Heuristics and resource depletion: eye-tracking customers' in situ gaze behavior in the field

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Abstract

When we visit a retail outlet, we go there to complete some type of shopping goal. These goals may be very specific and precisely planned prior to entering the store, or more abstract, and something we think of on the spur of the moment. The stores may display tens of thousands of different products, making it difficult to achieve the shopping goal in a rational manner. As a result, we use different types of heuristics to meet our shopping goals. In this study, we investigate how a customer's visual attention is influenced by their shopping goal, based on the results of three field experiments in three different contexts – a gas station, a sports store, and a grocery store. Firstly we establish that differences do exist in viewing behavior based on whether shopping goals are planned or unplanned. A more complex and unplanned shopping goal leads to increased observations of in-store stimulus. We then study whether or not the complexity of the first shopping goal also influences the viewing behavior of the next shopping goal, independently of the characteristics of the second goal. The findings confirm that complex decision heuristics deplete cognitive recourse. This finding results in diminished visual attention during subsequent choices. In turn, this has implications for a customer's shopping behavior.

Keywords. Consumer choice, heuristics, decision task, visual attention, resource depletion.

Introduction

A successful trip to a store may be regarded as the completion of a series of shopping goals. These goals may be set before the shopping trip starts, or realized during the visit to the store (Inman, Winer, & Ferraro, 2009; Park, Iyer, & Smith, 1989). Either way, the completion of a goal, or series of goals, entails picking products that fulfill the current needs and wishes of the shopper. The goals themselves also differ in terms of their specificity, ranging from selecting a particular product of a specific brand to a more general goal, such as acquiring something to quench a suddenly thirst, or finding food items that could be a meal for a family. Even though goals may be specific and articulated before the store visit in the form of a shopping list, up to an estimated 80 percent of the final decisions are made in front of the store shelf (POPAI, 1996). Given the large number of products in any given section of a supermarket, a customer cannot evaluate the strengths and merits of all available options. Instead, customers utilize some type of simplifying strategy, or heuristic, to narrow their visual attention, look at only a subset of the available products, and then make the choice in a fast and efficient manner; or, as (Woodside, Krauss, Caldwell, & Cheba, 2007, p. 17) state: 'Choices are created spontaneously as a result of subconscious heuristic processing, not as a result of the calculated pursuit of previously existing goals or preferences'.

In fact, customers often make product choices within seconds (Judd, Aalders, & Melis, 1988) and only consider a limited number of options before they make a choice (Hoyer, 1984; Nedungadi, 1990) and the selected option receives little visual attention during in-store decision making (cf. Otterbring, Wästlund, Gustafsson, & Shams, 2014). As customers also make multiple choices one after the other, the question then becomes: what consequence does the use of one heuristic have on the up-coming choices? Specifically this question is important as the cognitive effort differs from one heuristic to another, hence influencing the depletion of cognitive resources. Although a few studies have explored visual attention during

the process of choosing products from a shelf (e.g., Russo and Leclerc (1994)), no previous studies have investigated the effects of decision heuristics on visual attention during the choice process in a real store. There is probably no existing research that explores the relationship between heuristics decision making and resource depletion and the influence of this relationship on visual attention during the decision-making process. Understanding cognitive limitations is central to both theory and practical applications in consumer decision-making, because a better awareness of limitations would help us to understand information and choice overload (Johnson, 2008).

To fill this gap, the present study explores this relationship in three field experiments in different contexts by manipulating shopping tasks to influence heuristics decision making and resource depletion. Furthermore, process measures are used by measuring consumers' visual attention throughout the decision-making process. The purpose of the sequence of field experiments is as follows.

In the first field experiment, carried out at a gas station, we explored if there are differences in viewing behavior based on whether the customer has a pre-planned or unplanned (buy something that is not planned) shopping goal. The results from this field experiment suggest that customers seem to use different types of heuristics as a consequence of task specificity.

In the second field experiment, which was completed in a sports store, we drew on theories of heuristic decision making and resource depletion to compare decisions based on the take-the-best heuristic with regard to the selection of a specific pre-planned product. After completing the first task, we then studied its effect on a subsequent unplanned choice. The results show that the use of the take-the-best heuristic is more demanding and results in a more distributed gaze pattern. In support of the resource depletion theory, the results also show that take-the-best leads to a reduced gaze pattern during the subsequent choice.

This effect is reversed in the third field experiment that was carried out in a large food store. In this field experiment the selection of a pre-planned product was compared with a choice based on the satisfaction heuristic. In this case, a non-specific shopping goal resulted in less visual attention than a specific pre-planned shopping goal did. However, in support of the resource depletion theory, and consistent with the second field experiment, it was found that more visual attention on an initial choice task depletes resources on a second choice task.

Theoretical framework

The consumer choice process is most commonly viewed as a multi-stage process (Andrews & Srinivasan, 1995). Although there is a considerable variation in the number of proposed stages, the lowest common denominator is the notion that consumers screen and evaluate the alternatives before entering the choice stage (Bettman, Luce, & Payne, 1998; Shao, Lye, & Rundle-Thiele, 2008). During the initial screening phase, consumers gather information regarding the available options, and start eliminating inappropriate alternatives (Andrews & Srinivasan, 1995; Wedell & Senter, 1997).

The consideration phase follows the screening phase. In the consideration phase, the consideration set, a subset of the available alternatives (Payne, 1976), is actively evaluated (Bettman et al., 1998; Johnson & Payne, 1985). The consumer evaluates the products included in the consideration set and narrows the choices down to what is often described as the choice set (Roberts, 1989; Russo & Leclerc, 1994), repeating the process until only one final product remains. In many cases, however, customers do not go through one single choice process, but make several subsequent choices one after the other. This is typical for any trip to a grocery store. Earlier laboratory studies have shown that making a series of active choices leads to the depletion of resources. This makes people more susceptible to emotionally-laden product features (Bruyneel, Dewitte, Vohs, & Warlop, 2006), and more prone to impulse buying (Vohs & Faber, 2007). Resource depletion has also been shown to increase reliance on

intuitive thinking at the expense of a more cognitively demanding consideration (Pocheptsova, Amir, Dhar, & Baumeister, 2009).

Russo and Leclerc (1994) suggested that the choice process is viewed as a series of evaluations, comparisons, and eliminations that result in a single remaining alternative. Interestingly, in this process customers actually do not look at all of the available options (Russo & Leclerc, 1994). Needless to say, a product cannot be selected unless it has actually been looked at. If customers view a greater selection of products, it follows that more products have a possibility of being included in the consideration set. Other studies have explored such findings. The research of (Chandon, Hutchinson, Bradlow, & Young, 2009) shows that any given product has an approximately 70 percent likelihood of being noted. In relation to the research topic, including more options leads to a more demanding decision effort, and a customer will have to work harder to come up with a solution.

Heuristic decision making

Also central to the field of heuristic decision making is the use and evaluation of decision cues. Instead of making a rational and formal choice based on all available information, Goldstein and Gigerenzer (1999) argued that the choice process is based on different heuristics, making the process swift and effective. They furthermore proposed that people have an adaptive toolbox of different types of heuristics and that, depending on the situation, different heuristics are used to solve the problem (Gigerenzer & Gaissmaier, 2011). The most basic heuristic is the recognition heuristic (Goldstein & Gigerenzer, 1999), which simply states that, given a choice between two options in which one is recognized and one is not, the recognized one is preferred. If a person recognizes more than one option, these options are evaluated according to the fluency heuristic (Jacoby & Dallas, 1981), which uses the speed of memory retrieval as a cue to compare the degree of familiarity. In both cases, the more familiar option is evaluated more favorably. These results also confirm the findings of

(Shams, Wästlund, & Witell, 2012) that indicate that product familiarity is an important driver of visual attention.

In more complex situations involving several options, the decision is not based on recognition alone, but also involves the creation of decision criteria and the evaluation of cues. If the objective is to choose any product that meets a minimum requirement level, the satisfaction heuristic might be used (Simon, 1955; Todd, 1999). In contrast, if the objective is to select an option with the highest conformance to the decision criteria, the take-the-best heuristic (Gigerenzer & Goldstein, 1969) may be used to select the option that meets the highest-ranking unique criteria; alternatively the tallying heuristic (Dawes, 1979) may be used to select the option that meets the most non-ranked decision criteria.

Next, we will describe the three field experiments and what we tried to solve in each experiment.

Field experiment one: Influence of shopping goal on breadth of visual search

The research on heuristic decision making shows how consumers can use fast and efficient decision strategies to solve the goals of their shopping trip. However, it is important to discriminate between goals that were set before the trip to the store and goals that arose during the visit. Planned purchases are the result of shopping goals that stem from needs that are recognized before the visit to the store (Bucklin & Lattin, 1991). In contrast, unplanned purchases are the result of shopping goals that stem from needs that were unrecognized before the shopping event (Park et al., 1989). These two conditions represent two different types of challenges. If we know what we are looking for before entering the store, the goal is to search for a specific target, or something we recognize as a solution to our current need. This should be easier compared with the more complex problem-solving process of setting goals and evaluating possible solutions at the same time. The first experiment is carried out in order to understand if a planned shopping process leads to a different search pattern compared with an

unplanned shopping process where the goals are realized in the store. The primary aim of the first field study is to explore the influence of the shopping goal on the breadth of in-store visual search .The assumption is that consumers with predefined shopping goals display a narrow visual search behavior as they strive to resolve a specific goal. Consequently, the research question we are exploring is whether consumers that engage in unplanned purchases acquit themselves of a broader visual search. This is because they have no pre-planned specific goal to resolve, and hence they consider more possible alternatives on what to purchase.

Method

This study uses eye-tracking equipment at a gas station to explore the breadth of visual search when customers enter the store to pay for fuel. This provides an optimal contextual setting for measuring visual search because the options are limited, and the possibility exists for both planned and unplanned purchases. Furthermore, this study provides the opportunity to explore the consumer's visual search without interrupting their intended behavior.

Sample

The final sample comprised 190 participants (149 male, mean age = 46.93, *SD* = 14.51) who were recruited outside the gas station. A total of 203 participants were originally recruited, but 13 were excluded because of faulty eye-tracking recordings or because the main dependent variable did not fall within the ± 2 *SD* cutoff points (compare (Burzynska, Nagel, Preuschof, & Li, 2011; Dudschig, Lachmair, de la Vega, De Filipps, & Kaup, 2012)).

Design

The study was conducted as a quasi-experimental between-subjects design with participants divided into three groups based on their in-store purchase behavior. The three groups contained participants who (in addition to gas) purchased nothing (*n* = 102), participants who only purchased products they had decided on before entering the store (*n* =

63), and participants who purchased at least one product they had not intended to buy when they entered the store (n = 25). The number of products purchased was included as a covariate in the statistical analysis to nullify the effect of gaze behavior caused by participants searching for and buying unequal amounts of products.

Equipment

Visual attention was measured using Tobii glasses, a head-mounted eye-tracking system equipped with a 30-Hz sampling frequency eye-tracker and a scene camera to film whatever appeared in front of the glasses. Eye-tracking is less influenced by response bias than self-reporting, and has a more standardized method for investigating cognitive processes than memory-based measures (Krajewski, Sauerland, & Muessigmann, 2011). The eye-tracking system looks similar to a pair of regular glasses and, therefore, provides a rather unobtrusive way to record gaze in real-world situations. The resulting data for a session consists of a video recording of everything that was in front of the participant, with a superimposed red dot that shows the eye-fixations of the participant as he/she moves throughout the store. An eye-fixation is a point at which the eye fixates on an object and acquires information (Duchowski, 2007). To analyze the data, the product categories in the store were classified into different areas of interest (AOIs), one for each product category. Two research assistants coded the dataset to establish the number of observations, if any, that participants made on each AOI.

Procedure

Participants were recruited when they filled up their cars at the gas station. Participants were informed that we were interested in the gaze behavior during shopping and that all they had to do was wear a head-mounted eye-tracker. They were also told that they would be given a lottery ticket and a voucher for a free carwash if they participated. Those who willingly participated were asked to walk over to a research assistant waiting near the entry to the gas station store, who mounted the eye-tracking glasses and performed a short calibration routine.

Before the participants were asked to proceed into the store, they were instructed to go about their business and do whatever they had planned to do in the store. After the participants completed their business in the store, they were asked to fill out a short questionnaire regarding the products, if any, that they purchased and the extent to which they had planned to purchase them before they entered the store.

Measurements

The main dependent variable was the number of observations, if any, that participants had on each AOI, in other words, on each product category. The categorization enabled the measurement of both the number of AOIs observed by participants and the spatial distribution of gaze throughout the store. To achieve this measurement, each shelf and display was counted as a separate AOI even though some shelves and displays contained similar products. Conversely larger displays, such as the area behind the cashier, were divided into more than one AOI because they contained several different product categories.

This categorization resulted in the store being divided into a total of 23 AOIs. One observation was counted when a participant viewed one AOI without switching to another. Conversely, if the participant switched his/her visual attention from one AOI to another and then returned to the first AOI, such a switch resulted in two observations on that particular AOI. Since the number of observations is influenced by the number of purchased products – buying many products entails looking at a larger part of the store – the number of products purchased is used as a covariate in the analysis.

Results and Discussion

A one-way ANCOVA with in-store purchase behavior (no purchases, planned purchases, unplanned purchases) as a between-subjects factor, and number of products purchased as the covariate, showed a statistically significant main effect for in-store purchase behavior on the number of observed AOIs ($F(2,186) = 7.861$, $p < .001$). The covariate, the

number of products purchased, was significantly related to the number of observed categories ($F(1,186) = 13.781$, $p < .001$). Sidak corrected post-hoc comparisons showed that participants in the unplanned-purchases group observed a significantly ($p \leq .001$) larger number of AOIs ($M = 42.87$, $SD = 21.60$) than both the no-purchases ($M = 22.17$, $SD = 24.85$) and the planned-purchases ($M = 28.93$, $SD = 21.88$) groups. No significant difference existed between the no-purchases and the planned-purchases groups ($p = .355$).

This field study supported the notion that visual attention depends on the specificity of the customer's particular shopping task. When controlling for the number of purchases, customers who made one or more unplanned purchases (and, arguably, had a less structured shopping task) were found to display a more widespread gaze behavior compared with customers who did not make any unplanned purchases (and had a more structured shopping task). Even though shopping goal specificity clearly affects gaze-behavior, it is not possible to get to the bottom of the underlying heuristics used by the participants in this experiment. Setting the goal to acquire one's favorite beverage or setting the goal to acquire something to drink are equally feasible before the visit as during the visit to the store. Irrespective of heuristics, the participants with a less structured shopping task clearly included more products in their consideration sets.

In order to further investigate this relationship, in the following two experiments we will manipulate the specificity of the shopping tasks given to participants in such a way that it will affect the underlying choice heuristic.

Field experiment two: Effect of the take-the-best heuristic on visual attention and resource depletion

Field experiment two had two aims. Firstly, we investigated whether the specificity of a customer's shopping tasks influences how much visual attention they direct to task-relevant in-store stimuli. This task thus mimicked the conditions of the first experiment in terms of

goal specificity, that is, the first group already knew what they were searching for when entering the store while the second group had to rely on resources found within the store to complete their task. As an extension to the first experiment, we explored whether customers who were asked to select a product based on their personal preferences relied on a more complex heuristic, and therefore displayed a larger distribution of visual attention compared with customers who were asked to select a specific, pre-defined product within the same category.

Secondly, building on theories of resource depletion, in other words, the reduction of an individual's limited resources (cf. Bruyneel et al., 2006), we examined whether an initial choice task influences a customer's visual attention during a second, unrelated choice task.

Depending on the context and particularities of a given choice, different heuristics may be applied to complete the choice in as swift a manner as possible. If a choice is regarded as a product that will be used frequently, is visible to others, has a considerable cost, and reflects one's personal preferences, a feasible objective of the heuristic is to select the product that best fulfills the decision criteria.

Thus, given the assumed reliance on the take-the-best or tallying heuristic among customers who are considering purchasing a relatively expensive product, we make the following hypothesis. H1: For products associated with relatively high personal cost, customers who are asked to select a product they consider buying direct more of their visual attention toward task-relevant in-store stimuli, whereas customers who are asked to select a specific, pre-defined product within the same product category do not.

An even more intriguing question is whether the amount of visual attention during an initial choice task influences the amount of attentional resources directed at another, subsequently presented choice task. To the best of our knowledge, this question has never been explicitly investigated. However, related research findings support this notion. For

instance, Pocheptsova, Amir, Dhar, & Baumeister (2009) reported that a participant's choice behavior may be impaired by resource depletion and that such depletion increases the reliance on intuitive, less taxing information processing in subsequent decision making. Thus, an initial task that demands deliberate processing will, through resource depletion, increase reliance on more simplified styles of decision making in a subsequent, unrelated choice task. Although visual attention does not always drive choice behavior (Chandon et al., 2009), a reasonable assumption to make is that, if resource depletion has an actual effect on choice, it will also influence a customer's visual attention.

Accordingly, we make the following hypothesis. H2: In an initial choice task, customers who attend to a relatively large, as opposed to a small number of in-store stimuli, also look at a smaller number of such stimuli in a subsequent, unrelated choice task. Conversely, in an initial choice task, customers who attend to a relatively small number of in-store stimuli will look at a larger number of such stimuli in a subsequent, unrelated choice task.

Method

This eye-tracking experiment was conducted in a large national sports equipment store, and was designed to manipulate the decisions heuristic through variations in task specificity.

Sample

The final sample consisted of 98 participants (49 male, mean age = 32.90, *SD* = 19.94) who were recruited near the entrance to the sports equipment store. Altogether, 105 participants were recruited, but seven were excluded because of faulty eye-tracking recordings or because the main dependent variable did not fall within the ± 2 *SD* cutoff points.

Design

The study was conducted as a field experiment with a 2 (task specificity: specific versus non-specific) × 2 (choice task: first versus second) mixed design. The task-specificity manipulation was between participants, and the choice task was the repeated factor.

Participants were randomly assigned to one of the two experimental groups, and each completed two choice tasks. The objective of the first task was to choose a winter jacket. They were instructed to find, either a particular jacket (specific choice group; $n = 51$) that they were shown before entering the store, or a jacket that conformed to their own personal preference (non-specific choice group; $n = 47$). The second task was to find any product in the store that they would consider buying, either for personal use or for someone they knew.

Equipment

The equipment used was identical to that used in field experiment one.

Procedure

Participants were recruited as they were entering or passing by the sports store, which was located in a mall. The participants were informed that we were studying in-store gaze behavior and that their task was to perform two choice tasks when wearing a head-mounted eye-tracker. They were also informed that they would be given a lottery ticket and a 20 percent rebate voucher if they participated. The participants who willingly accepted to participate had the eye-tracking glasses mounted and went through a short calibration routine just outside the entrance to the store. Before the participants were asked to proceed into the store, they were either shown an advertisement of a jacket available in the store and asked to find it (specific choice group) or instructed to find a jacket that they would like to buy if they would have been shopping for a winter jacket (non-specific choice group). They were also instructed that, after they found the jacket, they should proceed with the second task of finding any product in the store that they wanted to buy using their 20 percent voucher (although the participants were not obliged to use the voucher on that specific day). After the participants had completed their choice tasks and returned to the assistants outside the store, they were asked to fill out a short questionnaire.

Measurements

As in field experiment one, the main dependent variable was the number of observations, if any, that participants had on each AOI, in other words, on each product category. In the first choice task, each AOI was based on the predominant color of the different winter jackets available in the store, resulting in 10 AOIs. For the analysis of observations in the second choice task, the entire assortment in the store was divided into 19 AOIs, for example, male sportswear, female sportswear, children's sportswear, indoor sportswear, outdoor sportswear, sporting accessories, and so on. As in field experiment one, a participant who viewed a given AOI without switching to another was recorded as having only one observation on that particular AOI. Conversely, if the participant switched his/her visual attention from one AOI to another and then returned to the first AOI, this switch resulted in two observations on that AOI.

Results and Discussion

To investigate *H1*, an independent samples *t*-test was conducted with task specificity (specific versus non-specific) as the independent variable and the number of observed AOIs during the first choice task as the dependent variable. Participants in the non-specific choice group (M = 127.19, SD = 99.21) observed a significantly ($t(96) = 2.60$, $p = .011$) larger number of AOIs than participants in the specific choice group (M = 81.04, SD = 75.50). This result supports H1 and suggests that, for products associated with a reasonable amount of personal costs (for example, a new winter jacket), customers who are asked to select a product they could consider buying, direct more of their visual attention toward task-relevant in-store stimuli compared with customers who are asked to purchase a specific, pre-defined product within the same product category.

To address H2, a 2 × 2 mixed ANOVA with task specificity (specific versus non-specific) as a between-subjects factor and choice task (first versus second) as a within-subjects factor was conducted on the number of observed AOIs. The analysis revealed no

significant main effect of task specificity ($F < 1$, $p > .35$). More importantly, and consistent with *H2*, a statistically significant task specificity × choice task interaction existed ($F(1,96) = 6.322$, $p = .014$). Participants in the specific choice group observed a smaller number of AOIs during their first (specific) choice task ($M = 81.04$, $SD = 75.50$) compared with their second choice task ($M = 136.39$, $SD = 114.93$). Conversely, participants in the non-specific choice group observed a larger number of AOIs during their first (non-specific) choice task ($M = 127.19$, $SD = 99.21$) compared with their second choice task ($M = 117.98$, $SD = 106.12$). To further investigate the interaction, we performed a residual means analysis (Rosnow & Rosenthal, 1989; Ross Jr & Creyer, 1993; Umesh N, Peterson A, McCann-Nelson, & Vaidyanathan, 1996). The interaction, as depicted in Figure 1, shows that participants in the specific choice group observed a smaller number of AOIs during their first (specific) choice task than expected, whereas participants in the non-specific choice group observed a larger number of AOIs during their first (non-specific) choice task than expected.

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Figure 1 here.

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This interaction further supports the take-the-best heuristic hypothesis (*H1*). Central to our compensatory hypothesis (*H2*), the interaction also shows that, despite the fact that the second choice task did not differ in specificity between the two groups, participants in the specific choice group observed a larger number of AOIs in the second choice task than could be expected based on the main effects, and participants in the non-specific choice group observed a smaller number of AOIs in the second choice task than could be expected based on the main effects. Thus, the level of specificity in the first task influenced a participant's gaze behavior in the second task, so that both groups responded with compensatory gaze behavior. Therefore, participants who observed a small number of AOIs in the first choice task (in other

words, those in the specific choice group) looked at a larger number of AOIs in the second task, whereas participants who observed a larger number of AOIs in the first choice task (in other words, those in the non-specific choice group) looked at a smaller number of AOIs in the second choice task. To put it another way, it seems as if depletion, as a consequence of consideration during the first task, leads to a more restricted consideration set in the second task.

To further investigate the effect of heuristics on visual attention and resource depletion, we attempt to reverse the effect in field experiment three.

Field experiment three: Effect of the satisfaction heuristic on visual attention and resource depletion

Field experiment three has two main objectives. Firstly, it explores whether customers who are asked to select a product they may consider buying, direct more of their visual attention toward task-relevant in-store stimuli compared with customers who are asked to select a specific, pre-defined product (as in field experiment two), or whether this effect may be reversed for products that are not as strongly associated with personal cost (for example, purchasing a package of coffee). Secondly, we investigate whether the effect of resource depletion on a customer's visual attention may be replicated and generalized to different retail settings.

Given that it is the level of activity involved in the choice and not the specificity of the goals that affect the choice outcomes, the complexity of the heuristic underlying the choice, rather than the specificity of the goal, should have a depletive effect on the task. As we only expect reliance on the take-the-best heuristic in contexts associated with a reasonably high amount of personal cost (as in the instruction of field experiment two to consider purchasing a winter jacket) or some other type of personal investment, we do not believe that customers asked to purchase a relatively inexpensive product (for example, a package of coffee) use the

same decision cue when making such a choice. Instead, we argue that, under such circumstances, customers are more likely to rely on the satisfaction heuristic.

This scenario should, therefore, reverse the effect found in field experiment two. Therefore, we develop the following hypothesis. H3: For products not associated with personal cost, customers who are asked to select a product they would consider buying, direct less of their visual attention toward task-relevant in-store stimuli compared with customers who are asked to purchase a specific, pre-defined product within the same product category.

Furthermore, in line with the results regarding resource depletion in experiment 2, we develop the following hypothesis. H4: In an initial choice task, customers who attend to a relatively large number of in-store stimuli, look at a smaller number of such stimuli in a subsequent, unrelated choice task. Conversely, in an initial choice task, customers who attend to a relatively small number of in-store stimuli, look at a larger number of such stimuli in a subsequent unrelated choice task.

Method

The shopping-list procedure is a method that controls the in-store behavior of customers without actually instructing them where to go. Prior research uses this method in real retail settings (e.g. Otterbring, Wästlund, & Gustafsson, 2014; Titus & Everett, 1996) to ensure that most participants move through the same areas of the store and eventually select products from the targeted focus areas. This approach shortens the time for task completion and focuses the participants on the AOIs.

Sample

The final sample consisted of 66 participants (26 male, mean age = 22.92, *SD* = 2.82) who were all university students. Altogether, 72 participants were recruited, but six were excluded because the main dependent variable did not fall within the ± 2 *SD* cutoff points.

Design

The study was conducted as a field experiment with a 2 (task specificity: specific versus non-specific) × 2 (choice task: first versus second) mixed design. As in field experiment two, the task-specificity manipulation was between participants and the choice task was the repeated factor. Participants were randomly assigned to one of the two experimental groups, and completed two choice tasks. The objective of the first task was to choose a package of coffee. The participants were instructed, either to find a particular coffee (specific group; n = 33), or to pick up a package of coffee based on their own personal preference (non-specific group; n = 33). The second task was to go to the pastry department and choose any type of pastry that they wanted.

Equipment

The equipment used was identical to that used in field experiment one.

Procedure

Participants were recruited on the Karlstad University campus. They were informed that we were studying in-store gaze behavior, and that their task was to perform two choice tasks when wearing a head mounted eye-tracker. They were also informed that they would be given a lottery ticket and a 5 percent rebate voucher if they participated. The participants who willingly participated were divided into small groups that were driven to and from the grocery store, one group at a time. On arrival at the grocery store, one participant at a time participated in the data collection. The experiment was framed as a short trip to buy coffee and pastry for a workplace gathering. In the specific choice group, the participants were told that the boss explicitly asked for a certain type of coffee. In the non-specific choice group, the participants were simply told to buy a package of ground coffee. Having gone through a short calibration routine, the participants were instructed to proceed with their tasks. After the participants completed their choice tasks and returned to the assistants outside the store, they were asked to fill out a short questionnaire.

Measurements

As in field experiments one and two, the main dependent variable was the number of observations, if any, that participants had on each of the AOIs. In the first choice task, the AOI categorization was primarily based on brands, but also on some additional categories, such as whole beans and instant coffee. In total, ten AOIs were used. For the analysis of observations in the second choice task, the assortment of pastries and baked goods were also divided into 10 categories.

Results and Discussion

To investigate *H3*, an independent samples *t*-test was conducted with task specificity (specific versus non-specific) as the independent variable and the number of observed AOIs during the first choice task as the dependent variable. Participants in the non-specific choice group (M = 15.00, SD = 7.84) observed a significantly ($t(64) = -3.44$, $p = .001$) smaller number of AOIs than participants in the specific choice group (M = 23.39, SD = 11.63). This result supports H3 and suggests that, for products associated with lower personal cost (for example, a package of coffee), customers who were asked to select a product that they could consider buying, direct *less* of their visual attention toward task-relevant in-store stimuli compared with customers who are asked to purchase a specific, pre-defined product within the same product category.

To address *H4*, a 2 × 2 mixed ANOVA with task specificity (specific versus non-specific) as the between-subjects factor and choice task (first versus second) as the within-subjects factor was conducted on the number of observed AOIs. The analysis showed no significant main effect of task specificity ($F < 1.71$, $p > .19$). However, a statistically significant main effect for choice task was found ($F(1,64) = 12.164$, $p = .001$). The first (coffee) choice was accomplished with fewer observations (M = 19.20, SD = 10.71) than the second (pastry) choice (M = 25.07, SD = 11.66). Central to our compensatory hypothesis

(*H4*), the analysis revealed the hypothesized task specificity × choice task interaction ($F(1,64) = 11.423$, $p = .001$). As in field experiment two, we conducted a residual means analysis to visualize the interaction effect as shown in Figure 2.

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Figure 2 about here.

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Evidently, participants in the specific choice group observed a larger number of AOIs during their first (specific) choice task than was expected, whereas participants in the non-specific choice group observed a smaller number of AOIs during their first (non-specific) choice task than was expected. This result further supports the satisfaction heuristic hypothesis (*H3*). Additionally, the interaction shows that, despite the fact that the second choice task did not differ in specificity between the two groups, participants in the specific choice group observed a smaller number of AOIs in the second choice task than was expected based on the main effects, and participants in the non-specific choice group observed a larger number of AOIs in the second choice task than was expected based on the main effects. This result further corroborates our compensatory hypotheses (*H2* and *H4*) and the notion that depletion leads to less consideration during subsequent tasks.

General discussion

All three of the experiments in this study were field experiments representing different contexts. Furthermore, all the field experiments captured process measures using an eye-tracking device while customers made decisions. In order to establish whether or not the level of preplanning of shopping goals influences gaze patterns, the first field experiment was conducted at a gas station. To further investigate the influence of the choice heuristic on visual attention, the second field experiment was carried out in a sports store. In this

experiment we compared the gaze patterns between participants who utilized the take-the-best heuristic with the gaze patterns of participants who were looking for a specific product. One of the shopping tasks, to find a jacket they liked, proved to be more demanding, and made customers look at more items before making their decision. This task in turn influenced the gaze patterns of the customers when solving the second, follow-on task, causing them to look at fewer items compared with customers who had the easier first task of finding a particular jacket.

The third field experiment was conducted in a grocery store. In this experiment we compared the gaze patterns of participants who utilized the satisfaction heuristic with the gaze pattern of participants who were looking for a specific product. The results of the third experiment confirmed the findings of the second field experiment that a more complex first task leads to customers looking at fewer items when solving the next task. However, by simplifying the first task to find a specific product with a less complex heuristic, we were able to reverse the effect of heuristic decision making on visual attention for the second task. Together, the results of experiments two and three show that the distribution of visual attention is influenced by the complexity of the shopping goal. This supports the interpretation of experiment one that unplanned purchases generate a larger gaze distribution due to the added complexity of both creating and fulfilling shopping goals.

On a general level, the three field experiments support two main findings: firstly, the complexity of the heuristic used to achieve the shopping goal influences the distribution of visual attention; and secondly, complex decision heuristics deplete resources, resulting in diminished visual attention during subsequent choices. As Gigerenzer and Gaissmaire (2011) show, customers apply heuristics to make quick choices, using as few mental resources as possible. Our result adds to this body of knowledge by showing that the complexity of the heuristic is a driver of gaze distribution and is a determinant of the amount of evaluations,

comparisons, and eliminations performed during the choice process. Consequently, if a customer takes shortcuts, in other words, makes a routine choice or looks for a specific product, he or she looks at fewer items on the way to making a decision. However, if the choice regards a product with a larger personal investment – the product is used frequently, is visible to others, has a considerable cost, or reflects personal preferences – the objective of the heuristic is to select the product that best fulfills other desirable criteria. However, an unresolved research question that this study aims to answer is: what happens after the first goal is solved?

Previous research (cf. Bruyneel et al., 2006) showed that depleted self-control affects subsequent choices. However, these studies have usually measured the effects of depletion in tasks involving a dichotomous choice. Our results show that the complexity of the underlying choice heuristic, and its required level of activity, determines the level of depletion and subsequent restriction of consideration. We have found that customers display compensatory behavior; that is, a narrow gaze behavior for one task results in a more widely distributed gaze behavior in a consecutive second task, and vice versa. If a customer gazes on relatively more items before making a decision, he or she will gaze on fewer items after making the choice. The implication is that, after a series of complex decisions customers relies on more simplified decision-making styles and, hence, is more susceptible to in-store marketing attempts, in other words, it leads to more spontaneous shopping. Furthermore, the source of depletion has been portrayed as a question of substantial importance in both theory and practice (Johnson, 2008). In this paper we have shown that heuristic decision making is one source of depletion, and that visual attention can be used as a tool to further explore resource depletion in future research.

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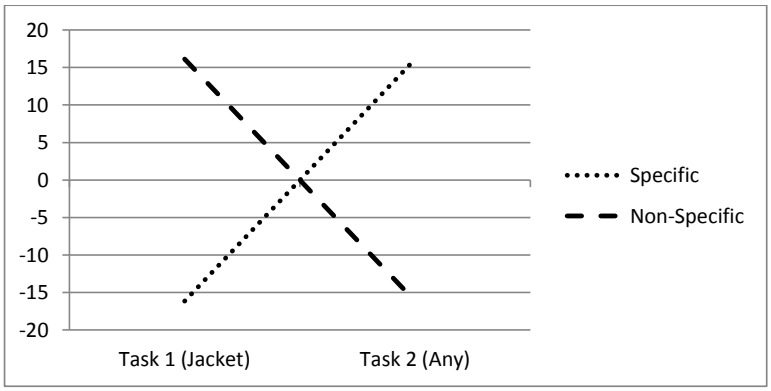

Figure 1. Graph showing the interaction effect of task specificity (specific versus non-specific) on the number of observations during a participant's first choice task (Jacket) and compensatory gaze behavior during the second choice task (Anything).

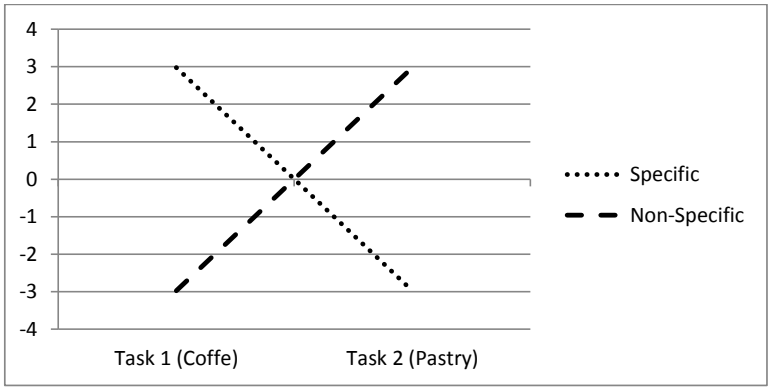

Figure 2. Graph showing the interaction effect of task specificity (specific versus non-specific) on the number of observations during a participant's first choice (Coffee) task and compensatory gaze behavior during the second choice (Pastry) task.