options were offered (Iyengar & Lepper, 2000). Experiment 3 consisted of three groups: extensive choice, limited choice, and the no-choice control group. After the participants chose a selection from either the extensive array or the limited array, they sampled the chocolate of their choosing; the control group sampled chocolate that was chosen for them by the experimenter. All participants filled out a questionnaire that asked them questions about their choice but before they sampled the product to avoid a bias about the outcome of their choice. The questionnaire included questions about their satisfaction with the choice process, their expectations concerning the choices that they made, the subsequent

satisfaction with their choice and later on their purchasing behavior. Results indicated that individuals reported that they enjoyed choosing when they had a display of 30 chocolates more than the display of 6; however, participants were more dissatisfied and regretful with the choices that they made. These findings demonstrated that offering extensive amounts of choice (or choice overload) in trivial choice making can have significant demotivating effects but suggest further research should be conducted on more substantial contexts (Iyengar & Lepper, 2000).

When people have too many options, or are overloaded with options, they tend to look to end the choice-making process by finding a satisfactory choice rather than optimal, one that may take less effort (Iyengar & Lepper, 2000). Those who choose from an extensive choice context may feel more committed or responsible for making a choice. In turn, this responsibly may inhibit choosers from actually choosing out of fear and possible later regret due to finding the "best" option and their inability to invest the time and effort needed to do so could enhance their experience of regret with the chosen option. They may find the excessive choices frustration, difficult, overwhelming, and even consuming given the amount of information that they need to consider (Iyengar & Lepper, 2000).

Maximizers and Satisficers

Schwartz, Monterosso, Lyubomirsky, White and Lehman (2002) is another study that discussed the psychological effects that excessive choice may have on people, more specifically on how some people can sometimes feel worse as they have more and more options to choose from (i.e., maximizers). In their study 1, Schwartz et al. used two measuring instruments: one design was used to assess the tendency to experience regret and the other was designed to assess the tendency to maximize or sacrifice. The Maximization Scale was used to examine correlations between a well-established measure of well-being and responses to the maximization and regret

scales. There were 1747 participants divided into seven samples groups; for example, some came from different colleges, a 1-day seminar, and another recruited from a train station. Schwartz et al. defined satisficers as people who strive for "good enough" and maximizers as those that desire the "best" possible result. Results from the correlation analysis were maximizers reported to be less happy, less satisfied, be less optimistic and have less self-esteem than satisficers (Schwartz et al., 2002). Also, the maximizers reported to be significantly more depressed and have more regret with their decision making than the satisficers.

Schwartz et al. (2002) study 2 and study 3 examined the relative importance of social comparison (i.e., relative standing with one's peers) to satisficers and maximizers. A person may need to look at all options and all alternatives to be able to make the "best" decision or choice. If this is not possible, then when the maximizer ends up choosing, they may have more doubt or regret that there may have been a better choice. Maximizers may be inclined to rely on information on how others are choosing. Study 2 specifically investigated relations between maximizing tendencies with regret, happiness, and social comparison in relationship to consumer purchasing choices. Results were maximizers were more likely to engage in social comparison and were less satisfied with their choices than satisficers (Schwartz et al., 2002). Study 3 was similar to study 2 except it involved more of a direct manipulation in a controlled laboratory setting in order to stimulate more "real-world" peer comparison and contexts. The study involved participants completing anagrams and were given as much time they needed but the performance of an undergraduate peer was manipulated so it either looked like the participant experienced failure (i.e., peer performed better) or success (i.e., peer performed worse). Results were maximizers more adversely affected by social comparison (Schwartz et al., 2002). More specifically, maximizers who saw that their peers were able to solve the anagram with less time

expressed greater doubts in their ability and showed a greater increase in a negative mood than when they saw the peers solve fewer anagrams. Satisficers showed little to no response to the social comparison.

Schwartz (2004b) stated that having the opportunity to choose can enhance our lives; therefore, explaining why some believe that more choices are better and more beneficial. Some choice may be better than no choice, but lots of choice is not always better than less choice. Schwartz did not say that choice is bad, as choice can increase autonomy, control and be quite liberating; however, it is when the number of choices grow that we see the negatives escalate and a person becomes overloaded. Schwartz offered some possible explanations for why people often end up unhappy when they have more choices. He begins by breaking people down to two groups: maximizers and satisficers. As like in Schwartz et al., (2002), maximizers were defined as those who try to make the "best" possible decision and satisficers as those who try to for "good enough." A maximization scale was used to determine a person's propensity to maximize and their level of satisfaction using a Likert like scale ranging from 1 to 7 (complete disagree to completely agree) with questions such as, "I never settle for second best." If an individual had an average score higher than 4 (the scales midpoint) they were considered a maximizer, and those that had average score lower than 4 were considered a satisficer. Schwartz explained that one of the biggest differences between maximizers and satisficers was a person classified as satisficer will stop looking when they find something that meets their standards; whereas, maximizers keep looking by reading labels, checking out reviews and continuing to do research. Surely no one can evaluate every aspect of every item; even though maximizers try to do so, this tends to cause the process to be more daunting as the number of choices increase. And then after

making a choice, they tend to battle with the alternatives that they didn't get to look into and whether or not they made the "right" choice.

In the end, maximizers may make more objective choices than satisficers but are less satisfied with their decisions (Schwartz, 2004b). Results from over 1,000 participants were that maximizers tended to engage in more comparisons of products both before and after buying and took more time choosing what to buy (Schwartz, 2004b). In addition, maximizers were less satisfied, were less happy, and more often ruminated on their choices, feeling nagged by the alternatives that they did not choose or did not have time to investigate.

Choice overload hypothesis is when there is an increase in the number of selections, there may be a correlation to adverse consequences (Scheibehenne & Greifeneder, 2010). Some of these adverse consequences may be a decrease in satisfaction with the option chosen and/or a decrease in a motivation to choose. As previously discussed, there is some evidence showing that more choices can be psychologically detrimental; however, whether excessive choices effects preference for choice is still open. There is still not a cohesive understanding if whether having more selections can benefit preference for choice and when more choices can contribute to negative emotional states and poor behavioral outcomes (Reed et al. 2012). Chernev, Böckenholt, and Goodman, (2015) found that higher levels of decision task difficulty, higher preference of uncertainty, greater choice complexity, and effort-minimizing goals contributed to choice overload.

The adverse psychological experiences associated with excessive choice can include post-choice feelings of regret and a weakening of cognitive resources (Reed et al. 2011). In addition, some research shows that people tend to shy away from having too many alternatives. Reed et al. (2011) used a qualitative discounting framework to study choice overload by using

hypothetical scenarios with human service workers involving choice of treatment strategies. The individuals had three types of choices: single option, limited options, and extensive options. Results were that an individual's preference for extensive options decreased as the number of options increased (Reed et al., 2011). This shows that as people have more choice selections, their desire to choose is less.

Reed et al. (2012) also evaluated a correlation between a discounting effect and the *paradox of choice*. Reed et al. (2012) used the phrase "paradox of choice" to describe how having too many choices can lead to poor behavioral outcomes and negative states of mind. Using a within-subject design, the authors examined if an individual's discounting of many choices was connected to either delay or probability discounting. The results of this study were that the paradox of choice occurred due to the effort associated with the search-costs and the delay of the consequences associated with the effort of deciding (Reed et al., 2012). There were two main limitations within this study. Reed et al. (2012) did not study the dimensions of extensive sets of choice and the association of the paradox of choice in relation to delay discounting. Secondly, the procedures used cannot attest to the processes that are associated with the large data such as, an elimination procedure to pare down excessive choice to more manageable numbers.

Miller et al. (2017) conducted an applied study of choice overload with three typically developing preschoolers. Miller et al. used behavior-analytic procedures in investigating the effects large numbers of toy options had on preference and selection. Participants were given an array of 6- toys or an array of 30- toys for two minutes, presented in a randomized fashion. Sessions consisted of two to four trials per session (dependent on the participant) until there was a total of 10 trials complete per condition per participant. The experimenter presented the bin of

toys and informed the child to choose one toy to play with and set the timer for 2 minutes. The duration of the engagement time was recorded with the selected toy. Results were that all three children played with the most preferred item in the 6-toy array for longer durations than in the same item in the 30-item condition (Miller et al., 2017). In addition, results were that preference for the three least preferred items were also higher in the 6-toy array than in the same item in the 30- toy array. These outcomes provide preliminary evidence that large arrays may influence both engagement times and preference for items. All children engaged more frequently and for shorter durations with the larger arrays. Miller et al. also found that the relationship between the duration and frequency was much stronger with the smaller array conditions than the larger. Miller et al. was the first attempt to evaluate choice overload using a behavior-analytic method and suggested further behavior analytic research on the effects of number and variety of options on choice behavior.

Time Constraint Effects on Choice

In addition to the amount and variety of options provided, the amount of time an individual must make a choice may affect the choices made. Hahn, et al. (1992) tested the theory that information overload occurs when the time-related task demands exceed the capacity of the system. Subjects included high school students who were to decide on which college to attend or which company to work for after graduation. A 4 (informational load) x 2 (time pressure) x 3 (involvement level) design was used. The operational definition of the informational load domain was the number of attributes per the alternative. Some example attributes for college attributes were: distance from home, registration fee, number of students per professor, etc. Some example company attributes were: number of paid holidays, annual sales, distance from home, etc. The informational load was manipulated by 3, 6, 12, or 20 attributes per alternative.

There were two levels each for the variables: level of involvement and time pressure. Level of involvement included both high-involvement choice tasks and low involvement choice tasks. Half of the subjects had no time pressure and the other half were given a predetermined time to make their decision. Each student was given a questionnaire that included three components. The first included questions about satisfactory attribute levels rated on a 9-point scale. The second component consisted of the students having to choose the best and second-best choice from 10 alternatives. This is where the time pressure and information load conditions were imposed. In addition, there was an announcement that an award would be given for person that could make the best decision. The last component included questions about their plans after graduation, the time pressure they felt, and the degree of effort to read the material. The authors speculated that information overload effect is dependent on time pressure. When subjects are not hurried, the quality of their decisions increase; however, when time pressure is added, performance first increased and then decreased as the informational load increased. It is here that the decision quality decreases (Hahn et al. 1992).

Haynes (2009) builds on the research (e.g., Chernev et al., 2015; Reed et al., 2012) that suggests having large numbers of alternative may have negative consequences. Haynes (2009) examined the boundaries of the choice overload phenomenon using a 2 (3 selections vs. 10 selections) x 2 (2 vs. 5-minute decision time) factorial design between subjects. The number of alternatives were manipulated; as well as, the minutes of decision time. Sixty-nine subjects were randomly assigned to one of four conditions. Depending on their condition, participants were given a list to choose from an array of 3 prizes or 10 prizes, each worth around $100. The experimenter then told them they would be given either 2 minutes or 10 minutes to read the descriptions and decide. The participants were given a post-decision questionnaire that was

completed to measure the difficulty of decision making, satisfaction, regret and enjoyment of the task (Haynes, 2009). Results were that individuals that had less time to decide with a larger amount of choices found their decisions to be more frustrating, more difficult, and less satisfied than the individuals that had more time, but those with larger options found more enjoyment with the task (Haynes, 2009). Individuals with larger alternatives were found to be less satisfied but did not have less regret as originally hypothesized.

In summary, the desire to have alternative options is a current social norm and has increased greatly, especially in Western Societies (Haynes, 2009; Leotti et al. 2010; Schwartz, 2000). Schwartz (2004a) even goes as far as saying that "human existence is defined by the choices people make" (p. 2). We make choices every second of every day and there are always alternatives to choose from. Although researchers have argued that there are psychological benefits of choice, there are some major disadvantages when there is a cumulative effect of choice that can lead to distress (e.g., Iyengar & Lepper, 2000; Scheibehenne & Greifeneder, 2010; Schwartz, 2000, 2002a, 2004b; Schwartz et al., 2002). Recent researchers have suggested that large numbers of alternatives may have negative consequences; such as less satisfaction (e.g., Schwartz 2004b; Schwartz et al., 2002) choice regret (e.g., Reed et al., 2011), and lead the person to feel bad or not confident in the decision that they made (e.g., Iyengar & Lepper, 2000; Reed et al., 2012; Schwartz et al., 2002). Additionally, individuals are often faced with time-based pressure within choice-making opportunities which often leads to a decrease in quality of their decision in quality of their decision (Hahn et al. 1992), become more frustrating, less satisfied (Haynes, 2009). Presenting a restricted-time limit can enhance a person's uncertainty, contribute to second guessing, and may have negative psychological impacts (Schwartz, 2004a, 2004b). This is important in applied settings as we don't want individuals to

"give up" or end up choose nothing at all if there are too many choices and/or if they don't have enough time to make their decision.

Purpose of Study

The primary purpose of the current study is to replicate and extend previous behavior-economic research on preference for choice, excessive choice and satisfaction using behavior-analytic methods. This will be accomplished through three, specific purposes. The first will determine if participants have preference for choice using a concurrent-chain arrangement. The second will be to evaluate whether the increase in the number of options within an array will affect an individual's preference for choice, possibly creating a breaking point. In addition, to determine the level of satisfaction of choice following changes in options using a repeated measure of self-reported satisfaction. The third purpose will be to evaluate the effects, if any, of time constraints on an individual's preference for choosing and the level of satisfaction of those choices using the same measures stated above.

Chapter 3: Methods

Participants

There were 40 participants in this study, 13 males and 27 females. There were seven participants aged 18-29, twenty-three participants aged 30-39, two participants aged 40-49, seven participants aged 50-59 and one participant aged 60-69. Participants were recruited through announcements posted on the authors social media account. The inclusion criteria included: being 18 years of age or older, the ability to read English, be able to use and navigate through computer program without assistance using a mobile device, tablet or computer, having a consistent internet connection, and agreeing to participate in multiple sessions. The time to completion will was dependent on individual performance but on average took 90 to 120 minutes over multiple days.

Consent Procedures

The screen of the computer program consisted of the participant selecting to consent or not consent to participate. Participants selected a box attesting to the fact that they were 18 years of age or older, able to read English and able to use and navigate the program on their own using a mobile device, tablet or computer and that they have consistent internet access. If they select 'no,' they were thanked for participating thus far and the program will close. If they select 'yes,' they were able to continue.

Settings & Apparatus

Sessions took place in the participants home or area of convenience, but it was suggested that they find a quiet place away from distractions. Each phase took a different among of time. Generally, phase one and three took 5-minutes, where phase two and four took approximately 30 to 40 minutes. Each phase had anywhere from 30 trials to 600 trials depending on individual

progress. Participants were able to complete all four phases of the study in one day but needed to take a computer forced 30-minute breaks in between phases. Most participants took approximately 3 days to complete the study.

The bulk of the program logic was done in the frontend javascript code, and some processing was done on webserver in C# programming. The web application and server-side code used to put it online was created using Microsoft ASP.NET MVC to be accessed from any type of internet-connected device. Sessions necessitated a desktop computer, laptop, mobile device with internet connectivity capability. It was recommended that participants use a desktop computer, laptop, or larger tablet instead of a mobile device, such as a phone, as the program will include many choices during some trials, and it may be difficult to scroll through them all; however, they will not be disqualified if they used a mobile device.

Dependent Variable & Response Measurement

There were three primary dependent variables in this study, the number of choice selections, the level of satisfaction and the number at which a breaking point occurred. The first dependent variable, *choice selection* was defined as the selection of one out of three presented choice contexts (choice, no-choice, and no control). The *choice* context allowed the participants to choose an item from an array of options. For example, if the array included a heart, triangle, and square symbol the participant was able to choose their preferred symbol from the choice selection. For the *no choice* context, the computer will choose an item for them out of the same choice items. For example, if the choice array included a symbol of a heart, triangle and square, the computer would choose randomly one of these items for the participant. For the *control* context, no choices could be made by the individual or the computer. This option served as the control because it was assumed that the participants would be less likely to select an option that

included no opportunities to choose and provided evidence to context discrimination. Choice selection was measured as the frequency that each context is selected per session. A more frequency selection for one choice option over the others suggested a preference for the associated choice option.

The second dependent variable, *level of satisfaction* was defined as favorability and/or contentment of the individual's selections and was measured using a 7-point Likert scale at the end of each session. Participants were prompted to select 1) strongly dissatisfied, 2) dissatisfied, 3) somewhat dissatisfied, 4) neutral (neither satisfied nor dissatisfied), 5) somewhat satisfied, 6) satisfied, or 7) strongly satisfied to describe their level of satisfaction with their choices after every 10 trials. And then again at the very end of the study, participants were given the same scale to rate their satisfaction overall after the completion of the study. The first three questions used the scale above. Questions four through eight used a similar scale and were prompted to select 7) strongly agree, 6) agree, 5) somewhat agree, 4) neutral (neither agree nor disagree), 3) somewhat disagree, 2) disagree, or 1) strongly disagree to describe their level of satisfaction with their choices. And the last two questions were yes or no questions.

The third dependent variable, the *breaking point* was defined as the point at which the participant switched choice preference contexts or the point at which the data showed high variability where a preference for choice could no longer be determined. Breaking points were evaluated during the choice overload evaluation and during the time constraint condition Breaking points were assessed to determine if there was a point at which a person longer prefers choice.

A Pearson's correlation was also conducted using the data from the satisfaction survey and the social validity survey. At the end of each session (10 trials), the participants were asked

to answer a 1-question survey on their satisfaction level for that session and then at the very end of the study, an additional 10-questions on their overall levels of satisfaction and level of agreement. A Pearson correlation is a method use to examine the relationship between two quantitative and continuous variables. Pearson correlation coefficient (r) is used to measure the strength of relationship between the two variables.

Interobserver Agreement & Treatment Integrity

Interobserver agreement was not needed as the computer programs (and Statistical Package for the Social Sciences [SPSS]) was used to generate the data and analyses. SPSS is a data packaging system that performs high quality complex analysis and data manipulation.

Treatment integrity was also not needed as the sessions were conducted via a computer program. However, tests were conducted by the researcher throughout the study to ensure the program was running correctly. These tests included the researcher opening sessions within different conditions and completing the trials to ensure all links were functioning correctly.

Experimental Design

An ABAC reversal design was used to demonstrate experimental control. See Appendix A, figure 1 for the Experimental Design Sequence. The first phase consisted of a choice assessment (baseline) phase (A). This phase was used to determine a relative preference for context. See Appendix C, figures 2-5 for example Choice Assessment initial and terminal links. Following the choice assessment, participants advanced into the choice overload evaluation (phase B). This phase was used to determine a change in preference for context given excessive choices. See Appendix C, figures 6-9 for example Choice Overload Evaluation initial and terminal links. And then, following the choice overload assessment, participants returned-to-baseline (A) and took the choice assessment phase again. This phase was used to determine if

there is preference for choice again with less choices. The next phase was the time constraint evaluation (phase C). This phase was used to determine if limited time changes preference for context. See Appendix C, figures 10-13 for example Time Constraint Evaluation initial and terminal links.

A concurrent-chain arrangement was used within sessions to measure preference across choice contexts. A concurrent-chain arrangement includes two or more schedules that operates concurrently, each producing a different reinforcer or outcome (Catania, 2013). Preference for each choice context was evaluated based on the participant's selection in the initial link. Control in responding across the three choice contexts was shown through differentiation between the choice, no choice, and control data paths.

Procedures

Each participant completed three practice trials that introduced them to each context (i.e., choice, no choice, and control). Each session consisted of 10 trials, each consisting of an initial and terminal link. During the initial link of each trial, the computer showed a different choice context: choice, no choice, and control. At the beginning of each trial, the participant was asked to choose the symbol that they prefer the most. After the participant selected a choice context, the terminal link associated with that option popped up on the screen. During the terminal link, the participant followed the instructions for that choice context. For example, if the participant selected the choice context, they would then choose which symbol they preferred most. The first phase consisted of a choice assessment phase (See Appendix C, figures 2-5). The participants' that demonstrated a preference for choice moved on to the next phase which was the choice overload evaluation (See Appendix C, figures 6-9). If the participant showed a preference for choice or reached a breaking point, participants went back to the baseline phase and took the

choice assessment again. If they again showed a preference for choice in the second-choice assessment, they would advance into the time constraint evaluation (See Appendix C, figures 10-13). This looked the same as the choice overload evaluation except there was an addition of a timer. Each trial began with an initial link and end with a terminal link.

Initial Link. As mentioned, the initial link included a condition-specific written prompt (see below) and three buttons. Each colored button was association with a different choice context (choice- Blue, no choice- Red, and control- Yellow).

Terminal Link. After the participant selected a colored button, they advanced to a screen displaying a condition-specific number of stimuli (see below). Depending on the selected context, there was another written prompt above the stimuli.

Choice. During the choice terminal links, the participant clicked on their chosen symbol and that symbol appeared in a blue box, the other stimuli disappeared. After the participant had made their selection, there was a 2 second delay before the next trial began.

No choice. During the no choice terminal links, the same group of symbols were presented for 2 second (s), and the other stimuli disappeared. After the stimulus had been randomly selected by the computer, there was a 2s delay before the next trial began.

Control. During the control terminal links, the written prompt read "No choice will be made." The same group of stimuli was presented for 2s and then all the stimuli disappeared. After the stimuli disappeared, there was a 2s delay before the next trial will began.

Choice Assessment. During the choice assessment, the number of stimuli presented in the terminal link remained constant across sessions. The written prompt in the initial link read "On the following screen, you will be presented with 4 symbols. Please select whether you would like to choose yourself, the computer to choose, or no choice will be made by selecting one of these

buttons." The same four stimuli were presented in the same positions across all three, terminal links. The stimuli may have change from trial to trial, but the same stimuli were always presented across terminal links within a trial. The participants' that demonstrated a preference for choice (consistent pressing of the blue choice button) for at least 7 out of 10 trials for three consecutive sessions moved on to the next phase. The participants who did not show preference for choice (did not obtain 7 choice out of 10 trials for three consecutive sessions up to 12 sessions or chose 4 choice or less out of 10 trials for three consecutive sessions) were thanked for their time and the study was terminated. Each session of 10 trials ended with a satisfaction survey. The purpose of this phase was to evaluate whether the participant showed a preference for choosing when the number of stimuli in the array was low and constant.

Choice Overload Evaluation. Participants who showed a preference for the choice context during the choice assessment advanced to the choice overload evaluation. The procedures were like the choice assessment, except the number of stimuli in the array increased systematically across sessions. The written prompt in the initial link read "On the following screen you will be presented with X number (e.g., 8, 16, 32, 64, 96) symbols. Please select one of these buttons below." During the first session of the choice overload evaluation, the number of items increased from 4 to 8. After three sessions in which the participant continued to show a preference for the choice context (7 blue out of 10 trials for three consecutive sessions up to 12 sessions), the number of stimuli was doubled (except for the last number of symbols). For example, from 8 to 16, then to 32, then to 64 and then 96 symbols (last array). However, if at any point the participant stopped showing a preference for choice (breaking point) they moved on to the choice assessment phase again (return-to-baseline). For example, when reaching 16 symbols, if a person selected less than 7 out 10 trials for 3 consecutive sessions, they automatically moved

on to the choice assessment phase again and did not go to the next set up symbols which would be 32. Each session will end with a satisfaction survey.

Time Constraint Evaluation. If the participants continued to show a preference for choice in the second-choice assessment phase they advanced to the time constraint evaluation. In this phase, all procedures remained the same as the choice overload evaluation except with the addition of a time limit in which selections had to be made. The written prompt in the initial link read "On the following screen you will be presented with X number (e.g., 8, 16, 32, 64, 96) symbols. You will have X amount of time to complete your choice. Please select one of these buttons below." The length of time was based on an average amount of time a group of test participants selected a stimulus during the terminal links of the choice assessment cut in half. For example, it took on average 10s for a participant to choose from 8 symbols, so the timer was set for 5s. It took on average 14s for a participant to choose from 16 symbols, so the timer was set for 7s. It took on average 16s for a participant to choose from 32 symbols, so the timer was set for 8s. It took on average 18s for a participant to choose from 64 symbols, so the timer was set for 9s. It took on average 20s for a participant to choose from 96 symbols, so the timer was set for 10s. A timer countdown was shown on every trial to inform the participant of how much time they had to make a selection. If the participant chose a stimulus within the time limit, the same consequences occurred as previous phases. If the person did not make a selection within the time frame allowed, the next trial popped up and that trial was counted as a no choice.

Satisfaction survey. At the end of each session, there was a satisfaction survey. The survey contained one question that was rated using a 7-point Likert scale: "Overall, how satisfied are you with your choices of symbols during this session?" The definition of satisfaction was provided each time this question is asked. Underneath the question, there was seven numerals

listed with their designations written underneath (7 = strongly satisfied, 6 = satisfied, 5 = somewhat satisfied, 4 = neutral (neither satisfied nor dissatisfied), 3 = somewhat dissatisfied, 2 = dissatisfied, 1 = strongly dissatisfied). Once they selected one of the seven satisfaction levels, the session was considered complete.

Social Validity Survey. At the end of the study, the participants were presented with a 10-question social validity survey. This survey included the respondent's overall satisfaction of their choices of symbols made per condition using a similar Likert scale as the previous satisfaction surveys. Additional questions about the different phases were also included such as: "Did you find it more difficult to choose when there were more options? Did you find it more difficult to make a choice when you were being timed? For specific questions see Appendix C, Table 1.

Chapter 4: Results

Choice-selection data from the separate phases are presented in figures 1-16. Sessions are depicted across the x-axis. Percent of selection are depicted along the left y-axis and satisfaction rating across the right y-axis. The circle data denotes choice selection. The square denotes no choice selection and the triangle denotes the control selections. The open data points are the baseline choice assessments (phase 1 and 3) and the closed are the intervention changes (phase 2 and 4). The shaded bar graphs show the satisfaction at each session (also represented by the right y-axis). The brackets at the top of the graph show the number of symbols (stimuli) during each session.

Choice Assessment Results

Choice assessment data included the percentage of selections for the participant choice, no choice (i.e., computer choice) and control options and the satisfaction score for each participant are depicted through figures 1-7. Overall there were three patterns of behavior. First some participants responded at high rates for choice selection which indicates preference for choice *(n* = 27). Others showed high rates for no choice selection which indicates a preference for no choice (*n* = 8). And last, some participants showed variable patterns that showed indifference between choice and no choice (*n* = 5).

Figure 1 shows the results for Eden, Kerry, and Kendra, who all showed preference for choice with some variability in responding. Eden (top left panel) selected the choice option most frequently (*M* = 7) as compared to the no choice (*M* = 3) and did not select the control option. Eden's average satisfaction was somewhat satisfied (*M* = 5.4). Kerry (top right panel) selected the choice option most frequently (*M* = 9.5) as compared to the no choice (*M* = 4.7) and did not select the control option. Kerry's average satisfaction was somewhat satisfied (*M* = 5.4).

Kendra (bottom panel) selected the choice option most frequently (*M* = 7.2) as compared to the no choice (*M* = 2.8) and did not select the control option. Kendra's average satisfaction was somewhat satisfied (*M* = 5). These data indicate that, for some participants, there was an overall preference for choice selection; however, they did not respond exclusively to the choice option and showed some variability, which may have been due to learning the contingencies.

Figures 2, 3, 4 and 5 shows the results for 24 participants who responded at consistently higher frequencies for the choice option, as compared to the no choice or control options, throughout the choice assessment. Figure 2 shows the results for Reana, Franny, Bob, Lily, Matt and George. Reana (top left panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Reana's average satisfaction was strongly satisfied (*M* = 7). Franny (top right panel) consistently selected the choice option most frequently (*M* = 9) as compared to the no choice (*M* = 1) and did not select the control option. Franny's average satisfaction was somewhat satisfied (*M* = 5.3). Bob (middle left panel) consistently selected the choice option most frequently (*M* = 8.3) as compared to the no choice (*M* = 1.7) and did not select the control option. Bob's average satisfaction was satisfied (*M* = 6). Lily (middle right panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Lily's average satisfaction was satisfied (M = 6). Matt (bottom left panel) consistently selected the choice option most frequently (*M* = 8.7) as compared to the no choice (*M* = 1.3) and did not select the control option. Matt's average satisfaction was between neither satisfied nor dissatisfied and somewhat satisfied (*M* = 4.7). George (bottom right panel) consistently selected the choice option most frequently (*M* = 8.3) as compared to the no choice (*M* = 1) and control (*M* = .67) options. George's average satisfaction was between neither satisfied nor dissatisfied and somewhat satisfied (*M* = 4.7).

Figure 3 shows the results for Jude, Dallas, Natalie. Nala, Vito and Mason. Jude (top left panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Jude's average satisfaction was neither satisfied nor dissatisfied (*M* = 4). Dallas (top right panel) consistently selected the choice option most frequently (*M* = 9) as compared to the no choice (*M* = 1) and did not select the control option. Dallas's average satisfaction was between neither satisfied nor dissatisfied and somewhat satisfied (*M* = 4.7). Natalie (middle left panel) consistently selected the choice option most frequently (*M* = 9.7) as compared to the no choice (*M* = .34) and did not select the control option. Natalie's average satisfaction was neither satisfied nor dissatisfied (*M* = 4). Nala (middle right panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Nala's average satisfaction was satisfied (*M* = 6). Vito (bottom left panel consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Vito's average satisfaction was strongly satisfied (*M* = 7). Mason (bottom right panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Mason's average satisfaction was strongly satisfied (*M* = 7).

Figure 4 shows the results for Karley, Kelly, Diane, Becka, Dan, and Jim. Karley (top left panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Karley's average satisfaction was neither satisfied nor dissatisfied (*M* = 4). Kelly (top right panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Kelly's average satisfaction was strongly satisfied (*M* = 7). Diane (middle left panel) consistently selected the choice option most frequently (*M* = 8.7) as compared to the no choice (*M* = 1) and the control (*M*

= .34. Diane's average satisfaction was satisfied (*M* = 6). Becka (middle right panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Becka's average satisfaction was satisfied (M = 6). Dan (bottom left panel consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Dan's average satisfaction was between satisfied and somewhat satisfied (*M* = 5.7). Jim (bottom right panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Jim's average satisfaction was satisfied (*M* = 6).

Figure 5 shows the results for Ruby, Sally, Molly, Connie, Lucy and Addie. Ruby (top left panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Ruby's average satisfaction was satisfied (*M* = 6). Sally (top right panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Sally's average satisfaction was satisfied (*M* = 6). Molly (middle left panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Molly's average satisfaction was satisfied (*M* = 6.3). Connie (middle right panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Connie's average satisfaction was satisfied (*M* = 6). Lucy's (bottom left panel consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Lucy's average satisfaction was satisfied (*M* = 6.3). Addie (bottom right panel) consistently selected the choice option most frequently (*M* = 10) and did not select the no choice or control option at all. Addie's average satisfaction was between neither satisfied nor dissatisfied and somewhat satisfied (*M* = 5.7).

Overall these data in Figures 2, 3, 4 and 5 show preference for choice with little to no variability in responding.

Figures 6 shows the results for 8 participants (Joe, Jake, Mesha, Carrie, Olivia, Denise, James, and Gena) who responded similarly for the choice and no choice options throughout the assessment. Joe (top far left panel) selected the selected the choice at a low frequency (*M* = 1) compared to the no choice option at a high frequency (*M* = 9); whereas, he did not select the control at all. Joe's average satisfaction was somewhat (*M* = 5). Jake (top middle left panel) selected the choice at a similarly low frequency (*M* = 1.7) compared to the no choice option at a high frequency (*M* =8), whereas he selected the control option (*M* = .34). Jake's average satisfaction was somewhat satisfied (*M* = 5). Mesha (top middle right panel) selected the choice option (*M* = 3) compared to the no choice option (*M* = 6.5) and the control (*M* = .5). Mesha's average satisfaction was satisfied (*M* = 6). Carrie (top far right panel) selected the choice at a similarly low frequency (*M* =1.3) compared to the no choice option at a high frequency (*M* =8), whereas she selected the control option (*M* = .34). Carrie's average satisfaction was somewhat satisfied (*M* = 5). Olivia (bottom far left panel) selected the choice at the same low frequency (*M* =1.3) and the no choice option at a high frequency (*M* = 8.3), whereas she selected the control option (*M* = .34). Olivia's average satisfaction was somewhat satisfied (*M* = 5.3). Denise (bottom middle left panel) selected the choice at a similar low frequency (*M* =1.7) compared to the no choice option at a high frequency (*M* = 8), whereas she selected the control option (*M* = .34). Denise's average satisfaction was somewhat satisfied (*M* = 5.3). James (bottom middle right panel) selected the choice at a low frequency (*M* = 3) compared to the no choice option at a higher frequency (*M* = 6.8), whereas he selected the control option (*M* = .25). James' average satisfaction was somewhat satisfied (*M* = 5.3). Gena (bottom far right panel) selected the choice

at a low frequency (*M* = 2.3) compared to the no choice option at a higher frequency (*M* = 7.7) and did not select the control option. Gena's average satisfaction was somewhat satisfied (*M* = 5). Overall this was the only group that showed an overall preference for no choice (*n* = 8).

Figures 7 shows the results for 5 participants (Mary, Brian, Raja, Emma and Riley) who responded similarly across choice contexts. Mary (top left panel) selected the choice at a moderate frequency (*M* = 5.7) and the no choice option at similarly moderate to low frequency (*M* = 3.7); whereas, she selected the control (*M* = .67). Mary's average satisfaction was satisfied (*M* = 6.3). Brian (top right panel) selected the choice at a similarly low frequency (*M* = 3) compared to the no choice option at a higher frequency (*M* =6.7), whereas he selected the control option (*M* = .34). Brian's average satisfaction was somewhat satisfied (*M* = 5). Raja (middle left panel) selected the choice at the same frequency (*M* = 4) as the no choice option (*M* = 4); whereas, she selected the control (*M* = 2). Her first two sessions showed some preference for choice selecting 10 two sessions in a row but then she switched 0 for the reminder sessions. Raja's average satisfaction was neither satisfied nor dissatisfied (*M* = 4). Emma (middle right panel) selected the choice at the same frequency (*M* = 3.8) as the no choice option (*M* = 4.3); whereas, she selected the control (*M* = 2). Emma's average satisfaction was neither satisfied nor dissatisfied (*M* = 4). Riley (bottom center panel) selected the choice (*M* = 4) as compared to the no choice option (*M* = 6) and did not select the control option. However, Riley did show a preference for choice responding (M=7) in the first four sessions and then decreased responding for the reminder of the phase. Riley's average satisfaction was neither satisfied nor dissatisfied (*M* = 4). She showed higher satisfaction when choice was selected and lower satisfaction when no choice was selected. This group is the only group that showed indifference between a

preference for choice and no preference based on variability in responding or similarity in responding across context.

Choice Overload Results

Choice overload data included the percentage of selections for the participant choice, no choice (i.e., computer choice) and control options and the satisfaction score for each participant are depicted through Figures 8-12. Overall, there were 27 participants who completed this phase. There were four patterns of behavior. First, no change in preference for choice with no substantial changes in the overall pattern of responding (*n* = 13). Second, no change in preference for choice but with substantial changes in the overall pattern of responding (n = 6). Third, change in preference at a small increase of 8 stimuli in the array (*n* = 3). And forth, change in preference at a larger increase of 64 or 96 stimuli in the array (*n* = 5).

Figure 8 and 9 shows the results for 13 participants that showed no change in preference or any substantial changes in pattern of responding between the choice assessment and choice overload phases. Figure 8 shows the results for Reana, Lily, Kerry, George, Natalie, and Nala. As the choice assessment data were presented previously, the choice overload data will only be presented here. Reana (top left panel) selected the choice option consistently throughout the choice overload phase even as the number of stimuli in the array increased to 8, 16, 32, 64 and 96 stimuli. She rated her satisfaction (*M* = 7) as strongly satisfied across all sessions. Lily (top middle panel) also selected the choice option consistently throughout the phase with very little variability in responding. Lily consistently rated her satisfaction (M=6) as satisfied throughout this phase. Kerry (top right panel) selected the choice option consistently throughout the phase but showed slightly more variability than Reana or Lily. Her satisfaction ratings (*M* = 5.6) varied from neither satisfied nor satisfied to satisfied. George (bottom left panel) selected the

choice option consistently throughout the phase but showed more variability than all other participants in this figure. His satisfaction ratings (*M* = 4.7) was highly varied throughout, from neither satisfied nor satisfied to somewhat satisfied. Like, Reana, both Natalie and Nala selected the choice option consistently throughout the choice overload phase even as the number of stimuli in the array increased to 8, 16, 32, 64 and 96 stimuli. Natalie's satisfaction actually increased with 64 and 96 stimuli. Nala's satisfaction remained the same throughout and rated her satisfaction (M=6) as satisfied throughout this phase.

Figure 9 shows the results for Kendra, Karley, Ruby, Addie, Mason, Diane, and Molly. Kendra (panel A), Ruby (panel C), Addie (panel D), Mason (panel E) and Diane (panel F) selected the choice option consistently throughout the choice overload phase even as the number of stimuli in the array increased to 8, 16, 32, 64 and 96 stimuli. Kendra's satisfaction varied throughout this phase but averaged at neither satisfied nor dissatisfied (*M* = 5.3). Mason and Diane's satisfaction remained the same throughout and rated their satisfaction (*M* = 6) as satisfied. Ruby (*M* = 6.2) and Addie's (*M* = 6) satisfaction remained mostly steady at satisfied. Karley (panel B) and Molly (panel G) selected the choice option consistently throughout the phase but showed slight variability. Karley's satisfaction was the most varied throughout the participants in this phase ranging from neither satisfied nor dissatisfied to satisfied. Her satisfaction decreased as the number of choices increased. Molly's satisfaction was mostly satisfied (*M* = 5.9). All participants in this figure's satisfaction were similar from the choice assessment phase to the choice overload phase except for Karley's whose satisfaction increased. Overall, these results show no change in preference or any substantial or sustained changes in the pattern of responding.

Figure 10 shows the results for Dallas, Kelly, Eden, Sally, Connie, and Lucy. Dallas (top left panel) showed variability in his pattern of responding for 64 and 96 stimuli. His level of satisfaction ranged from somewhat satisfied to satisfied throughout (*M* = 5.7). Kelly (top middle panel) showed high variability in responding for 8 stimuli and then steady for 16, 32, 64 and 96 stimuli. Kelly's satisfaction remained the same throughout at strongly satisfied. Eden (top right panel) showed no variability in preference and steady satisfaction at strongly satisfied throughout in the choice overload phase; however, this was a sustained change from the previous phase that showed variable data in the choice assessment phase. Sally (bottom left panel), Connie (bottom middle panel) and Lucy (bottom right panel) showed high variability for all stimuli, 8, 16, 32, 64 and 96 in this phase. Their level of satisfaction also varied from neither satisfied nor dissatisfied to strongly satisfied throughout this phase. All participants satisfaction ratings were similar across phases. Overall, these results show no change in preference based on the number of choices but substantial and sustained changes in the pattern of responding.

Figure 11 shows the results for Franny, Matt, and Bob. Franny's (top panel) breaking point was at 8 stimuli, meaning she did not respond consistently for the choice option when the array was increased to 8 stimuli. Franny's satisfaction rating (*M* =5.3) remained like the previous phase which corresponded to neither satisfied nor dissatisfied. Matt's (middle panel) breaking point was also at 8 stimuli. Unlike Franny, Matt's responded changed to a consistent selection for the no-choice option during this phase. His average satisfaction rating (*M* = 3.6) in this phase corresponded to somewhat dissatisfied to neither satisfied nor dissatisfied and was similar to the previous phase. Bob (bottom panel) also had a breakpoint of 8 stimuli was variable responding. His satisfaction rating (*M* = 4) decreased overall throughout the choice overload

condition. Overall, these data indicate that for some participants, the increase from 4 to 8 stimuli may be enough to change their preference for choice contexts.

Figure 12 shows the results for Becka, Jude, Dan, Vito and Jim. Becka's (top panel) breaking point was at 64 stimuli, meaning she did no longer respond consistently for the choice option when the array was increased to 64 stimuli, instead switched to the no-choice option. Becka's satisfaction rating did not change from the previous phase and remained at satisfied throughout. Jude's (middle left panel), Dan (middle right panel), Vito (bottom left panel) and Jim (bottom right panel) show a breaking point at 94 stimuli, meaning they no longer respond consistently for the choice option when the array was increased to 94 stimuli and also switched to the no-choice context. Dan, and Jim's satisfaction rating decreased significantly from 64 stimuli on (from to satisfied to dissatisfied) and Vito's satisfaction (from strongly satisfied to satisfied) when he reached 96 stimuli. Jude's satisfaction rating was varied throughout which differed from his steady neither satisfied nor dissatisfied rating in the choice assessment phases. Similar to figure 11, these data indicate that for some participants, the increase from 32 to 64 stimuli and 64 to 96 stimuli may be enough to change their preference for choice contexts.

Time Constraint Results

The return-to-baseline and time constraint data included the percentage of selections for the participant choice, no choice (i.e., computer choice) and control options and the satisfaction score for each participant are depicted through figures 13-16. Overall, there were 22 participants who completed these two phases. There were four patterns of behavior. First, no change in preference for choice with no substantial changes in the overall pattern of responding (n = 10). Second, no change in preference for choice but with substantial changes in the overall pattern of responding (n = 4). Third, change in preference at a small increase of 8 stimuli in the array (n =

2). And forth, change in preference at a larger increase of 64 or 96 stimuli in the array (n = 6). In addition, all participants showed similar patterns of responding during both baselines. If they showed steady responding in the first-choice assessment, they also showed steady responding in the second-choice assessment. Or, they showed variable responding in the first-choice assessment and then they also showed steady responding in the second-choice assessment except for two participants (see below).

Figure 13 shows the results for Judy, Nala, Mason, Kelly, Diane, Dallas, Kendra, Karley, Eden, and Dan between all the four phases: choice assessment, choice overload phases, choice assessment (back to baseline) and time constraint. Judy (panel A), Nala (panel C), Kelly (panel G), Diane (panel I), Eden (panel H), and Dan (panel J) showed no variability in responding during the time constraint phase and continued to show a preference for the choice context. Both Judy, Nala and Eden's satisfaction rating decreased slightly from the second-choice assessment phase from a steady somewhat satisfied to a steady neither satisfied nor dissatisfied during the time constraint phase. Kelly and Diane's satisfaction remained the same throughout all phases. Dan's satisfaction rating decreased from the second-choice assessment phase (neither satisfied nor dissatisfied) to the time constraint phase (somewhat dissatisfied). Although Mason (panel E), Kendra (panel D) and Karley (panel F) showed slight variability in responding during the time constraint phase, overall, they still showed a preference for the choice context. Mason, Kendra, and Karly also showed some variability throughout in their satisfaction rating during this phase. Dallas (panel B) showed the most variability in this figure but overall showed a preference for the choice context and his satisfaction rating also showed some variability. Diane (panel I) and Eden (panel H) were the only two participants that showed change in responding from the first-choice assessment (variable responding) to the second-choice assessment steady

responding). Overall, these results show no change in preference or substantial or sustained changes in the pattern of responding.

Figure 14 shows the results for Natalie, Ruby, Connie and Addie. Natalie (top left panel), Ruby (top right panel), and Connie (bottom left panel) showed extreme variability and change of responding during the time constraint phase for all the numbers of stimuli, 8, 16, 32, 64 and 96 stimuli. Natalie's satisfaction rating was steady during both choice assessment phases at neither satisfied nor dissatisfied and varied for 64 and 96 stimuli during both the choice overload and time constraint phases. Ruby's satisfaction level for the first-choice assessment and choice overload phase remained constant at satisfied but reduced during the second-choice assessment and became highly variable during the time constraint phase. Connie's satisfaction rating was steady during both choice assessment phases at satisfied and varied throughout all stimuli for both the choice overload and time constraint phases. Addie (bottom right panel) showed variability and a substantial change in the pattern of responding during the time constraint phase for 64 and 96 stimuli. Overall, these results show no change in preference but do have a substantial or sustained change in the pattern of responding. Addie's satisfaction rating remained the same throughout all four phases which averaged around satisfied.

Figure 15 shows the results for Sally and Lucy. Sally and Lucy's breaking point was at 8 stimuli, meaning they did not respond consistently for the choice option during the time constraint phase when the array was increased to 8 stimuli. Both participants satisfaction rating was satisfied for both choice assessment phases but then became varied with an overall lower satisfaction rating during both the choice overload and time constraint phases. Overall, these data indicate that for some participants, the increase from 4 to 8 stimuli may be enough to change their preference for choice contexts when time pressure is added.

Figure 16 shows the results for Bob, Carrie, Becka, Jim, Molly, and Vito. Bob's (top panel) breaking point was at 96 stimuli, meaning he no longer responded consistently for the choice option when the array was increased to 96 stimuli during the time constraint phase, instead switched to the no-choice option. Bob's satisfaction rating changed slightly from the choice assessment phases and became slightly more variable during the choice overload and time constraint phase. Carrie's (top right panel) breaking point was at 64 symbols but showed variability during the time constraint phase for 8, 16 and 32 stimuli. Carrie's satisfaction rating was variable throughout all four phases. Becka's (middle left panel) breaking point was at 64 stimuli in the time constraint phase where she switched to the no choice context. Becka's breaking point was at 64 symbols, where she switched to the no choice context. Her satisfaction rating was consistent for the first three phases where she continually chose satisfied. During the time constraint phase, she drastically changed her satisfaction neither satisfied not dissatisfied with 16 symbols, to somewhat dissatisfied with 32 symbols and strong dissatisfied with 64 symbols. Similarly, to Carrie, Jim's breaking point was at 64 symbols and showed some variability leading up at 32 symbols. His satisfaction rating was the same for both choice assessment phases where he continuously selected satisfied. His satisfaction rating decreased for both the choice overload and time constraint phases significantly from satisfied to strongly dissatisfied. Molly's (bottom left panel) breaking point was at 64 symbols. Like Carrie variability during the time constraint phase she showed high variability for 8, 16 and 32 stimuli. Her satisfaction rating was steady at satisfied for the first three phases and then switched to variable for the last phase. Vito (bottom right panel) breaking point was at 96 stimuli with some variability with 32 stimuli. Vito's satisfaction remained the same at strong satisfied for both choice assessments but showed a decrease during both the choice overload (at 96 stimuli) and

time constraint phases (at 64 stimuli). Overall, these results show a change in choice preference and some change in satisfaction at an increase of 64 or 96 items in the array.

Table 2 displays the name of all individuals who participated in this study, their age range, their choice context (preference for choice, preference for no choice, or indifferent to either) in the choice assessment phase one and three, and the breaking point for each participant in both the choice overload phase and the time constraint phase. All 40 individuals participated in the choice assessment-phase one. There were 27 participants that preferred the choice option over the no choice (n = 8) and control options. There were 5 participants responded relatively equal or varied responses for the choice and no choice options indicating relative indifference to the two options. Of the 27 participants that preferred the choice option over the no choice option, 13 showed no change in preference or substantial changes in the pattern of responding. Six showed no change in preference but did show a substantial change and variability in the overall pattern of responding. And 8 participants showed a breaking point, 3 participants at 8 stimuli and 5 participants at 64 or 96 stimuli. Of the 40 participants, 14 did not continue to the second-choice assessment phase (return-to-baseline) or did not come back to complete phase three. Twenty-four participants showed preference for choice, whereas, two did not. Of the 40 participants, 18 did not continue to the time constraint phase or did not come back to complete phase four. Ten participants showed no change in preference; whereas, 4 showed no change in preference but did show a substantial change and variability in the overall pattern of responding. And 8 participants showed a breaking point, 2 participants at 8 stimuli and 6 participants at 64 or 96 stimuli.

As stated above, a Pearson correlation was also used to evaluate the relationship between the variables. The Pearson correlation showed a negative relationship for as the number of

choices increased; the level of satisfaction decreased, but it was not a statistically significant correlation and a definite conclusion cannot be made. For these reasons, additional and continued research should be done to examine the relationship between excessive choices and satisfaction levels. Overall, results did not show a significant correlation between the number of choices that participants were asked to choose from and those that selected the choice option (opposed to the no choice option). However, it is possible that these statistical analyses may not be valid because a small sample size was used, and a Pearson correlation calculation only provides an approximation. Typically, when larger sample sizes are used the possible difference due to the approximation is minimal but when using smaller samples sizes as in this study, this difference may be substantial. And last, the Pearson correlation found that there was a statistically significant correlation between the participants satisfaction with their choice when they chose themselves (opposed to the computer choosing). Pearson's Correlation between those that chose, and their satisfaction was $r(38)=.186$, $p=.01$. These results support the research hypothesis that people are more likely to be satisfied with their choices when they choose themselves and less satisfied or dissatisfied when others choose for them (in this case the computer choice).

The Pearson correlation was used to measure the strength of the relationship between two variables in the choice overload phase using the social validity survey that was delivered at the very end of the program. Results found a statistically significant relationship between it being more difficult to choose with more choices vs easier to choose with less options; $r(25)=.524$, $p=.01$. There was a statistically significant relationship between when the same number of options throughout the choice assessment was offered versus being satisfied with choice selection; $r(25)=.449$, $p=.01$. In addition, a statistically significant relationship was found between the choice assessment phase versus the choice overload breaking point; $r(25)=.705$,

p=.01. A statistically significant relationship was found between it being more difficult to decide with more choices versus second-guessing choice options in choice overload phase; r(25)=.339, p=.05. And last, there was a statistically significant relationship between participants second guessing in the choice overload phase versus it being more difficult to choose with more choices; r(25)=.385, p=.05.

The following statistically significant correlations were found relating to the time constraint phase. A statistically significant correlation was found between the second-choice assessment phase and the time constraint phrase with participant breaking points; r(20)=.734, p=.01. There was also a statistically significant correlation between the presence of the timer and those that stated there were some questions that they second guessed; r(20)=.481, p=.01. There was a statistically significant correlation between the presence of the timer changed their choice selection and that it was more difficult to choose when timed which; r(20)=.384, p=.05. There was a statically significant correlation between the presence of the timer and participants stating if they could, they would go back and change their answers; r(20)=.490, p=.01. There was a statistically significant correlation between the question “did the presence of the timer change how chose your symbols” and “if they could go back and change some of their answers they would” which was shown r(20)=.456, p=.01. And last, it was more difficult when timed and they second-guessed their choices; r(20)=.540, p=.01.

Chapter 5: Discussion

The primary purpose of the study was to determine the prevalence of participant who displayed a preference for choice contexts using a concurrent- chain arrangement. Overall, two-thirds of the participants (27/40 = 68%) preferred the choice option during the first-choice assessment which is consistent with previous research (Ackerlund Brandt et al., 2015). However, unlike Ackerlund Brandt et al., 20% preferred the no choice option and 12% were indifferent between choice and no choice. Because the participants in that study were preschool children, this disparity may indicate that preference for no choice context, and perhaps choice contexts, are a product of a conditioning history. However, because choice contexts are often associated with preferred outcomes, most individuals developed a preference. It would be interesting to determine mechanisms which result in the development of a preference for no choice contexts, as was the case for many of the participants in phase one. Unfortunately, these participants did not move on to the later phases, so little can be determined from these data at this time.

Almost all of the participants who progressed from phase one to phase two (24/26=92%) also completed phase three, the return-to-baseline choice assessment, and continued to prefer the choice option, even if they met a breakpoint in phase two. These results replicate previous research with children that showed participants preferred making choices and that this preference is persistent and resistant to change (e.g., Ackerlund Brandt et al., 2015; Tiger et al., 2006; Schmidt et al., 2009; Sran & Borrero, 2010). In addition, these results also support the perspective that choice is valued (Leotti et al., 2010) and allows us to have control over our environment (Lefcourt, 1973). Although the majority of participants did have a preference for choice, one-third (13/40) of the participants either showed a preference for no choice (8/13) or responded similarly to both choice (5/13) options suggesting that one was not more preferred

than the other. Although unlikely, a possible reason for the lack of preference for choice displayed by these participants may be that the two conditions were not salient enough.

The second purpose of this study was to evaluate if an increase in the number of options would change participant's preference for choice and if a participant would reach a breaking point, or a switch in preference between choice contexts (i.e., from the choice to no choice context). Additionally, we sought to evaluate if such increase would change a participants' satisfaction rating. Approximately one-third (8/27 = 30%) of participants reached a breaking point at either 8 stimuli (*n* = 3; 3/8), 64 stimuli (*n* = 1; 1/8), or 96 stimuli (*n* = 4; 4/8), during the choice overload phase. This research supports previous research that participants may choose smaller arrays over extensive arrays (Iyengar & Lepper, 2000; Karsina et al., 2011; Miller et al., 2018; Tiger et al., 2010). These findings were consistent with the social validity results which included self-reports that choosing became more difficult when there was an increase in choices, and it was easier to choose with less options. They showed to be satisfied when the number of options were consistent during the choice assessment phase (4 options offered). Participants also stated that they second guessed their choice selection during the choice overload phase. These results also support the behavior economic research and extends the research to behavior analytic perspective in that these findings demonstrate offering extensive amounts of choice in trivial choice making can have demotivating and adverse effects, often leaving individuals dissatisfied or regretting choice selection (Iyengar & Lepper, 2000; Schwartz, 2000; Schwartz et al., 2002).

It is important to discuss that there was no change in preference for choice during the choice overload evaluation for almost half (13/27 = 48%) of the participants. The remaining 22% of participants did not display a change in preference for choice; but their pattern of responding changed substantially and there was an increase in variability as the number of

options increased. A possible reason why only 30% reached their breaking point may be partly due to the age of the participants. Seventy-five percent of the participants were between the age of 18 and 39 years of age. Some of the earlier studies on this research (choice overload) was conducted 10-30 years ago. The amount of choices that are offered to many of us daily, often because of the overwhelming advances in technology over the past 10-30 years, may have had some conditioning effects on participant choice. The common, almost constant, exposure to large numbers – perhaps limitless numbers – of options may be leading to participants not reaching a breaking point because they may not be as sensitive to excessive choices as older generations who have not been exposed to technology for their entire lives.

The third purpose of this study was to evaluate whether a time constraint would change preference for choice or patterns of responding, if it would cause that change to occur faster than simply increasing the number of options, and if it had an effect on the overall satisfaction ratings. Results were over one-third (8/22 = 36%) of participants showed a breaking point (a switch from choice to no choice) at either 8 stimuli (n = 2), 64 stimuli in the array (n = 5) or 96 stimuli in the array (n = 1). Although 8 participants reached a breaking point in both the choice overload evaluation and the time constraint evaluation, it wasn't the same 8 participants; only 4 participants had a breaking point for both phases. This compliments the research by Hahn et al. (1992) that found there was a decrease in responding when time pressure was added. Future researchers may wish to further investigate time constraints on decision making as there seems to be limited research. However, 45% (10/22) of the participants displayed no change in preference for choice. This may be due to a product of a conditioning history. In addition, 18% (4/22) was found to have no change in preference for choice but there were substantial changes in the overall pattern of responding. It is possible that the time constraint also was not salient enough

especially for those participants who responding quickly to begin with. Also, it is possible that we may have given participants too much time and there wasn't enough pressure to change preference due to associated anxiety. However, given some of the time frames, cutting 10 seconds (for 8 stimuli) in thirds which would be 3.3 seconds may have been difficult to do. Future research may wish to use these procedures and give the participants one-third of the time to choose to assess if this may influence participant choice.

In addition, the social validity survey for questions surrounding the time constraint phase showed that participants found it difficult to choose with the presence of the timer (62%) and often second guessed their answers (100%). Also, participants would go back and change their answers if they could (51%) and the timer influenced how they chose their symbols (51%). This supports the research from Haynes (2009) that found participants that had less time to decide with a larger amount of choices found their decisions to be more frustrating, more difficult, and less satisfied than the individuals that had more time.

There were a few limitations with this study that should be discussed. As discussed previously, only one-third of participants showed a breaking point in the choice overload and/or time constraint phases. It is possible that increasing the array to 96 stimuli was not a substantial enough number for participants to reach a breaking point. Reed et al. (2011) asked participants to choose a treatment program for a hypothetical client using choices that increased 3, 6, 12, 24, 48, 96, 192, and 384, and found that more than half of the participants switched to the limited choice option scenario from the extensive- options scenario. A possible, reason for difference between studies may have been because Reed et al. (2011) used a larger array of choice options than the current study. However, Reed et al. (2011) gave each participant the option to choose to have (a) single option (i.e., only one treatment program available), (b) limited options (i.e., two

programs available), or (c) extensive options (in which more than two programs were available). The current study's choice options were consistent with the same number of choice options throughout the session (i.e., same number of choices for each of the choice contexts). For example, the participant would select to choose themselves from 16 choice options, have the computer choose for them from 16 options or select that no choices be made at all from 16 options; whereas Reed et al. (2011) had participants choose from three different sets of choices, 2-options, 1-option or 384-options. However, future behavioral research should use more choice options to determine if excessive choices over 96 causes a person to switch from having a preference to choose to no longer have the desire to choose.

Another limitation was that this study used arbitrary symbols which held no meaning for the participants. It is possible that using preferred stimuli may have resulted in different outcomes as categories such as these may have more a reinforcing value that a symbol with no significance was lacking. Although this may be unlikely as Cassano, Ackerlund, Griffith and Mahoney (2019; unpublished manuscript) used such stimuli (i.e., books, snacks, vacations, food, clothing, etc.) to measure choice preference and results were like the current study. However, future research may wish to use stimuli that may have more meaning than symbols such as with candy, ice creams, travel destinations, etc. would yield stronger results.

The third limitation is related to the lack of value of the symbols, because this study used hypothetical choices instead of real-life situations. It may be that if real items were presented, even a three-dimensional array of arbitrary symbols, there may have been effects on responding that were not present using a two-dimensional computer screen. However, research such as Madden, Begotka, Raiff, and Kastern (2003) evaluated the subjective value of real and hypothetical rewards in a delay discounting (i.e., the decline in the present value of a reward

with delay to its receipt) experiment and the results indicated support for the validity of using hypothetical rewards to estimate discounting rates. Although choices made during discounting studies are not the same as the present study, there are likely similarities in the mechanisms behind responding. However, future researchers may wish to compare hypothetical and real-life scenarios in relation to the choice overload phenomenon.

Regardless of limitations, this study has significance as it demonstrates that excessive options are not always better or more beneficial and more options may cause a person to be less satisfied. Additionally, there were numerous strengths of this study. First, this study is the extension of research using typical adults as most of the research to date on preference for choice consists of individuals with autism and other developmental disabilities or children. Extending to a new population provides further information on the possible phylogenic or ontogenic origins of preferences for choice-making contexts.

A second strength was that a relatively large sample (N=40) was used. Often in behavior-analytic research, the number of participants is quite limited. Having a larger sample allows for more evaluations regarding probable relationships between observed results and variables such as age, similar to Ackerlund Brandt et al. (2015). Overall, the results are that more people prefer to make their own choices rather and are more satisfied when they make their own choices than someone else making a choice for them. This is consistent with the relative preferences found in previous research and indicates that a preference for choice is a common occurrence across ages.

A third strength is this is the only study other than Miller et al. (2017) that evaluated choice overload using behavior-analytic methods, at least to the author's knowledge. Additionally, this is the only study – known to the authors – that evaluated a time constraint variable regarding choice overload using behavior-analytic methods. This is important as in the

fast-moving pace of today's society, having to make quick decisions is part of our everyday life. This current research shows that more choices are not always better as previously one would have imagined.

These results extend previous research by showing that people prefer to choose themselves; however, at some point more choices may decrease satisfaction and may make choosing more difficult and contribute to individuals second-guessing their selection, especially when given a reduced amount of time to make a decision. There is still much to be learned about the underlying mechanism behind choice preferences and decision making; as well as, what strategies contribute to the narrowing down of choices when given a large array, and how many options are too many choices. Continued research in this area is very much needed.

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Table 1

Choice Preference and Breaking Points

Participant	Gender	Age	Choice assessment	Choice overload	Second choice assessment	Time constraint
Joe	M	30-39	NC	NA	NA	NA
Jake	M	30-39	NC	NA	NA	NA
Riley	F	50-59	I	NA	NA	NA
Mary	F	18-29	I	NA	NA	NA
Brian	M	30-39	I	NA	NA	NA
Mesha	F	30-39	NC	NA	NA	NA
Carrie	F	30-39	NC	NA	NA	NA
Raja	F	30-39	I	NA	NA	NA
Olivia	F	30-39	NC	NA	NA	NA
Denise	F	30-39	NC	NA	NA	NA
James	M	30-39	NC	NA	NA	NA
Gena	F	30-39	NC	NA	NA	NA
Emma	F	18-29	I	NA	NA	NA
Reana	F	30-39	C	NB	NA**	NA **
Franny	F	18-29	C	8	C	NA **
Lily	F	50-59	C	NB	C	NA **
Matt	M	40-49	C	8	NC	NA
Kerry	F	30-39	C	NB	NC	NA
Bob	M	30-39	C	8	C	64
George	M	18-29	C	NB	C	64
Jude	M	18-29	C	96	C	NB
Dallas	M	30-39	C	NB*	C	NB
Natalie	F	50-59	C	NB	C	NB*
Nala	F	50-59	C	NB	C	NB
Kendra	F	30-39	C	NB	C	NB
Vito	M	60-69	C	96	C	96
Mason	M	30-39	C	NB	C	NB
Karley	F	40-49	C	NB	C	NB
Kelly	F	18-29	C	NB*	C	NB
Eden	F	50-59	C	NB*	C	NB
Diane	F	18-29	C	NB	C	NB
Becka	F	50-59	C	64	C	64
Dan	M	50-59	C	96	C	NB
Jim	M	30-39	C	96	C	64
Ruby	F	30-39	C	NB	C	NB*
Sally	F	30-39	C	NB*	C	8
Molly	F	30-39	C	NB	C	64
Connie	F	30-39	C	NB*	C	NB*

Lucy	F	30-39	C	NB*	C	8
Addie	F	30-39	C	NB	C	NB*

Note. NC = preference for choice; C = preference for choice; I = indifferent (neither choice preference or no choice preference); NA = the study ended for that participant; NB = no breaking point; the number (e.g., 8, 8, 64, 96) = the number of symbols in which the participant reached their breaking point. *variability in data **participant did not finish

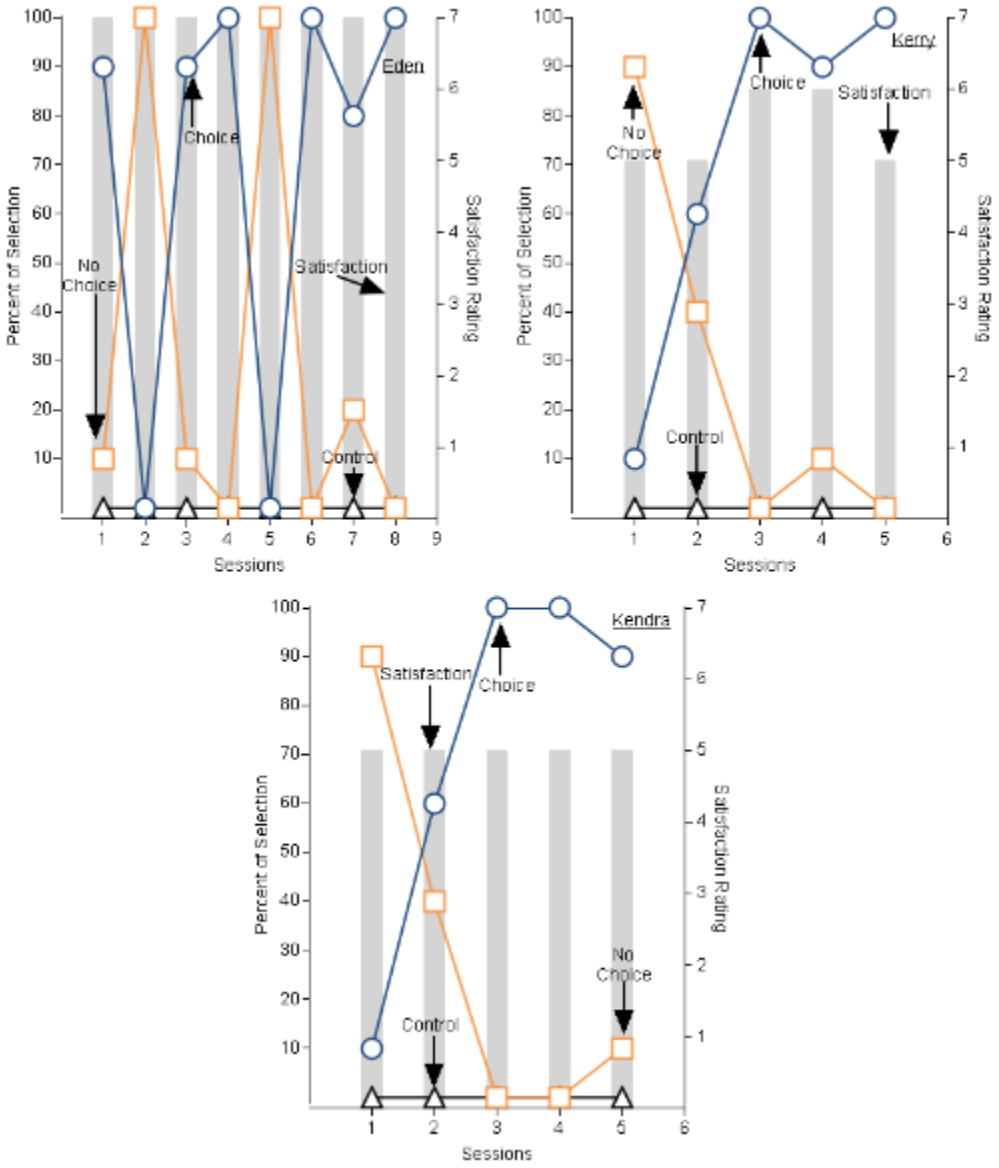

Figure 1. The percent of selection for the choice, no choice and control initial links and participant satisfaction ratings during the choice assessment for Eden (top panel), Kerry (middle panel) and Kendra (bottom panel).

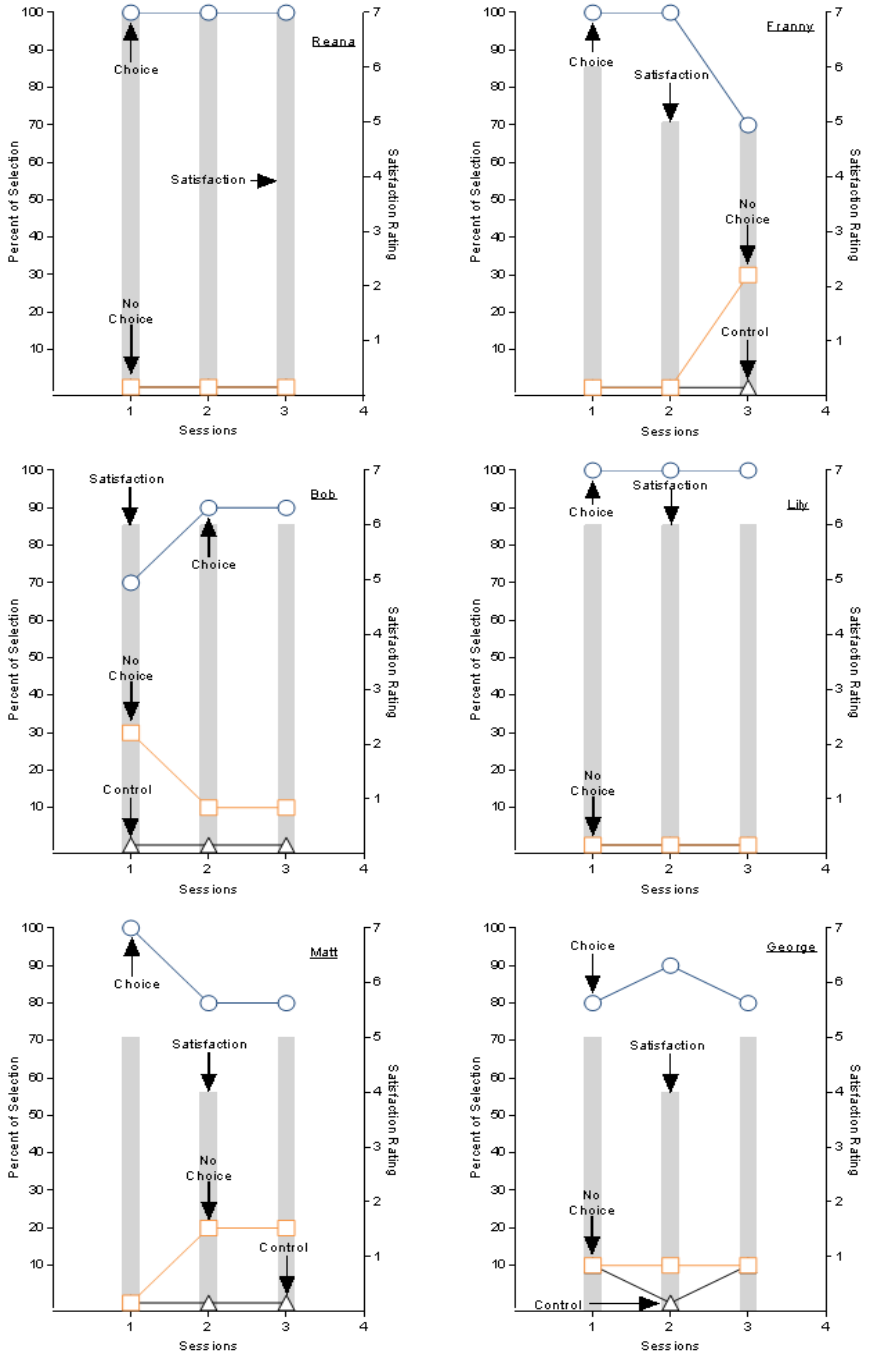

Figure 2. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment for Reana (top left panel), Bob (middle left panel), Matt (bottom left panel), Franny (top right panel), Lily (middle right panel), and George (bottom right panel).

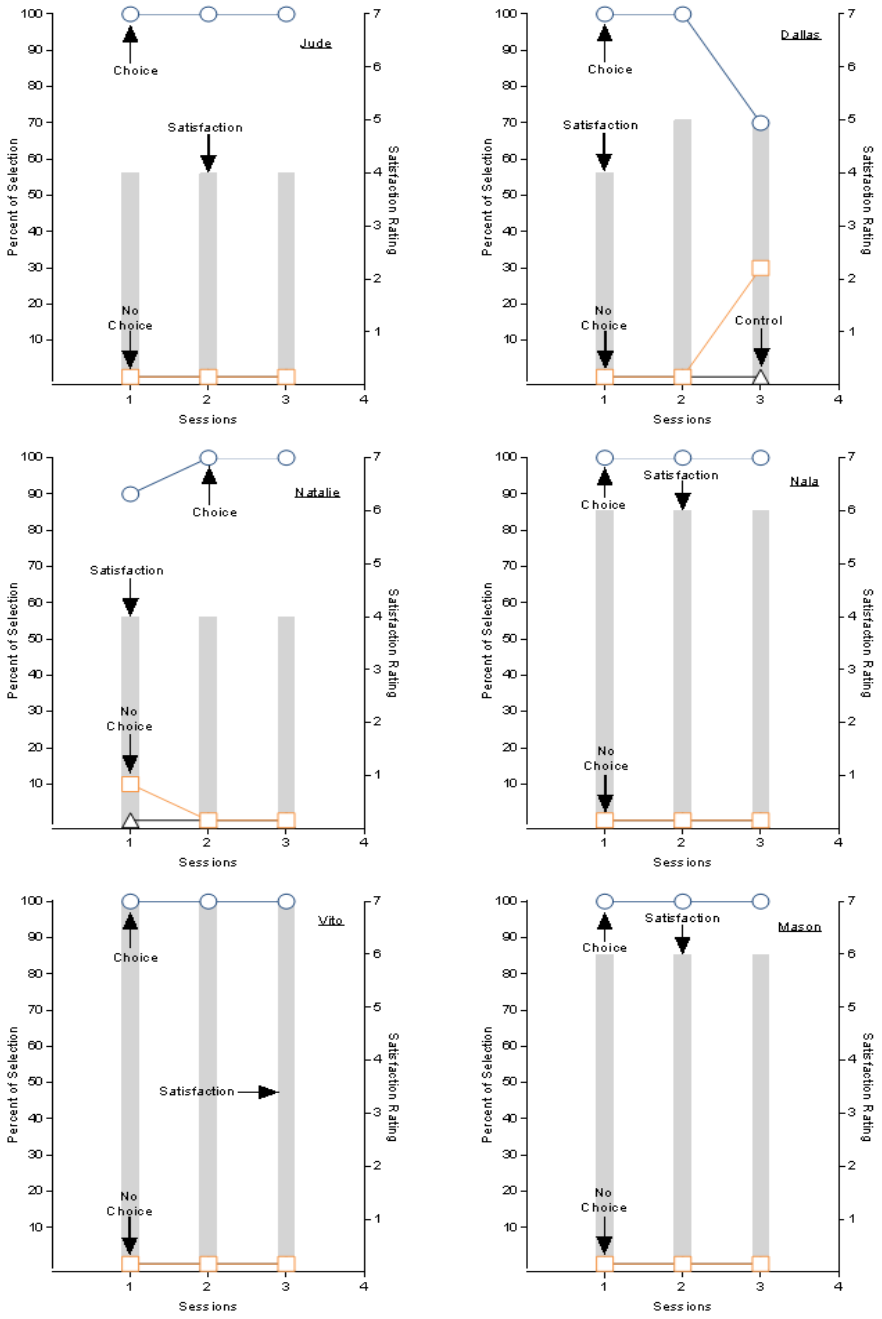

Figure 3. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment for Jude (top left panel), Natalie (middle left panel), Vito (bottom left panel), Dallas (top right panel), Nala (middle right panel), and Mason (bottom right panel).

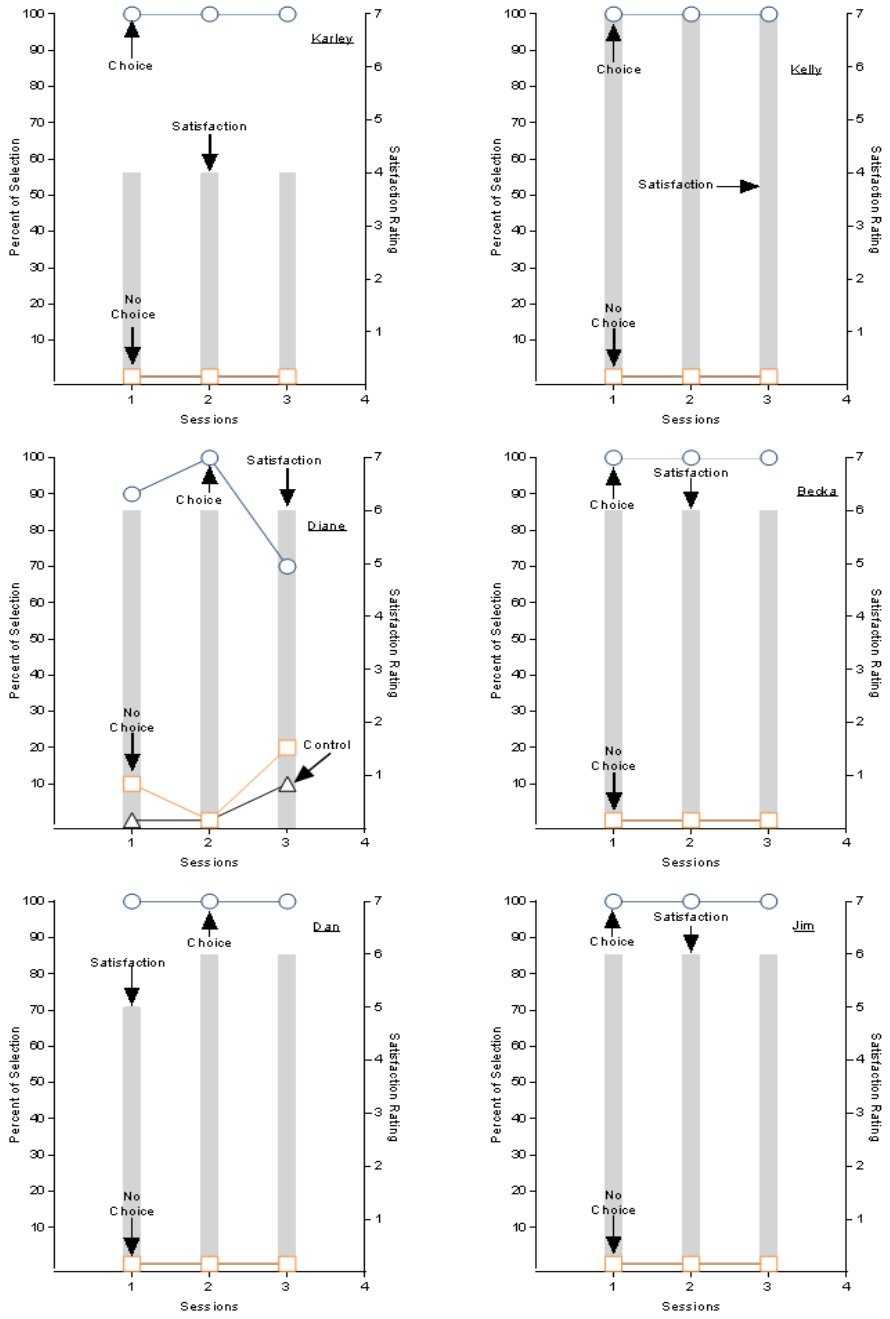

Figure 4. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment for Karley (top left panel), Diane (middle left panel), Dan (bottom left panel), Kelly (top right panel), Becka (middle right panel), and Jim (bottom right panel).

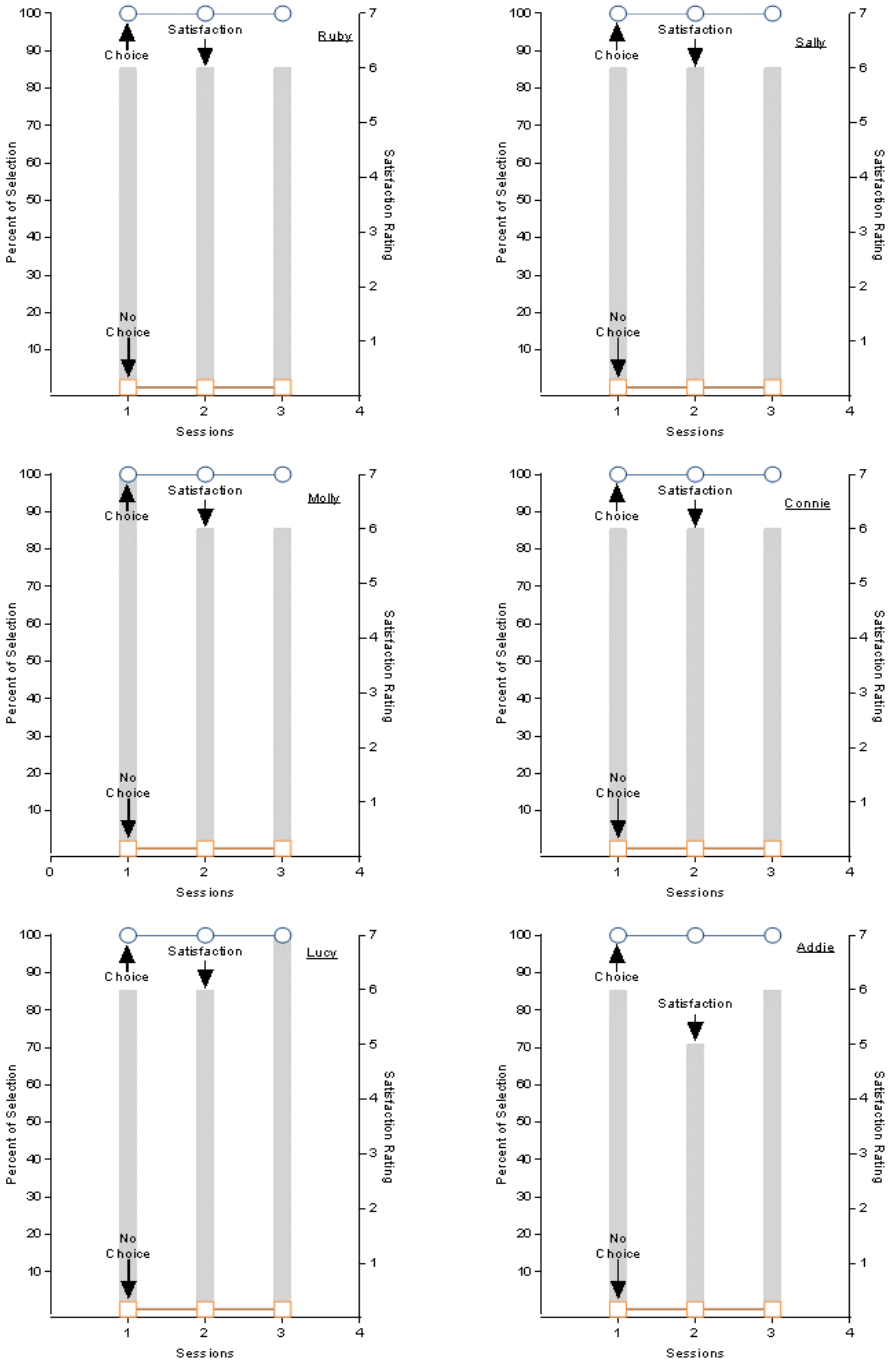

Figure 5. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment for Ruby (top left panel), Molly (middle left panel), Lucy (bottom left panel), Sally (top right panel), Connie (middle right panel), and Addie (bottom right panel).

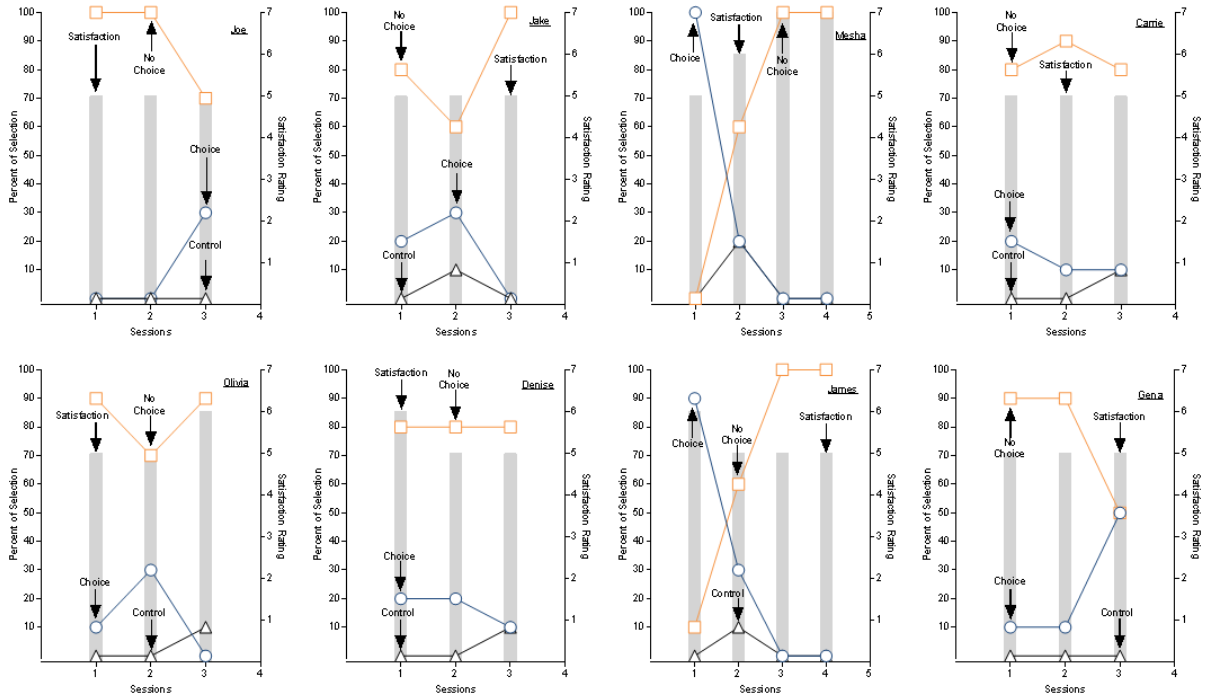

Figure 6. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment for Joe (top far left panel), Jake (top middle left panel), Mesha (top middle right panel), Carrie (top far right panel), Olivia (bottom far left panel), Denise (bottom middle left panel), James (bottom middle right panel), and Gena (bottom far right panel).

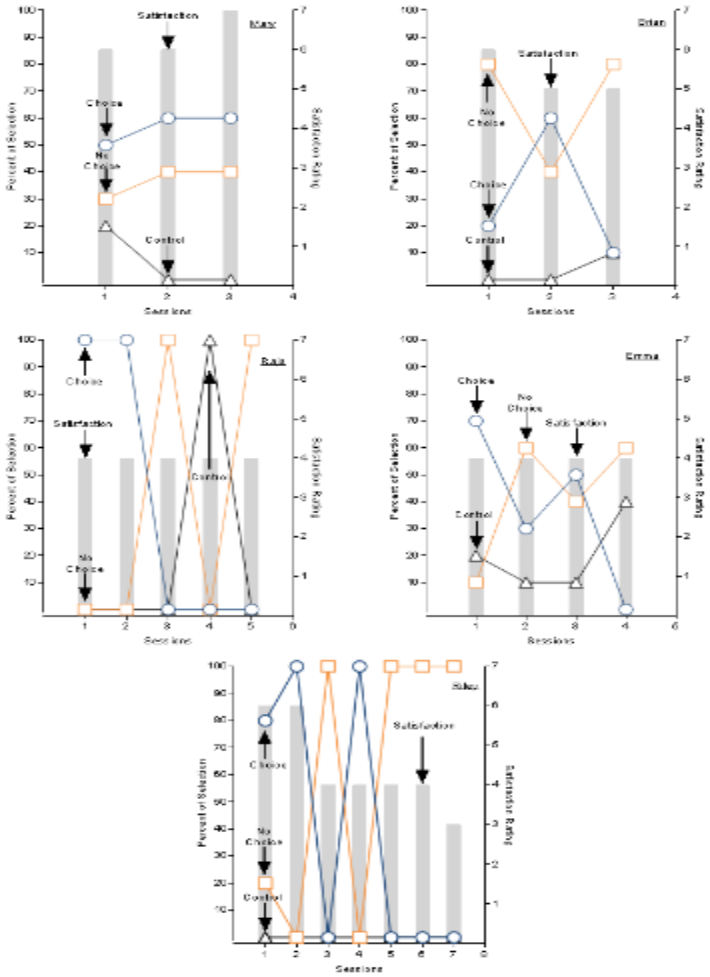

Figure 7. The percent of selection for the choice, no choice and control initial links and participant satisfaction ratings during the choice assessment for Mary (top left panel), Brian (top right panel), Raja (middle left panel), Emma (middle right panel) and Riley (bottom center panel).

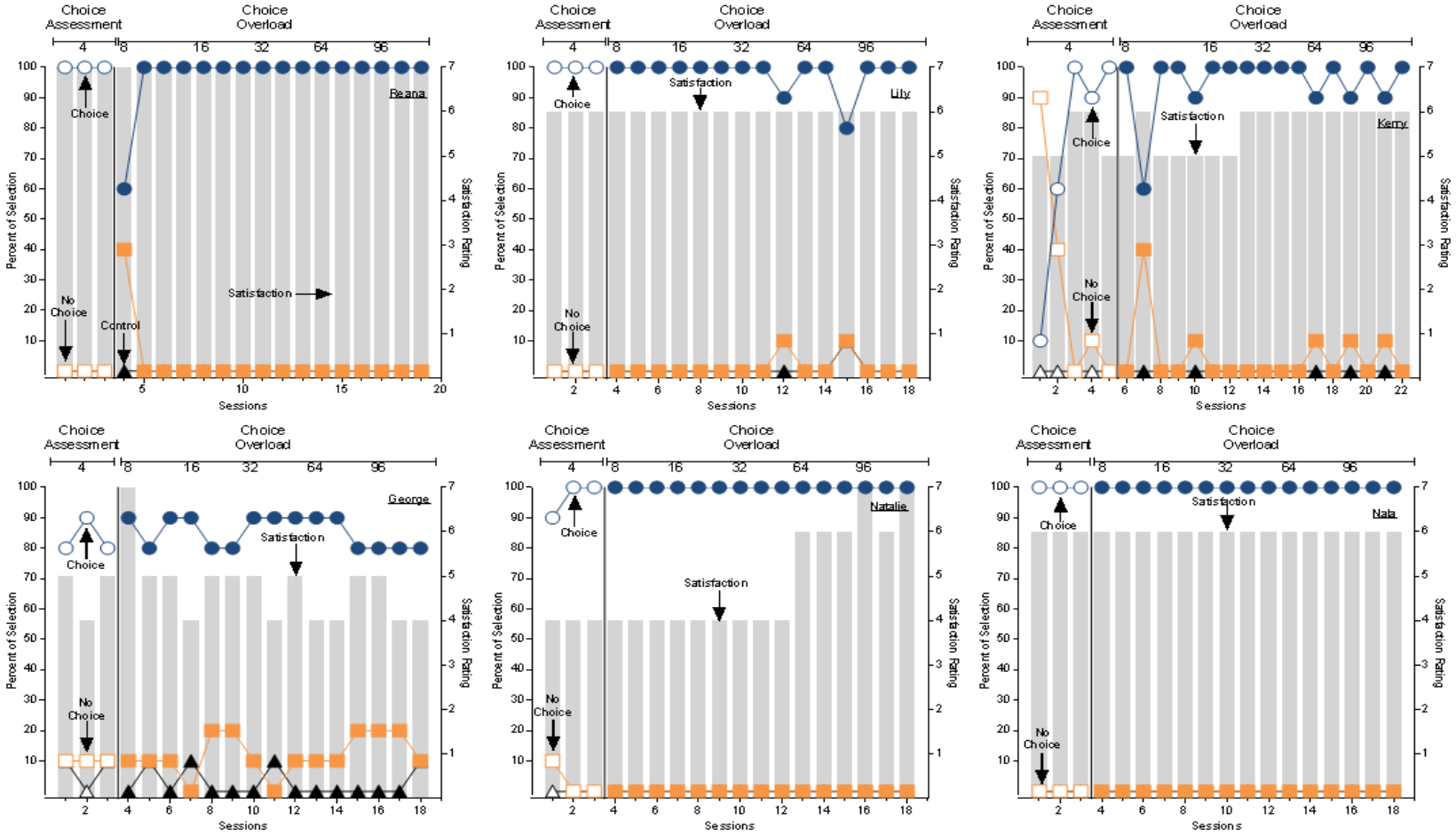

Figure 8. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment and choice overload phase for Reana (top left panel), Lily (top middle panel), Kerry (top right panel), George (bottom left panel), Natalie (bottom middle panel), and Nala (bottom right panel).

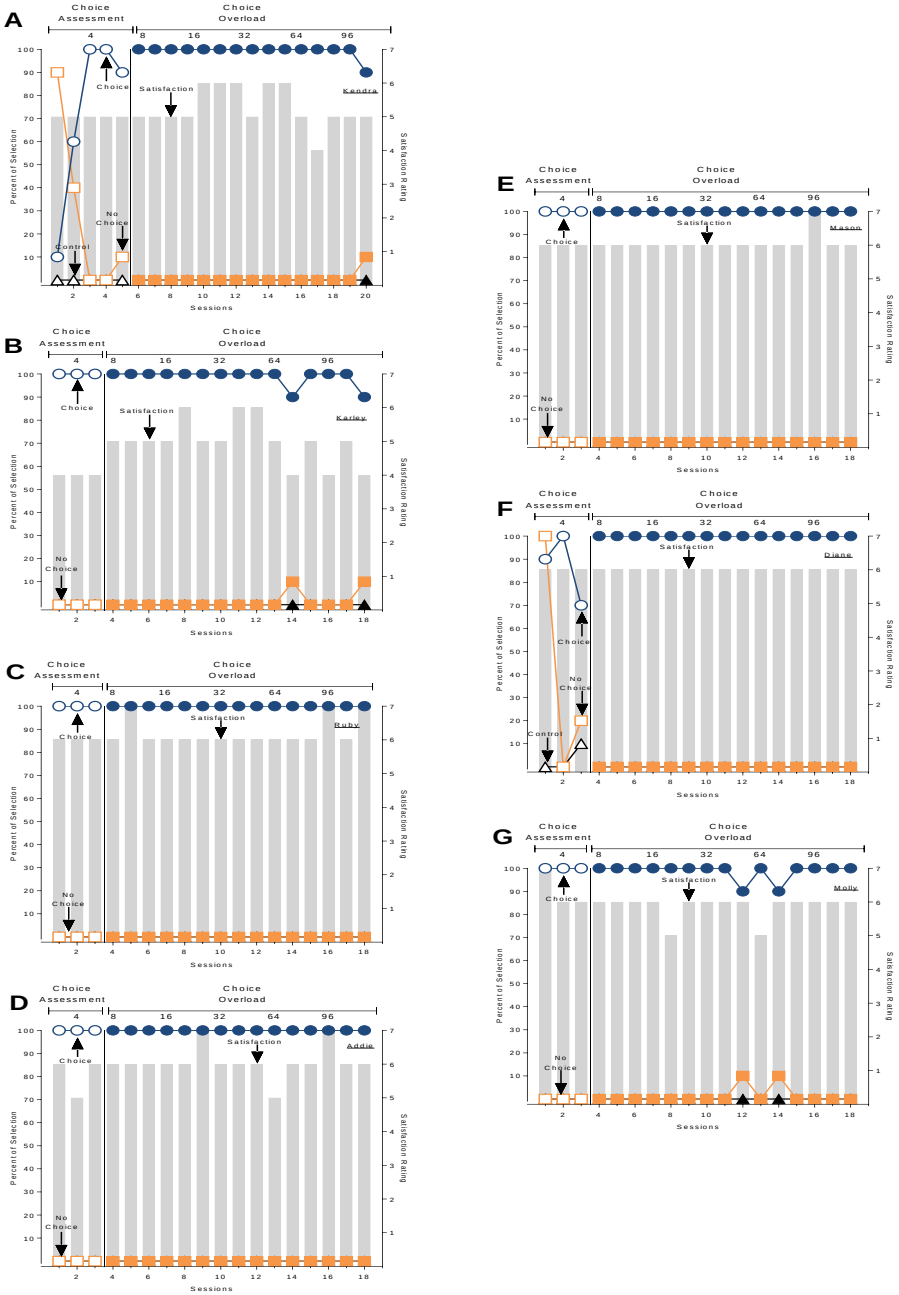

Figure 9. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment and choice overload phase for Kendra (panel A), Karley (panel B), Ruby (panel C), Addie (panel D), Mason (panel E), Diane (panel F) and Molly (panel G).

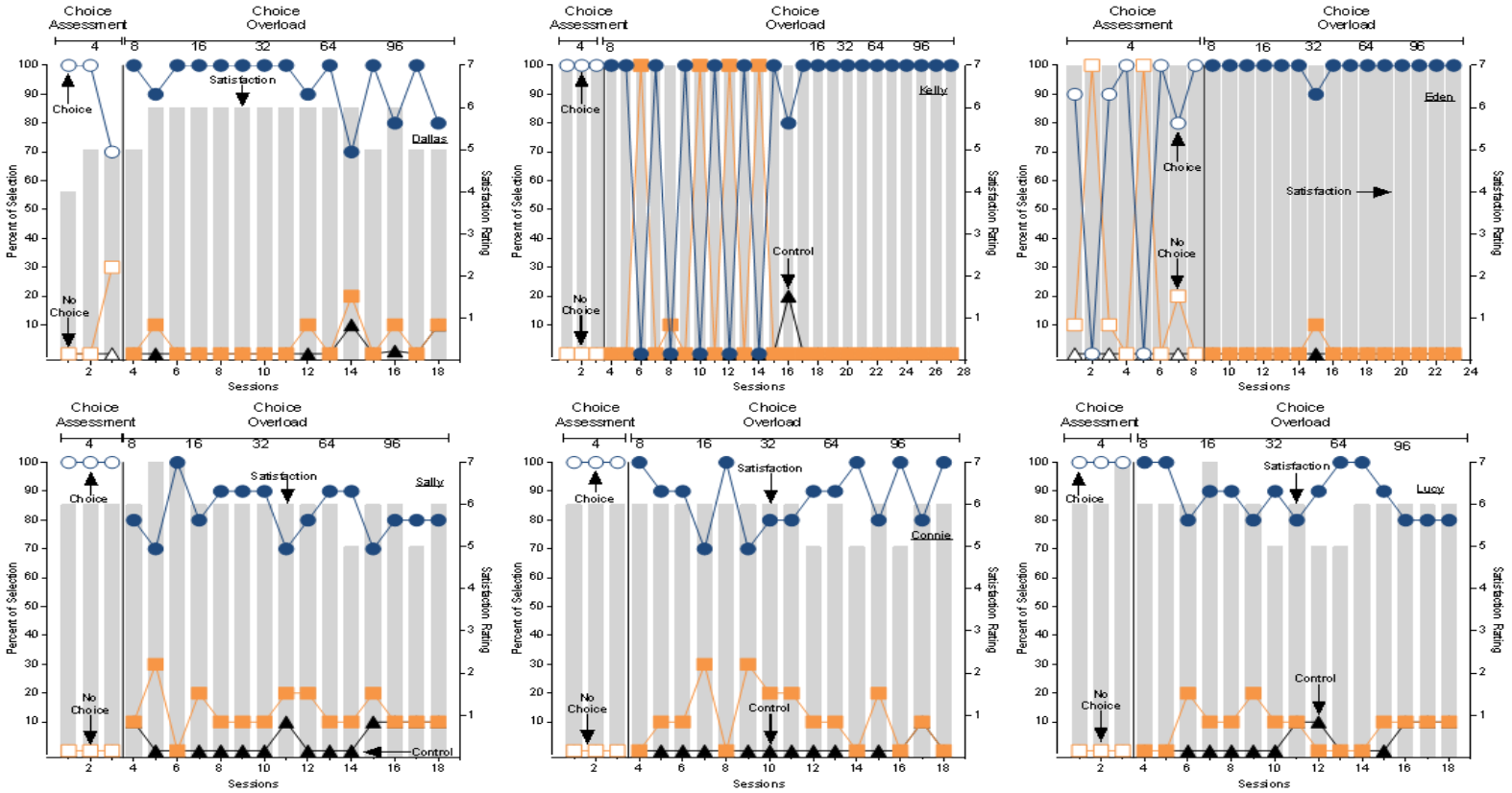

Figure 10. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment and choice overload phase for Dallas (top left panel), Kelly (top middle panel), Eden (top right panel), Sally (bottom left panel), Connie (bottom middle panel) and Lucy (bottom right panel).

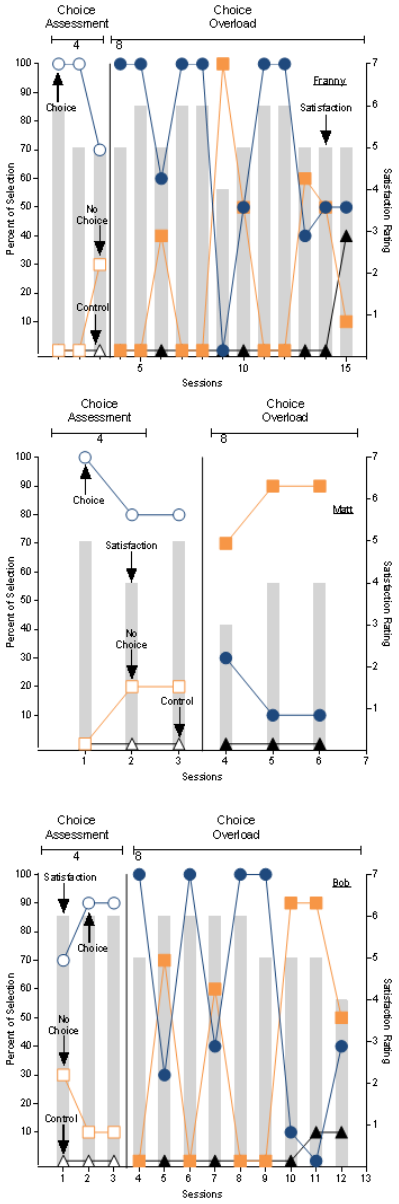

Figure 11. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment and choice overload phase for Franny (top panel), Matt (middle panel), and Bob (bottom panel).

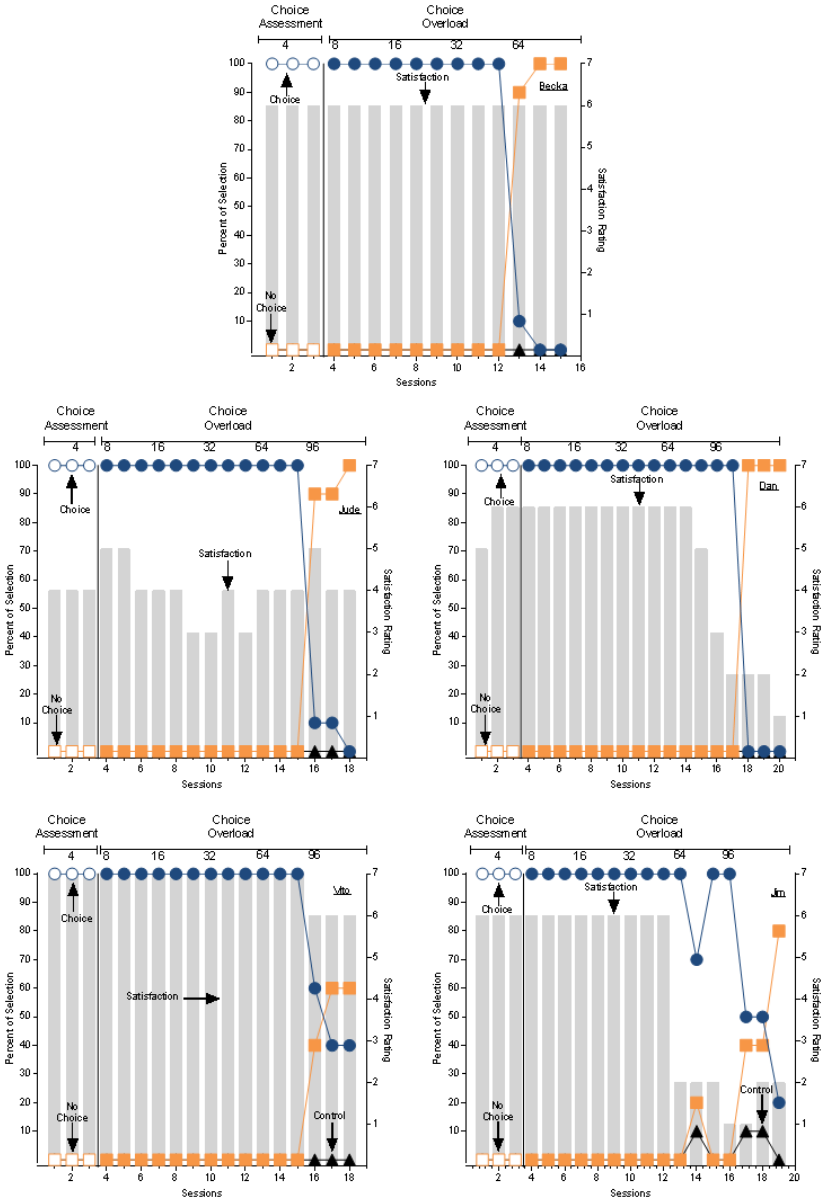

Figure 12. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment and choice overload phase for Becka (top panel), Jude (middle left panel), Dan (middle right panel), Vito (bottom left panel) and Jim (bottom right panel).

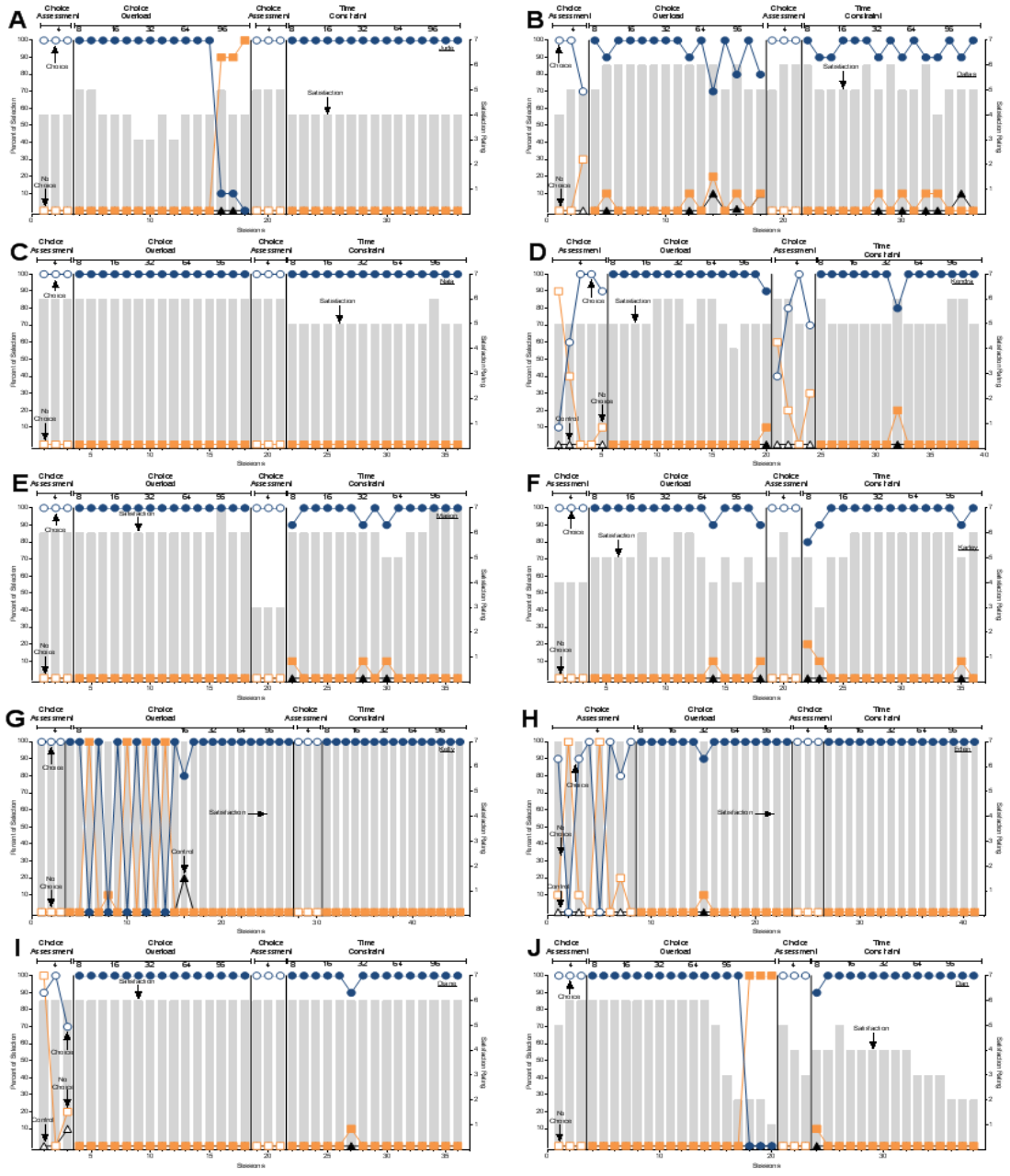

Figure 13. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment, choice overload, second-choice assessment and time constraint phase for Judy (panel A), Dallas (panel B), Nala (panel C), Kendra (panel D), Mason (panel E), Karley (panel F), Kelly (panel G), Eden (panel H), Diane (panel I), and Dan (panel J).

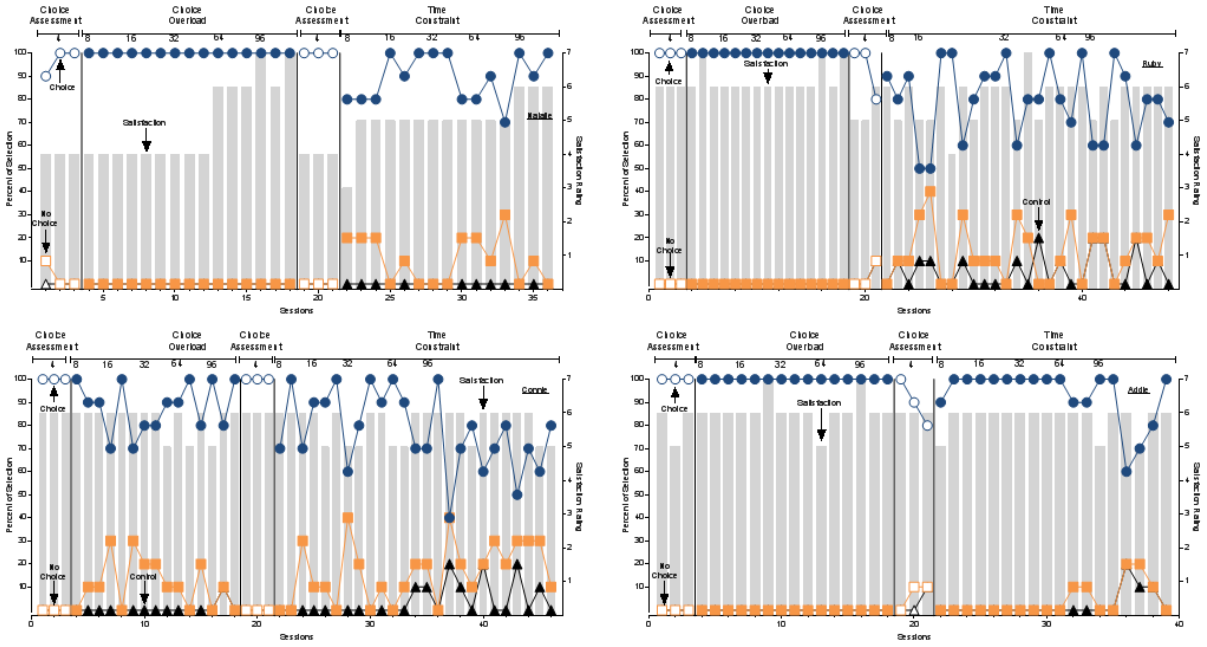

Figure 14. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment, choice overload, second-choice assessment and time constraint phase for Natalie (top left panel), Ruby (top right panel), Connie (bottom left panel) and Addie (bottom right panel).

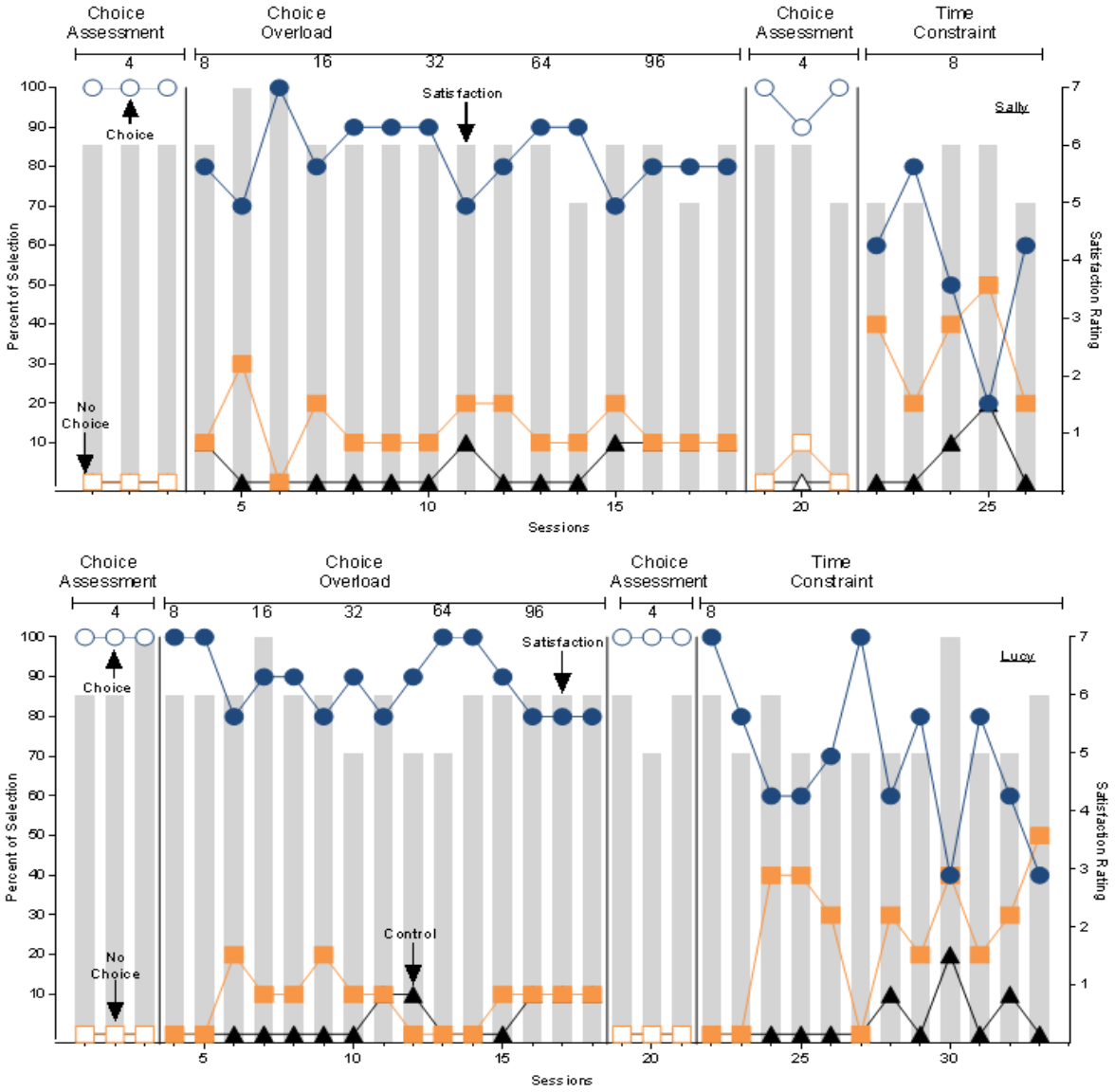

Figure 15. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment, choice overload, second-choice assessment, and time constraint phase for Sally (top) and Lucy (bottom).

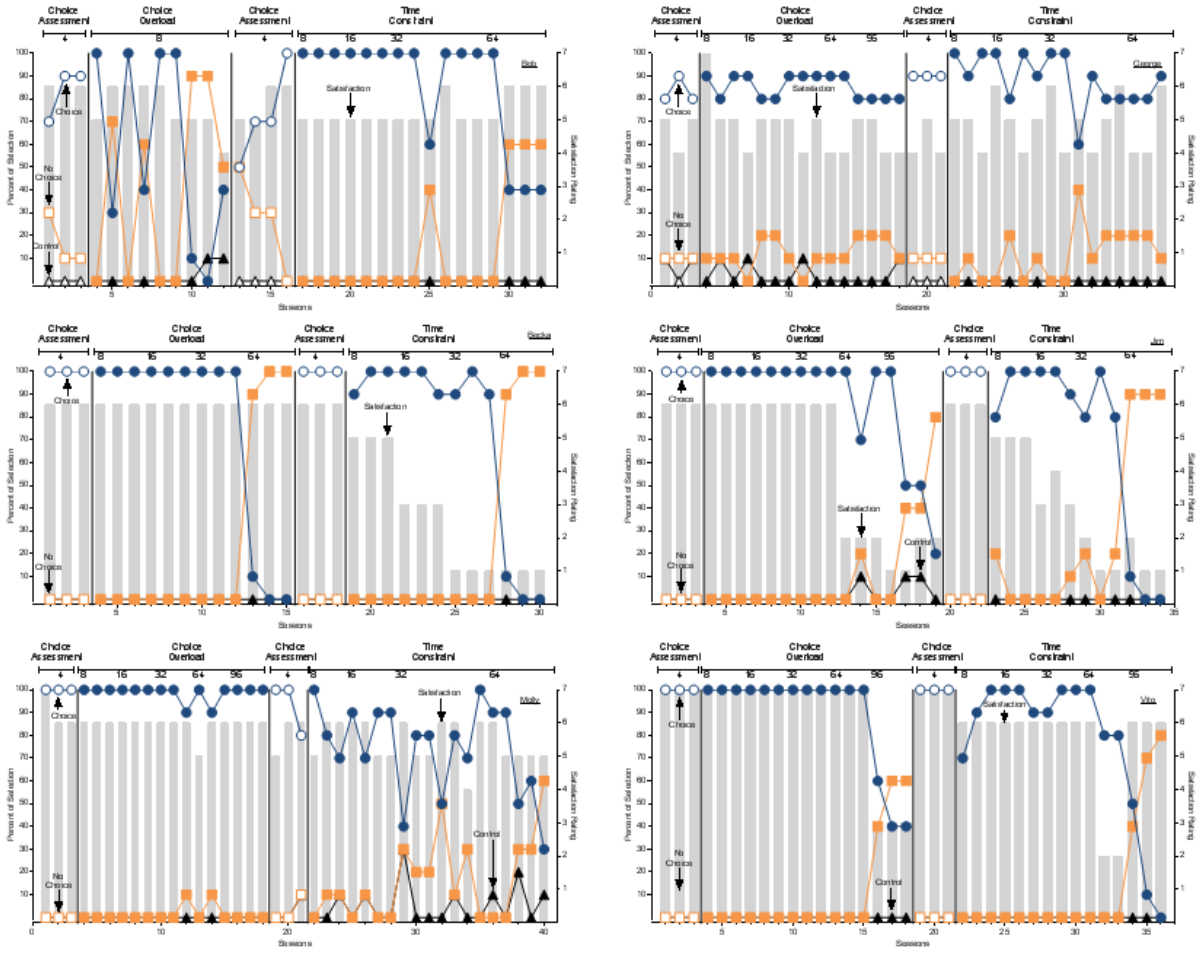

Figure 16. The percent of selection for the choice, no choice and control initial links, and participant satisfaction ratings during the choice assessment, choice overload, second-choice assessment and time constraint phase for Bob (top left panel), Carrie (top right panel), Becka, (middle left panel), Jim middle right panel), Molly (bottom left panel) and Vito (bottom right panel).

Appendix A

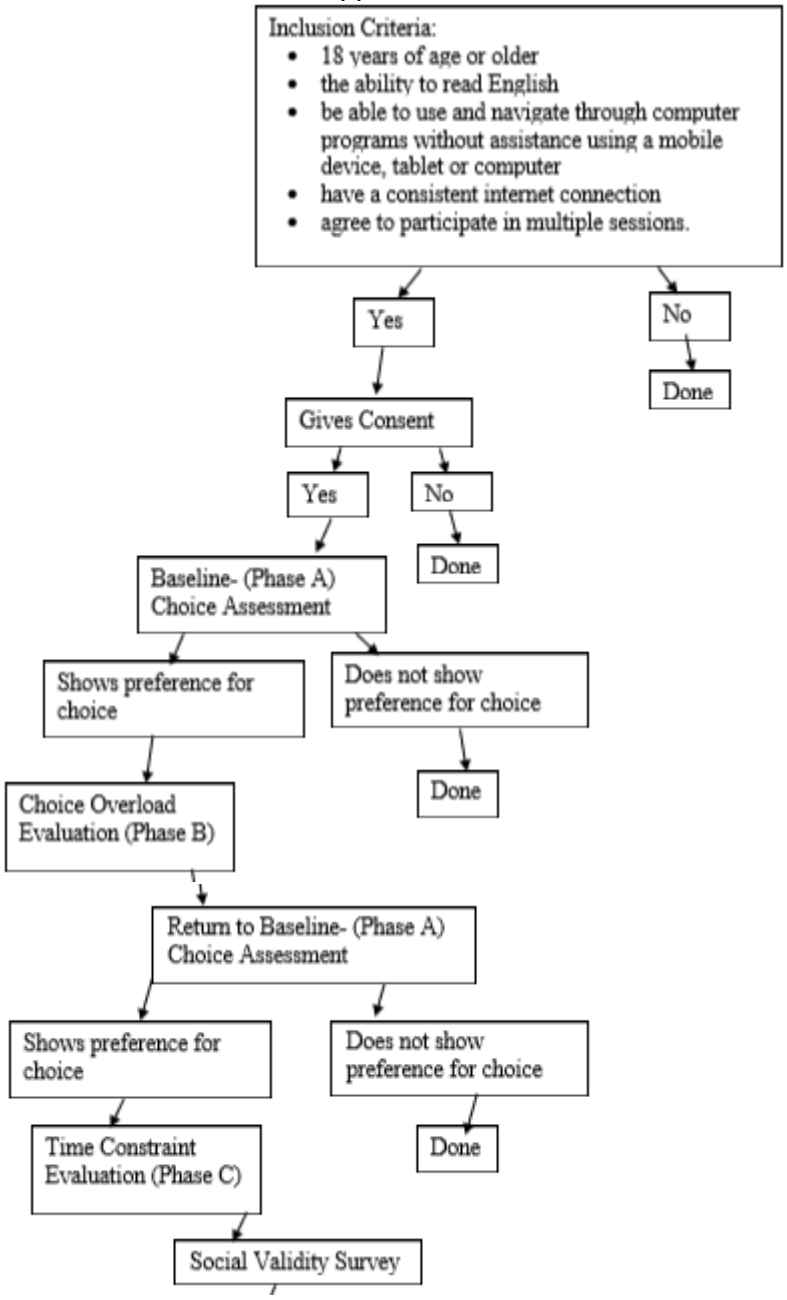

Figure 16. *Experimental Design Sequence*

Appendix B

Table 2

Social Validity Survey Questions.

Question Number	Specific Question
Question 1	Overall, how satisfied were you with your choices during the first part of the study when there was always the same number of choices?
Question 2	Overall, how satisfied were you with your choice during the second part of the study when the number of options increased?
Question 3	Overall, how satisfied were you with your choices during the third part of the study when there was a time constraint for each choice trial?
Question 4	Did you find it more difficult to make a choice when there were more options provided?
Question 5	Did you find it more difficult to make a choice when you were being timed?
Question 6	Did the presence of the timer change how you chose your symbols?
Question 7	If I could take this study over, I would change some of my answers.
Question 8	I found myself second-guessing some of my answers in the choice overload evaluation phase.
Question 9	I found myself second-guessing some of my answers in the time constraint evaluation phase.
Question 10	It was easier to choose when there were less options provided.

Note. The above table shows the 10 questions that was presented to the participants during the social validity survey.