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Payment for Pain: Differences between Hypothetical and Real Preferences

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***Abstract*—**Decision-makers tend to prefer the first alternative over subsequent alternatives which is called the *primacy effect*. To reliably measure this effect, we conducted an experiment with real consequences for preference statements. Therefore, we elicit preferences of subjects using a rating scale, i.e. hypothetical preferences, and willingness to pay, i.e. real preferences, for two sequences of pain. Within these sequences, both overall intensity and duration of pain are identical. Hence, a rational decision-maker should be indifferent, whereas the primacy effect predicts a stronger preference for the first sequence. What we see is a primacy effect only for hypothetical preferences. This effect vanishes for real preferences.

***Keywords*—**Decision making, primacy effect, real incentives, willingness to pay.

I. Introduction

THE order in which alternatives are presented influences how humans remember the alternatives. According to this serial position effect (introduced by Ebbinghaus [5] and first experimentally observed by Deese and Kaufman [3], [6]), humans best remember the alternatives seen last (recency effect) and the ones seen first (primacy effect). Among others, the impact of the serial position effect on television advertising has been intensively studied. An analysis of advertisements shown during the Super Bowl indicates a clear primacy effect [10], while a long-term analysis of television advertising in the Netherlands found both the primacy and the recency effect [16].

The serial position effect not only influences how well alternatives are memorized, but which alternative is favored (e.g. [7]). An international study analyzing the participants of the idol series, a singing competition broadcast on television, finds that later presentations are favored over earlier ones, i.e. the recency effect [15].

Serial position effects occur [1], as alternatives experienced first are rehearsed during the subsequent presentation of further alternatives and put into long-term memory (primacy effect). Alternatives last seen are still accessible in short-term memory (recency effect), and therefore easily retrievable [6]. Formal economic models describe corresponding bounded rational decision makers by limiting the number of alternatives memorizable (e.g., [4], [13]). It has even been shown that satisficing instead of optimizing behavior due to limited mental capabilities drives serial position effects [18].

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In this paper, we assault serial position effects from two perspectives: first, we investigate whether serial position effects still occur, if only two alternatives are presented, i.e. if memory limitations are unlikely to influence behavior. Second, we analyze whether serial position effects still occur in presence of monetary incentives [19]. Participants in our experiment experienced two sequences of pain with identical overall pain levels, but differing in the distribution of pain intensity levels. We aimed for an elicitation of real preferences for the two sequences. Therefore, we implemented a mechanism to indicate willingness to pay. The indicated amounts were relevant for the payoff subjects finally received for their participation. In the next step, we used a numerical rating scale to elicit hypothetical preferences. Answers subjects gave here had no consequences for their final payoff. Consistent with Murphy et al. [14], we find a clear primacy effect if consequences are excluded. The effect vanishes if participants had to pay for their preferences.

II. Method

To investigate preferences for alternatives that participants experience first over those that they go through subsequently, our participants experienced two alternatives of pain using the cold pressor test [8], i.e. both alternatives that the participants experienced consisted of putting one hand in basins filled with cold water. We decided for this procedure to investigate sequence effects for the following reason [1]: prior to the experiment, participants typically have no experience concerning cold pressor tests. Hence, participants are typically unbiased [2]. The pain perception induced by cold water is constant. Hence, varying the immersion duration does not increase or decrease the pain and no feeling of satiety occurs [3]. Identical experimental conditions are easily contrivable for all participants as the experience only depends on the water temperature.

83 participants took part in our experiments at the Otto-von-Guericke-University, Magdeburg. The experiment consisted of two meetings: first, seven days prior to the real experiment. At this meeting, all participants received a show up fee of 12 Euro for the second meeting (Fig. 1). During the second meeting, the experiment itself took place.

A. Pain Experience

In the beginning of the experiment, we handed out written instructions describing the procedure of the experiment. After reading the instructions, each participant experienced two alternatives. For each of them, she/he had to put one of her/his hands in a basin of cold water with temperatures varying

between 4 °C and 12 °C. One alternative started with the lowest temperature getting warmer stepwise, namely the improving sequence (4 °C, 8 °C, 12 °C), the other alternative starting with the warmest temperature and getting colder, namely the declining sequence (12 °C, 8 °C, 4 °C). In both sequences, participants experienced each temperature for one minute. Hence, a rational decision maker should be indifferent as the overall pain per sequence was identical.

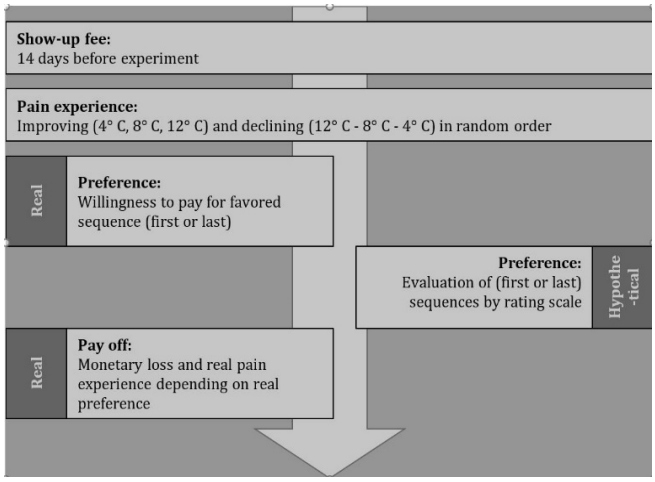

Fig. 1 Experimental procedure

Each participant experienced the two sequences, the increasing and the declining one, in random order and knew neither the immersion duration nor temperatures. After the first experience, each participant had to wait for 30 seconds, switch her/his hand, and continue with the second sequence. The change of hands guaranteed equal conditions of pain perception for both sequences.

B. Real Preferences

After experiencing both the sequences, we asked the participants to tell which sequence they favor and how much they were willing to pay to re-experience the favored sequence instead of the non-favored one. Participants who were indifferent, i.e. who stated they did not favor any of the alternatives, did not explicitly have to specify their willingness to pay (it obviously was 0.00 Euro) and immediately continued with stating their hypothetical preferences (see Section II *C*). For all participants favoring one alternative, we elicited the willingness to pay for the favored sequence. Therefore, we implemented the Holt-Laury Procedure (inspired by Holt and Laury [9]): We presented each participant 25 choices, each containing the non-favored sequence and the favored one. The non-favored sequence was coupled with rising amounts of money. In the first line, the amount to pay was 0.00 Euro, and the amounts were raised in steps of 0.20 Euro until 5.00 Euro at the 25th choice. For each of the 25 choices, participants indicated whether they preferred the non-favored sequence or the favored one plus paying the corresponding amount of money. Using the Holt-Laury Procedure, we derived the willingness to pay of each participant by identifying the maximum amount of money she/he was willing to pay for re-experiencing her/his favored sequence. The participants stating a willingness to pay of 0.20 Euro or more continued with specifying their hypothetical preferences (see Section II *C*). We asked all participants favoring one sequence but specifying no willingness to pay for it, for their willingness to pay for re-experiencing the non-favored sequences by presenting them the Holt-Laury Procedure comparing the initially non-favored sequence to the initially favored sequence plus an amount of money. Thereby, any possible strategies that the participants might follow could be controlled.

When specifying their willingness to pay using the Holt-Laury Procedure, all participants knew that their decision would be paid in the end of the experiment using the described method.

C. Hypothetical Preferences

After specifying the willingness to pay, we derived hypothetical preferences. Therefore, subjects used two numerical rating scales. Every rating scale represented one sequence. Subjects were to evaluate the pain intensity that they had perceived during the first and the second experience. The rating scales had eleven values starting with 0 for no pain until 10 for the strongest pain.

All participants knew that these hypothetical preference statements remained without any monetary consequences, i.e. they knew it was not payoff relevant.

D. Hypothetical Preferences

In the end of the experiment, we realized the real preferences of our participants. For all participants having a willingness to pay of 0.00 Euro, we determined one of the two sequences randomly and the participants re-experienced this randomly drawn alternative. Subject who indicated a willingness to pay went through a lottery: we randomly determined one choice they had made before (during the Holt-Laury procedure). The next step depended on the decision that the participant had made at the selected choice: she/he either had to experience the sequence that she/he disliked more or she/he re-experienced the preferred one and additionally paid the corresponding amount of money to us.

III. Results

We investigated individual preferences for painful sequences using real willingness to pay and a numerical rating scale. As duration and temperatures were equal for both pain sequences, a rational decision-maker would be indifferent, favoring neither the first nor the last alternative. This includes the fact that the willingness to pay would be 0 and ratings would not differ. A decision-maker showing preferences in line with the primacy (recency) effect, however, would favor the pain sequence experienced first (last) over the pain sequence experienced later (earlier).

We first investigate whether the participants preferred the first sequence (primacy effect) or the second sequence (recency effect) when stating their preferences without consequences on the rating scales. Fig. 2 presents the results.

A majority of 61 participants prefer the first sequence over the second, whereas 19 participants feel stronger pain during the first than during the second sequence. Three participants rate both sequences equally. Hence, we clearly find a primacy effect for participants stating their preferences without any monetary consequences (Binomial test, p=0.000). However, there is no indication for a recency effect in the data (Binomial test, p=0.000).

Next, we focus on the data for willingness to pay. 36 participants are indifferent, i.e. they are not willing to pay anything (Fig. 2). Four of them specify to be indifferent in the very beginning of specifying their willingness to pay, the 32 other participants state to favor one of the sequences but had a willingness to pay of 0.00 Euro. 33 [14] participants are willing to pay 0.20 Euros or more to re-experience the first (second) sequence. To evaluate whether the primacy effect occurs for real preferences, we classify the 33 participants with a positive willingness to pay for the first sequence as success and all other participants as fail. A binomial test rejects that the participants prefer the first sequence (Binomial test, one-sided, p=0.039). Subsequently, we control for a recency effect by assuming that the participants pay for the second sequence. This hypothesis can also be rejected (Binomial test, p=0.000).

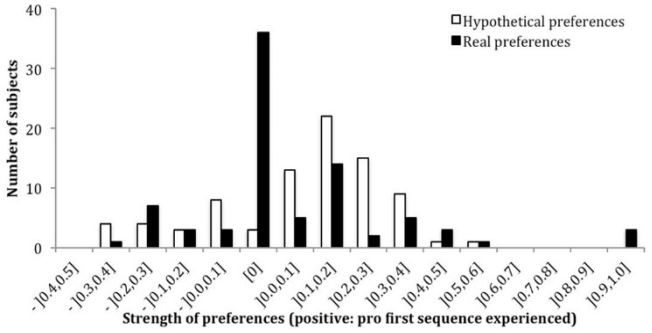

Fig. 2 Number of individuals per indicated strength of preferences for both methods: willingness to pay and numerical rating scale

IV. Discussion

Participants show a primacy effect if their decisions had no monetary consequence. However, they are indifferent in face of monetary consequences. In the remainder of this section, we relate our results to the other results concerning the serial position effect.

Mantonakis et al. [12] elicited preferences of participants for wines that they tasted sequentially. In their evaluation, the participants tended to prefer the wines that they tasted first. The result quantitatively changed with experience: Experienced oenophiles more persistently searched for good wines. As a result, their preferences were distributed all over the sequence of identical wines, instead of proportionately selecting the first. According to Mantonakis et al. [12], the impact of memory limitations was confirmed by means of the integration of wine experts: these experts who tended to find memorization of well-known tastes easier, showed a lower tendency toward primacy, and as a consequence, made more comprehensive decisions. Based on Mantonakis et al., the primacy effect in our study elicited for hypothetical preferences corresponds with their results.

Li and Epley [11] described the impact of the desirability of choices. They showed that participants prefer later options if the elements in the choice set are desirable, while they favor first options where elements are unwanted. Li and Epley related their results to recognition: Earlier experienced elements have to be reconstructed. These reconstructions show a tendency toward intermediate evaluations, in comparison with recent experiences [17]. Hence, recent positive experiences were observed to tend to be better than older experiences and chosen more frequently (leading to a recency effect), while recent negative experiences tend to be worse than older negative experiences and chosen less frequently (leading to a primacy effect). As the painful sequences in our study were also averse, the primacy effect that we find for hypothetical preferences is in line with their prediction.

Finally, in an experiment to elicit preferences for chewing gums with and without time constraints [2], a primacy effect only occurs for fast chewing gum selection, but not for elaborate decisions. We conclude that order effects only occur for inconsiderate decisions where individuals invest less mental spending. Corresponding with our results, a primacy effect only occurs for hypothetical preferences, but there are no sequential order effects as soon as real preferences are requested. However, when delving deeper into the matter, our results are not that obvious. First, we believe that comparing two alternatives to each other is unlikely to be subject to memory limitations. If memory limitations would influence choices over two alternatives, choices by humans were generally impossible. Second, participants stated their hypothetical preferences after specifying their real preferences. Following the idea of Carney et al. [2], they had already invested more mental capabilities in the moment where they indicate these real preferences. Why should the individual forget her/his evaluation and again invest effort to repeatedly evaluate the alternatives using the new method? Summing up, although our results are perfectly in line with the results observed in literature and we believe that memory limitations drive the results when remembering television advertising or not, we believe that our results cast serious doubts on the explanation using memory limitations when it comes to real choices.

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