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Past decisions do affect future choices: An experimental demonstration

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ABSTRACT

This paper demonstrates experimentally that the mere fact that an alternative was chosen in the past increases the likelihood that it will be re-chosen in the future, when new alternatives are being offered. The experimental design consists of a new variation of the *free-choice paradigm* that is immune to [Chen and Risen's \(2010\)](#) criticism of how results have been interpreted in previous studies of post-decision effects. An additional experiment indicates that once participants have chosen a particular alternative they view its characteristics more positively. I suggest that the new design can be used to study various aspects of the effect of past decisions on future ones. In the present paper, I apply it to show that the allocation of limited resources among various uses may be biased in favor of a particular use if it was preferred to another in a previous situation.

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Introduction

Imagine you are shopping around for a car. You visit one dealership each day and closely examine the cars being offered for sale. Suppose that on the first day of the search you find model A to be the best among the models being offered at the dealership you are visiting. Now suppose that on the second day you visit a different dealership and encounter model A again, along with some previously seen models and several models that you haven't yet seen. Would the fact that model A was judged to be the best among the offered models on the previous day increase the subjective value you attribute to it on the second day and the likelihood that you end up buying it?

The main goal of this paper is to demonstrate experimentally that the mere act of deciding on the preferred alternative in a given context may enhance its attractiveness in the future and increase its likelihood to be preferred to other alternatives. Recently, [Chen \(2008\)](#) and [Chen and Risen \(2010\)](#) argued that studies which used variations of [Brehm's \(1956\) free-choice paradigm](#) to demonstrate choice-induced changes in preferences were subject to a methodological flaw that raises doubts as to the interpretation of their results. The present paper introduces a new experimental design that is immune to this criticism and uses it to explore choice-induced changes in preferences.

Many real-life decision contexts are sequential in nature and hence give rise to the possibility of one decision influencing a subsequent one. This paper focuses on situations in which making an interim decision does not have material consequences and

nevertheless it may affect future decisions. Consumer search is a prominent example. Thus, even if consumers visit only one sales outlet, their consideration of the alternatives may be carried out in several stages and the order in which the products are presented to them may affect their purchase decision. Another example would be a selection committee that interviews part of a group of candidates on one day and then the rest on another day. At the end of the first day, committee members might make an interim choice of the best candidate from among the ones they have seen that day and then on the second day will choose the best of all the candidates. In some cases, the decision makers' choice process induces a structure of sequential decisions since their attention is first drawn to a particular subset of the alternatives and only after identifying the best alternative in that subset do they consider the complete set of alternatives.

The classic model of rationality assumes that preferences are stable, unless the material conditions are changed, and thus it is unable to capture such order effects in the decision maker's consideration process. A better understanding of how decisions affect subsequent decisions may provide the foundations for new models of choice.

The psychological literature has discussed various mechanisms that may lead to the enhanced attractiveness of a previously chosen alternative. According to the Theory of Self-Perception ([Bem, 1965](#)), individuals' past choices reveal information to them about their own attitudes, which in turn affects their future choices. Alternatively, Differentiation and Consolidation Theory ([Svenson, 1992](#)) suggests that during the choice process one alternative is differentiated from the others in order to make it appear sufficiently superior. Thus, preferences are constructed such that the perceived attractiveness and importance of the alternatives' various attributes are in favor of the alternative to be chosen. (For a

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review of theories of biased predecision processing, see Brownstein, 2003.) The most commonly discussed explanation for the effect of past choices on future ones is cognitive dissonance reduction (Festinger, 1957), which states that the desire for consistency induces the decision maker to place a higher value on a previously chosen alternative. This may result in the decision maker re-choosing this alternative, even when new and more attractive alternatives are available.

In the present paper, I argue that the observed tendency to re-choose an alternative is due to a change in attitude in favor of that alternative. However, the experiments I report here do not distinguish between the different mechanisms that may lead to such a change in attitude.

Following Brehm's (1956) experiment, which studied the effect of choice on subsequent preferences, many studies of cognitive dissonance used variations of his free-choice paradigm (e.g., Egan, Santos, & Bloom, 2007; Hoshino-Browne, Zanna, Spencer, Zanna, Kitayama, & Lackenbauer, 2005; Lieberman, Ochsner, Gilbert, & Schacter, 2001). The findings of these studies have been interpreted as evidence for the increased valuation of an alternative chosen in a previous context and a decreased valuation of the non-chosen alternative. However, Chen and Risen (2010) pointed out that the experimental design used in these studies does not allow the results to be interpreted unambiguously in this manner. They meticulously reviewed the free-choice paradigm studies and suggested that the choices may be reflecting preferences in these experiments rather than affecting them. In particular, the weakness in these studies is that they are subject to self-selection and do not control for the information on the initial preferences that is revealed by the choice. I discuss this issue at length below and suggest a new design that avoids the problem of self-selection.

The free-choice paradigm

Most of the studies that use the free-choice paradigm involve the ranking of a number of alternatives and test how that ranking is altered following a close choice between pairs of alternatives. In these experiments, participants are first asked to rank a list of items and then to choose between two similarly ranked items. Finally, they are asked to rank the list of items again. A change in the ranking following the choice was interpreted as evidence of a change in attitude.

This paradigm has been modified in other studies in order to examine how choices affect subsequent choices (rather than ranking of items). Egan et al. (2007) conducted an experiment with children and capuchin monkeys to demonstrate that making a choice between two items reduces the subjective value of the rejected (non-chosen) item. In their modified free-choice paradigm, the experimenter first selects three alternatives (A, B and C) among which the participant appears to be (approximately) indifferent. The participants are then asked to choose between A and B. If the participants choose A, for example, they are then asked to choose between the rejected alternative B and the alternative C. The argument presented in Chen and Risen (2010) is that the high proportion (more than 50%) of participants who chose C in this case does not imply that the choice between A and B changed the participants' preferences. The reason is that participants are not exactly indifferent between the three alternatives and their choice of A over B reflects their initial preferences, according to which they do not particularly like B. Specifically, their preference ordering over the three alternatives may be one of the following: $A \succ B \succ C$, $A \succ C \succ B$ or $C \succ A \succ B$. If the three orderings are a priori equally likely, then one would expect about 2/3 of the participants who chose A over B to choose C over B in the subsequent choice (for further discussion of this point see Chen & Risen, 2009; Sagarin

& Skowronski, 2009a, 2009b). This proportion is very close to the one obtained in the experiment conducted by Egan et al.

Similarly, if after choosing A over B the participants are asked to choose between the chosen alternative A and the alternative C, a high proportion of participants choosing A would not be an indication of a choice-induced change in attitude. Moreover, a randomly assigned control group that chooses between A and C does not help in identifying a possible change in attitude since the group of participants who chose A over B self-select to choose between A and C, whereas in the control group the whole population makes the choice. If the three preference orderings above are a priori equally likely, it is to be expected that among the participants who prefer A to B, A will be preferred to C more often than is the case in the general population.

An analogous self-selection problem pertains to the free-choice paradigm studies that measured spreading in the rating following a choice. Chen and Risen (2010) argue that taking into account that participants' preferences are not measured perfectly and that the ratings of the alternatives become more accurate as the participants gain experience with the rating task (namely, in the second rating), a spreading in rating in favor of the previously preferred alternative is to be expected even if the participant's preferences remain stable during the experiment. Furthermore, they argue that their preference-driven model of choice can account for part of the results in studies that used the free-choice paradigm to explore the moderators and mediators of dissonance (such as the study that compared the effect of choosing between "far" alternatives and "close" alternatives in Brehm, 1956).¹

A new modification of the free-choice paradigm

In order to solve the self-selection problem, I adopt a different approach to demonstrate a change in attitude following a difficult choice. Participants are randomly assigned to one of two conditions. In the first condition, all participants choose between alternatives A and B and then, in a second phase, choose between alternatives A, B, and C (the alternatives are identical for all participants and it is not determined in advance whether participants are roughly indifferent between the three). In the second condition, participants choose between the alternatives A, B, and C (as in the second phase of the first condition) and following that are asked which alternative they would have chosen if their chosen alternative had not been available. Thus, I will refer to the first condition as the 2–3 condition and to the second as the 3–2 condition. The procedures are summarized in Fig. 1.

I will compare between the distribution of choices made from the set {A, B, C} in the second phase of the 2–3 condition and the distribution of choices made in the first phase of the 3–2 condition. Since the two conditions are randomly implemented and all participants in the experiment make a choice from the set {A, B, C}, any difference between the distributions can be attributed to the choice made in the first phase of the 2–3 condition. A higher probability of choosing a previously chosen alternative in the 2–3 condition should lead to C being chosen less often and A and B more often than in the 3–2 condition. A significant difference will provide support for the hypothesis that the mere choice of A over B (B over A) in the first phase of the 2–3 condition makes A (B) more attractive in comparison to C in the second phase. Later I will discuss the contribution of the second phase of the 3–2 condition to the analysis.

¹ Note, however, that their criticism does not apply to the two other paradigms that were used to study dissonance reduction: the induced compliance paradigm (e.g. Festinger & Carlsmith, 1959; Linder, Cooper, & Jones, 1967) and the effort justification paradigm (e.g. Aronson & Mills, 1959; Wicklund, Cooper, & Linder, 1967).

It is worthwhile discussing two related studies that, in an attempt to deal with Chen and Risen's critique, have modified the free-choice paradigm in different ways.

Egan, Bloom, and Santos (2010) designed an experiment to show that children and monkeys value an item less after "rejecting" it and choosing a different item. Participants in their experiment chose between two concealed items A and B in the first phase and then chose between the non-chosen item and another concealed item C. They found that more than 50% of the participants (and more than in a control condition) chose C in the second phase, suggesting that the first choice indeed affected the second one. Note, however, that it is difficult to interpret these results as a choice-induced change in preferences since preferences did not guide choices at all in making these "blind choices".

Sharot, Velasquez, and Dolan (2010) observed how a participant's rating of items changes following a blind choice between two of the items. In their experiment, a participant first rated a number of items and then made a choice between two of them while they were concealed. The chosen item was then revealed and each of the participants again rated the items. An interesting detail in the design is that before making the choice, participants were told that the two concealed items would be exposed for 2 ms, but that they would not be able to consciously perceive them. In actuality, the items were not exposed. However, participants may have believed that unconsciously they had made an informed choice and the results showed that the selected item was rated as more desirable after the blind decision than before.

These two blind choice studies nicely deal with the self-selection problem by making sure that the participant's choice cannot reflect his preferences over the items. The drawback of these studies is that in real-life contexts, we rarely make completely blind choices and it is not clear whether the effects found in these blind choice experiments will be relevant when one must make a choice between non-concealed items.

An important advantage of the approach used in the present paper is that participants' choices reflect their preferences at the moment of the decision. This aspect of the experimental design makes the settings here more natural and may give rise to a more profound change (for example, one could imagine that such an attitude change will last longer than a choice-induced change following a "blind" choice). In this paper, I use the new method to examine the effect of choice on a subsequent choice in a particular context (using a specific type of alternatives and participants). One shall apply this method in various situations in order to re-evaluate the extent of such effects.

Overview

Study 1 demonstrates the increased probability of choosing an alternative that was preferred in a previous and different context. Study 2 attempts to shed light on the source of this tendency by demonstrating an explicit attitude change in favor of a previously chosen alternative. In particular, it shows that an alternative's characteristics are seen in a more positive light when it has been chosen in a previous context and that criteria according to which it was judged to be superior are perceived as more important. In Study 3, I apply the method to demonstrate that the allocation of resources across various uses may be biased in favor of a particular use if it was preferred in a previous context. The concluding section relates the findings to the literature on status quo bias and discusses the scope of the phenomenon.

Study 1: Re-choosing a previously chosen alternative

The experiment tests the hypothesis that an alternative that was chosen in a different context in the past is more likely to be

re-chosen over new alternatives, compared to the case in which this alternative is seen for the first time. The design can be seen as a modification of the free-choice paradigm that avoids the self-selection problem discussed in Chen and Risen (2010).

Method

The participants in the experiment were undergraduate students in economics at Tel Aviv University and Haifa University and graduate students in the social sciences at Tel Aviv University and the Hebrew University. 41% Of the participants were females. The students were invited by e-mail to participate in a short online experiment.

In the experiment, several hypothetical women were described who are candidates for adopting a five-year-old orphan. The participants' task was to choose the best-suited candidate in their opinion. (The choice problem is inspired by Problem 1 in Shafir, Simonson, & Tversky, 1993, Section 2.)

Participants were randomly assigned to one of two conditions. In the first condition (the 2–3 condition), 136 participants were asked to choose between candidates A and B (the question was "Who do you think is the best candidate between them?") and then, in a second phase, to choose between candidates A, B, and C. In the second condition (the 3–2 condition), 120 participants were asked to choose between candidates A, B, and C (as in the second phase of the 2–3 condition). After having made the choice, they were asked which candidate they would have chosen if their chosen candidate had not been available (if she had been left off the list). My hypothesis was that the choice of C would be less frequent in the second phase of the 2–3 condition than in the first phase of the 3–2 condition.

Fig. 2 presents the descriptions of the three candidates. In constructing the alternatives, I sought to create a dilemma for the participants. Each description includes both positive and negative characteristics and some of the characteristics may be perceived as either positive or negative. Note that none of the candidates can be considered to be a "middle" option. Finally, the characteristics were presented in a list to facilitate comparison. In short, the experiment's design was intended to encourage choice based on reason rather than on a first impression or a hunch.²

Results and discussion

Table 1 presents the choices made from the set {A, B, C} in each condition. Recall that the participants in the 3–2 condition made this choice in the first phase, whereas participants in the 2–3 condition made it in the second phase, after choosing the best candidate from between A and B.

In the 2–3 condition, C is chosen less often and A and B more often than in the 3–2 condition. The proportions of participants who chose C in the two conditions are significantly different, $\chi^2(1) = 5.49$, $p = 0.019$, and conditional on not choosing C, the distribution of the choices A and B is not significantly different in the two conditions, $\chi^2(1) = 0.21$, $p = 0.65$. These results provide support for the main hypothesis of this paper, i.e., that the mere choice of A over B (B over A) in the first phase of the 2–3 condition made A (B) more attractive relative to C in the second phase. Note that the problem of self-selection is not relevant here since all the participants in each of the random conditions chose from the same set {A, B, C}. Also note that when choosing from the set {A, B, C}

² I conducted a pre-test to ensure that none of the candidates was unanimously preferred over the other two. A few dozen students were asked to choose between the three candidates and the distribution of responses suggested that this was not a trivial task.

A summary of the experimental procedure in the two conditions.

	The 2-3 condition	The 3-2 condition
Phase 1	Choice from {A, B}	Choice from {A, B, C}
Phase 2	Choice from {A, B, C}	Choice of the second best

Fig. 1. A summary of the experimental procedure in the two conditions.

participants in the two conditions possessed the same objective information regarding the available alternatives.

One may wonder whether the low frequency of choosing C in the 2–3 condition is mainly driven by a tendency to stick with the first phase choice of A, by a tendency to stick with B or by both. The following analysis identifies traces of the tendency to re-choose the first phase chosen candidate in both groups of participants, those who *initially* prefer A to B and those who *initially* prefer B to A.

The first step is to establish that the presence of C in the 3–2 condition does not affect the participants' preference between A and B. Since participants in this condition who chose C in the first phase were asked who they would have chosen if C had not been available, we can ascertain the number of participants who reflected the following preferences: $C > B > A$ and $C > A > B$. Taking into account the choices of A and B in the first phase of the 3–2 condition, we can calculate the proportion of participants in this condition who preferred A to B and vice versa: $(A > B, B > A) = (71\%, 29\%)$.³ The proportion of participants in the first phase of the 2–3 condition who preferred A to B and vice versa is $(A > B, B > A) = (72\%, 28\%)$. These proportions are not significantly different, $\chi^2(1) = 0.05, p = 0.83$. Since the participants in the two conditions are taken from the same population, it can be assumed that the distribution of the *initial preferences* in the two conditions was the same. We can therefore conclude that the calculated proportion of participants who prefer A to B and vice versa in the 3–2 condition indeed reflects the participants' initial preferences between A and B.

The next step is to calculate the proportion of participants in each condition who initially preferred A to B (B to A) and end up choosing C in a choice between all three candidates. This enables examining whether, given a particular preference over A and B, the likelihood of choosing C is lower after actually making a choice between A and B. Table 2 summarizes the results.

The percentages in the table reflect the proportion of participants who chose C within the group of participants who held the same initial preferences over A and B in that condition. It appears that whether $A > B$ or $B > A$ initially, the likelihood of choosing C decreases by 13–17% when the choice from {A, B, C} follows the choice between A and B.

The main advantage of the experiment's design is the possibility of attributing the observed decline in the frequency of choosing C to the effect of the previous decision. This provides a response to Chen and Risen's (2010) claim that in such circumstances (and specifically in all the experiments that tested this aspect of cognitive dissonance) past choices may simply reflect the decision maker's preferences rather than cause an actual change in attitude.

It is important to distinguish between the effect of the *act of deciding* on future preferences and changes in preferences that are due to the effect of past choices on the material conditions in future decision contexts. Thus, when decision makers own or consume a particular product, they are likely to become attached or

accustomed to it and hence to attribute a higher subjective value to it in the future (Knetsch, 1989 was the first to demonstrate such an attachment effect). Some evidence suggests that even the expectation of owning an item might produce an attachment effect (Ericson & Fuster, 2011). These effects are essentially different from the one explored in this paper, since the decisions in the experiments do not have any material consequences. Choosing one's favorite candidate involves simply expressing an opinion and does not lead to any consumption or the expectation of consumption (as opposed to, say, choosing what to eat).

What kind of reasoning can result in a past choice having an effect on a participant's attitude in the present? One distinct possibility involves the rationalization or justification of a previous decision. Consider, for instance, participants who chose Candidate A over B in the first phase. They may justify the choice with the opinion that a stable social life is an extremely important characteristic while a candidate's wealth is of only minor importance. In that case, when later choosing between A and C, they may find A to be more attractive than C because C dates a lot of different partners. However, without the extra weight placed on the social life criterion, as a result of using it to justify the choice of A over B, they might have considered C to be a better choice than A. It is also possible that the participants construct their preferences over the characteristics of A and B and decide on the relative importance of the characteristics in a way that will make the decision easier and will help justify it. In other words, assigning more weight to characteristics that support the choice of a particular candidate may be part of the deliberation process rather than a result of the decision. The next study explores how the choice between the same two candidates A and B affects the perception of their characteristics and the weight placed on the choice criteria.

Study 2: The effect of choice on evaluation of alternatives' characteristics

This study attempts to demonstrate that the choice between Candidates A and B may increase the perceived attractiveness of the chosen candidate's individual characteristics. The results show that participants' attitudes towards the candidates' characteristics are not just correlated with their previous choice between the two candidates but are also *changed* as a result of the choice (in favor of the chosen candidate). This change in attitude may lead to the preference of a previously chosen candidate over new candidates in a future comparison, as I suggest in the discussion of Study 1.

Method

Participants consisted of former undergraduate economics students from various countries, mainly in Europe and North America, who subscribe to the mailing list of <http://gametheory.tau.ac.il> and who indicated their willingness to participate in experiments from time to time. The list includes about 8000 subscribers. A group of subscribers was invited by e-mail to participate in a short online experiment and 261 agreed (30% of whom were females).⁴ The participants were randomly assigned to one of the two experiment's conditions.

The experiment consisted of two parts. One part involved a choice between two candidates and in the other participants evaluated the candidates' characteristics. In the choice condition, 137 participants were first asked to choose between A and B as the most suitable candidate for adopting an orphan (the candidates'

³ Note that the method I use in the experiment does not require that the proportion of participants who prefer A to B be equal the proportion who prefer B to A.

⁴ The invitation was sent to all individuals who subscribed to the mailing list during 2009 and 2010. About 10% of the recipients decided to participate in the experiment.

Woman A	Woman B	Woman C
Lives in a village in the countryside	Lives in a big city	Lives in a small town
Average income	Very rich	Lower than average income
Stable social life	Has a boyfriend for 2 years	Dates a lot
Long working hours	Sometimes has work-related travel	Average working hours
Minor health problems	Good health	Reasonable health
Raises two children from a previous marriage	Does not have children	Incapable of having children
Extremely intelligent	Sports fan	Very warm person

Fig. 2. The descriptions of the candidates that were used in Studies 1 and 2.

descriptions were as in Study 1). They were then asked to give their opinion of various characteristics of the candidates. In the control condition, which had 124 participants, the order of the two parts was reversed. The information on the choices made between A and B in the control condition makes it possible to compare the evaluation of characteristics between the two conditions, given the same choice of candidate, in the spirit of Chen and Risen's (2010) suggestion.

There were two stages in the evaluation of characteristics. The first consisted of seven questions that required the participants to compare the characteristics of A and B for each of the following seven criteria: place of residence, economic status, social life, work schedule, health status, number of children and personality traits (the candidates' characteristics are described in Fig. 2). The seven questions appeared together on one screen. For each criterion, the participants were asked to indicate which attribute they find preferable for a woman who is adopting a child and to what degree. The participants were asked to use the following scale: A++ (A's attribute is far better than B's attribute), A+ (A's attribute is notably better), A (A's attribute is slightly better), B (B's attribute is slightly better), B+ (B's attribute is notably better) and B++ (B's attribute is far better than A's attribute).

For the purpose of our analysis, the participant's answer to each question was transformed onto the following numerical scale: $-3, -2, -1, 1, 2, 3$ (corresponding to B++, B+, B, A, A+, A++), which can be viewed as the degree to which A's attribute is preferred over B's. Denote the answers to these seven questions by q_1, q_2, \dots, q_7 .

In the second stage of the evaluation, the participants were asked to review the seven criteria and to decide on their degree of importance in deciding which candidate is more suitable for adopting a child. The characteristics of A and B were not presented during this stage. Thus, the evaluation focused on the importance of each of these criteria in this type of decision in general rather than relating to the specific characteristics of A and B. The seven questions appeared together on one screen. The participants chose a number between 1 and 8 that reflect the importance of each criterion, where 1 indicates a low degree of importance and 8 indicates a high degree. Denote the answers to these seven questions by w_1, w_2, \dots, w_7 .

Given a particular condition, a straightforward hypothesis states that the participants who chose A will overall have stronger preferences for A's characteristics relative to participants who chose B. The more interesting hypothesis states that participants who chose X in the choice condition will perceive the advantages of this candidate as being more significant than participants who chose X in the control condition. The formal hypotheses are presented below.

Results and discussion

Overall relative advantage

In order to measure the overall effect of having already made a choice (in the choice condition) on the participant's perception of the characteristics and their importance in a choice between candidates, the following variable, denoted as *Relative Advantage* (RA), was constructed: $RA = q_1w_1 + q_2w_2 + \dots + q_7w_7$.

This measure incorporates both the relative advantage of one candidate over the other in a particular characteristic and its importance in the choice between the two. A high positive value of RA indicates a strong preference for A while a low negative value indicates a strong preference for B.

The hypotheses are as follows: 1. Main effect of Decision: Participants who chose A will tend to have higher values of RA than participants in the same condition who chose B. 2. Interaction between Condition and Decision: Participants in the choice condition who chose A (B) will tend to have higher (lower) values of RA than those who chose A (B) in the control condition.

A 2×2 ANOVA (Analysis of Variance) with Condition (choice, control) and Decision (A, B) as between-subject factors revealed a main effect of Decision on RA , $F(1, 258) = 161.952$, $p < .001$, $\eta_p^2 = .386$. Participants who chose A have a higher mean RA ($M = 19.83$) than those who chose B ($M = -19.33$). A main effect of Condition on RA was also found, $F(1, 258) = 6.814$, $p = .010$, $\eta_p^2 = .026$. Participants in the choice condition have a higher mean RA ($M = 8.39$) relative to participants in the control condition ($M = 1.83$). (The main effects here and in the subsequent analysis were obtained in a model without an interaction since the ANOVA cells are unbalanced.) This was qualified by an interaction between

Table 1
The choice frequencies in Phase 2 of the 2–3 condition and in Phase 1 of the 3–2 condition.

	Woman A (%)	Woman B (%)	Woman C (%)
The 2–3 condition – Phase 2 (n = 136)	46.3	21.3	32.4
The 3–2 condition – Phase 1 (n = 120)	38.3	15	46.7

Condition and Decision, $F(1, 257) = 11.26, p = .001, \eta_p^2 = .042$. Participants in the choice condition who chose A have a higher mean RA ($M = 27.33$) relative to participants in the control condition who chose A ($M = 11.95$), whereas participants in the choice condition who chose B have a lower mean RA ($M = -21.62$) relative to those in the control condition who also chose B ($M = -16.57$).

As discussed above, the main effect of Decision is straightforward. However, the main effect of Condition on RA was unexpected. This suggests that a previous choice between A and B positively influences the way in which A is perceived, even if B is the previously chosen candidate. One explanation may be that it takes more time to learn to like A's characteristics since she does not have clear-cut positive characteristics, such as "healthy" and "rich", while B does. The choice stage provides more time to explore the characteristics and to form a subjective opinion of them. The key finding is the interaction between Condition and Decision, which suggests that the mere choice between A and B changes the perception of their characteristics in a way that is consistent with the choice made.

One might wonder whether the findings described above are driven by the effect of making a decision on the attractiveness of the chosen candidate's characteristics or by a change in the importance attributed to the criteria according to which the chosen candidate is superior or perhaps by both. The following analysis will attempt to separate these two possible effects.

The attractiveness of characteristics

Recall that the first stage of the evaluation involved determining to what degree a particular characteristic is preferred in A relative to B. A variable denoted by *Attributes Preferences (AP)* was created by summing up the seven comparisons, i.e. $AP = q_1 + q_2 + \dots + q_7$. This variable represents the degree to which A's characteristics are preferred over B's overall.

The hypotheses are as follows: 1. Main effect of Decision: Participants who chose A will tend to have higher values of AP than participants in the same condition who chose B. 2. Interaction between Condition and Decision: Participants in the choice condition who chose A (B) will tend to have higher (lower) values of AP than those who chose A (B) in the control condition.

A 2×2 ANOVA with Condition (choice, control) and Decision (A, B) as between-subject factors revealed a main effect of Decision on AP, $F(1, 258) = 181.785, p < .001, \eta_p^2 = .413$. The mean AP for participants who chose A was $M = 3.35$, whereas the mean AP for those who chose B was $M = -3.18$. As before, a main effect of Condition on AP was found, $F(1, 258) = 4.253, p = .040, \eta_p^2 = .016$. Participants in the choice condition have a higher mean AP than those in the

Table 2
The percentages of participants who ended up choosing C, conditional on their preferences between A and B.

	% Of C > A > B out of A > B	% Of C > B > A out of B > A
The 2–3 condition (n = 136)	33	32
The 3–2 condition (n = 120)	46	49

control condition ($M = 1.28$ vs. $M = .52$). This was qualified by an interaction between Condition and Decision, $F(1, 257) = 5.40, p = .021, \eta_p^2 = .021$. Participants in the choice condition who chose A have a higher mean AP than those who chose A in the control condition ($M = 4.23$ vs. $M = 2.43$), whereas participants in the choice condition who chose B have a lower mean AP than those in the control condition who chose B ($M = -3.38$ vs. $M = -2.93$).

The importance of the various criteria

Finally, I examined the effect of the previously made choice between the candidates on the importance attributed to the various criteria. A's *Supportive Characteristics* are those characteristics that a particular participant found to be preferable in A (the participant indicated that for these criteria, A's attributes are preferable to B's) and similarly for B's *Supportive Characteristics*. Note that the preferences over the candidates' characteristics generally differ between participants. My hypothesis was that having chosen one of the candidates, a participant tends to attribute greater importance to criteria according to which the chosen candidate is superior in his view and vice versa. A variable denoted as *Relative Importance (RI)* was created by summing up the degrees of importance attributed to A's *Supportive Characteristics* and subtracting those attributed to B's *Supportive Characteristics* for each participant.

The hypotheses are as follows: 1. Main effect of Decision: Participants who chose A will tend to have higher values of RI relative to participants in the same condition who chose B. 2. Interaction between Condition and Decision: Participants in the choice condition who chose A over B (B over A) will tend to have higher (lower) values of RI than those who chose A (B) in the control condition.

A 2×2 ANOVA with Condition (choice, control) and Decision (A, B) as between-subject factors revealed a main effect of Decision on RI, $F(1, 258) = 143.70, p < .001, \eta_p^2 = .358$. Participants who chose A have a higher mean than those who chose B ($M = 7.35$ vs. $M = -10.07$). A main effect of Condition on RI was also found, $F(1, 258) = 5.644, p = .018, \eta_p^2 = .021$. Participants in the choice condition have a higher mean RI than those in the control condition ($M = 2.20$ vs. $M = -.60$). This was qualified by an interaction between Condition and Decision, $F(1, 257) = 4.94, p = .027, \eta_p^2 = .019$. Participants in the choice condition who chose A have a higher mean RI than those who chose A in the control condition ($M = 10.15$ vs. $M = 4.40$), whereas participants in the choice condition who chose B have a lower mean RI than those in the control condition who also chose B ($M = -10.40$ vs. $M = -9.68$).

The results indicate that both types of evaluation of the candidates' characteristics were affected by the decision made previously. While the first type of evaluation captures the perceived attractiveness of one characteristic relative to another, the second type captures the perceived importance of the various criteria when choosing between candidates (not necessarily candidates A and B). I found that the characteristics of the previously chosen candidate are seen in a more positive light. Furthermore, the criteria according to which the chosen candidate is (subjectively) viewed as superior become more important. It is plausible that this positive perception will also affect future comparisons of the chosen candidate to other candidates. Thus, I suggest that the increased valuation of the characteristics of a previously chosen candidate is the source of the phenomenon observed in Study 1, in which the act of choosing an alternative increases the likelihood of it being chosen again in other contexts.

The results are consistent with previous findings of increased attractiveness (measured in various ways) of chosen alternatives, such as those appearing in Simon, Krawczyk, and Holyoak (2004) and Svenson and Jakobsson (2009). The importance of this study is that it shows an explicit attitude change following a choice in the specific context in which the tendency to re-choose an alternative was demonstrated (Study 1).

The findings in this study can also be viewed as related to the confirmation bias (Wason, 1968) and the literature on information distortion (e.g., Russo, Carlson, Meloy, & Yong, 2008; and Russo, Medvec, & Meloy, 1996), according to which people tend to interpret new information in a way that supports their previous beliefs and behavior. Note, however, that participants in the choice condition seemed to perceive old information (the already familiar characteristics of the two candidates) in a way that was consistent with their first-phase choice.

Finally, this paper focuses on the effect of choice on subsequent decisions and on subsequent evaluations of the alternatives' various characteristics. However, it is also possible that evaluations of alternatives' characteristics affect subsequent choices between the alternatives. The comparison between the two conditions indicates that the choice between A and B in the control condition is not affected by the prior evaluation of the candidates' characteristics. Thus, 62% of the participants in the choice condition chose A as compared to 65% in the control condition and the proportions are not significantly different, $\chi^2(1) = 0.165$, $p = 0.68$. In other words, comparing the candidates' characteristics and ranking their importance did not change the participants' overall preferences between A and B.

Study 3: How a previous choice can affect the allocation of resources

The allocation of limited resources among different groups or tasks is a central topic in economics and management. For example, managers often have to decide how many employees to hire for each of the firm's projects given a limited salary budget. The government faces the task of allocating its budget between defense, health, education, etc. And all households must decide how to divide their income between consumption and savings.

The task of allocating resources among various alternatives (i.e. various uses) differs in character from the choice of one alternative from several. In particular, when allocating limited resources, the decision makers do not have to choose just one alternative and reject the others. In addition, they must use their cardinal preferences over the alternatives, rather than just ordinal preferences. Thus, a strongly preferred alternative is likely to be assigned a large amount of resources.

Studies 1 and 2 have shown that a previously chosen alternative has a higher probability of being chosen again and that the characteristics of the chosen alternative are perceived in a better light. Eliciting information on the intensity of preferences by having participants make an allocation decision, allows for studying another aspect of the effect of past choices on subsequent decisions.

The study reported in this section re-examines the idea presented in Study 1 that a previously chosen alternative is likely to be preferred in the future to new alternatives and the idea presented in Study 2 that the preferences over the chosen and rejected alternatives become more extreme following a choice between them. In particular, it studies how a choice between two charitable organizations A and B affects the resources assigned to these organizations and to an additional organization C in a future task. This framework allows me to explore how the cardinal preferences between the alternatives are affected by a previous choice between them. Note, however, that since limited resources are being allocated, the framework makes it possible to observe only the relative values of the alternatives (i.e. in comparison to one another).

Method

Participants consisted of former undergraduate economics students from various countries, mainly in Europe and North America,

who subscribe to the mailing list of <http://gametheory.tau.ac.il> and who indicated their willingness to occasionally participate in experiments. A group of the subscribers was invited by e-mail to participate in a short online experiment and 487 agreed (35% of whom were females).⁵ They were randomly assigned to one of the two experiment's conditions.

The experiment consisted of two parts. One part included a choice between the two charitable organizations, A and B. In particular, participants were asked to imagine that their boss had asked them to decide which of the two charitable organizations should receive a donation of a few thousand dollars from the company. The participants were not allowed to split the donation between the two organizations. In the other part, the participants were asked to imagine that their boss had asked them to allocate \$55,000 of the company's money between the same two organizations and an additional organization C. (The three organizations are based on real and well-established charities, which are described in Fig. 3.) The participants were asked to write an amount of money near each of the three organizations, such that the total would sum up to \$55,000. It was stressed to the participants that they do not have to assign positive amounts of money to all the organizations.⁶

In the choice condition, 258 participants were first asked to choose between organizations A and B and then were asked to allocate \$55,000 between three organizations: A, B and C. In the control condition, to which 229 participants were assigned, the order of the two tasks was simply reversed. It was emphasized to both groups that they should make their second hypothetical decision as if the first hypothetical task had never happened.

Note that each part of the experiment involves a different type of decision. Thus, a participant may identify more with organization A and hence choose to donate a few thousands dollar to it when asked to choose between A and B, and still believe that \$55,000 can make a bigger difference for organization B and contribute the whole amount to B in this part (formally, this is not a preferences reversal). However, it is likely that a participant who believes in a particular organization's values or aims will both choose it between A and B and will assign it a significant proportion of the \$55,000 in the allocation between A, B and C. And indeed this was the case for almost all participants.

In the spirit of the previous studies in this paper and their results, I hypothesized that after choosing between A and B, the allocation of the \$55,000 would reflect a stronger cardinal preference for the previously chosen organization over the previously rejected one. Furthermore, the allocation would reflect a greater preference for the chosen organization relative to the newly added organization C than in the case that no previous choice had been made between A and B. In other words, the participants in the choice condition should allocate more of the \$55,000 to the previously chosen organization (relative to the previously rejected organization and the newly added organization) than participants in the control condition, who allocate the \$55,000 without having previously chosen between A and B.

Results and discussion

I will report the results in two stages. Stage 1 will not relate to the decision that was made between only A and B and will simply

⁵ The invitation was sent to all individuals who subscribed to the mailing list between 2000 and 2008. A reminder was sent a few days later. About 12% of the recipients decided to participate in the experiment.

⁶ I used the particular amount of \$55,000 since it is a round number and would not require too much calculation from the participants and because it cannot be divided equally among the three organizations, which would require the participants to invest some thought in the allocation.

Organization A
Established in 1991. It works to alleviate the suffering of children in impoverished regions across America and around the world. Through strategic partnerships in targeted communities, it works to improve the lives of poor children and their families by meeting their physical, emotional and spiritual needs. So far, it has helped children in 35 US states and 72 countries worldwide.
Organization B
Established in 1948. It supports thousands of disabled people in more than 50 countries. The organization helps people with physical impairments, mental difficulties and long-term health conditions, as well as their caregivers, friends and families. It seeks to help the disabled attain education, livelihoods and healthcare. It has over 200 local services and projects, including residential homes, daytime activities and home help.
Organization C
Created by doctors and journalists in 1971. It provides independent, impartial assistance in more than 60 countries to people whose survival is threatened by violence, neglect or catastrophe, primarily due to armed conflict, epidemics, malnutrition, exclusion from healthcare or natural disasters. It reserves the right to speak out in order to bring attention to neglected crises or abuse of the aid system and to advocate for improved medical care.

Fig. 3. The description of the organizations that were used in Study 3.

compare between the \$55,000 allocations in the two conditions (in parallel with the analysis in Study 1). Since in both conditions all participants allocate the \$55,000, there is no self-selection problem and any difference between the two distributions of allocations is due to the prior choice between A and B, which occurred only in the choice condition. Stage 2 will use the information on the choice between A and B for the analysis and will examine the effect of the experimental condition on the allocations when controlling for the choice between A and B.

Stage 1

Consider the participant's allocation of the \$55,000 among A, B and C. Define the organization between A and B that is assigned a higher amount as High (even if organization C was assigned the highest amount) and the other as Low. Think of High as the preferred organization between A and B in the context of this allocation task. I hypothesized that the cardinal preference for High relative to the other two organizations would be strengthened if a previous choice was made between A and B (assuming that High is the previously chosen organization, which indeed was the case for all but 5 participants). More precisely, the following two variables will have higher values in the choice condition:

1. The High–Low gap: the difference between the amounts of money donated to High and Low.
2. The High–C gap: the difference between the amounts of money donated to High and Organization C.

For the sake of robustness, the High/Low ratio (the amount of money donated to High divided by the total amount donated to High and Low) and the High/C ratio (the amount of money donated to High divided by the total amount donated to High and C) were also examined in order to determine whether they are larger in the choice condition. These one-directional hypotheses were tested using a one-tailed test. Note that if a particular participant allocates the same amount to A and B, then either of the two can be defined as High and this will not affect the values of the four variables described above for these participants.

A Mann-Whitney test indicated that the High–Low gap is larger for participants in the choice condition (Mdn = 10,000) than for participants in the control condition (Mdn = 5,000), $W = 51,636$, $p = .003$. The High–C gap was also larger for participants in the choice condition relative to the control condition (Mdn = 5000 vs. Mdn = 1000), $W = 52,875$, $p = .027$. Similar results were obtained for the High/Low ratio and for the High/C ratio. Thus, the allocation of the \$55,000 between A, B and C, which reflects the cardinal preferences over these alternatives, was affected by the previous choice between A and B in the expected direction.

Since the two parts of the experiment involve different types of decisions (binary choice vs. the allocation of a sum among three alternatives), the structure of the experiment avoids the technical possibility of inertia. One might interpret the allocation of the whole sum to a previously chosen organization as an automatic decision. However, such extreme allocations were not frequent in the choice condition (5.4%) and their frequency was similar in

the control condition. That is, the choice condition did not encourage automatic decisions in the allocation task.

Stage 2

In this section, the participant's choice between A and B is taken into account. Denote the organization chosen by the participant in the choice between A and B as Chosen and the other as Rejected. Following are the variables to be analyzed:

1. The Chosen–Rejected gap: the difference between the amounts of money donated to Chosen and Rejected.
2. The Chosen–C gap: the difference between the amounts of money donated to Chosen and Organization C.

The hypothesis is that the values of these two variables are larger in the choice condition, i.e., that there is a main effect of Condition on each of these variables when controlling for the participant's choice between A and B. The main effects are tested in a model without an interaction since the ANOVA cells are unbalanced (it was tested and confirmed that there is no significant interaction between Decision and Condition).

Chosen–Rejected gap. A 2×2 ANOVA with Condition (choice, control) and Decision (Organization A, Organization B) as between-subject factors revealed a main effect for Condition on the Chosen–Rejected gap, $F(1, 484) = 8.014$, $p = .005$, $\eta_p^2 = .016$. The mean of this gap is higher for participants in the choice condition ($M = 13,004$) than for those in the control condition ($M = 8861$). Similar results were obtained for the Chosen/Rejected ratio.

Chosen–C gap. A 2×2 ANOVA with Condition (choice, control) and Decision (Organization A, Organization B) as between-subject factors revealed a main effect for Condition on the Chosen–C gap, $F(1, 484) = 5.642$, $p = .018$, $\eta_p^2 = .012$. The mean gap is larger for participants in the choice condition than for participants in the control condition ($M = 6917$ vs. $M = 2634$). I also found that Decision has an effect on this gap. The mean gap for participants who chose A was higher than for those who chose B ($M = 6480$ vs. $M = 2659$), $F(1, 484) = 4.618$, $p = .032$, $\eta_p^2 = .009$. The same effects were found for the Chosen/C ratio.

In summary, the values of the gap and ratio variables increase as a result of previously choosing between A and B. This may reflect a change in how the participants perceive the importance of these organizations or in their sympathy towards them. Note that there is a low correlation between the variables Condition and Decision ($\phi = 0.12$, $p = 0.007$). In the choice condition, 53% of the participants chose A when asked to choose between A and B, whereas in the control condition 65% did so. Thus, the participants cannot be separated into two types of individuals (as was done in Study 1), i.e. those who always choose A over B and those who always choose B over A. However, it may still be useful to control for the information on the participant's choice between A and B. As mentioned above, the analysis of variance indicates that there is no significant interaction between Decision and Condition ($F(1, 483) = 0.068$, $p = .794$, $\eta_p^2 = 0$, for the dependent variable Chosen–Rejected gap; and $F(1, 483) = 0.053$, $p = .818$, $\eta_p^2 = 0$, for the Chosen–C gap) and that the effect of Condition on the aforementioned gaps is not due to its shared variance with Decision.

General discussion

This paper introduces a novel modification of the free-choice paradigm, which is immune to Chen and Risen's (2010) critique, and demonstrates that an alternative chosen in a different context in the past has a greater probability of being chosen again in the

future. It is also shown that in a case where decision makers allocate a given amount of resources between various uses, rather than choosing just one, the allocation will be biased towards the use that was preferred in a previous context. I argue that the mere act of choosing an alternative may induce a favorable attitude towards it. Indeed, the findings of an additional experiment indicated that the characteristics of a previously chosen alternative become more attractive and that heavier weight is given to criteria according to which the chosen alternative was judged superior to the rejected one.

As discussed above, there are various mechanisms that might lead to such bias. For example, it may be a result of the desire to justify previous choices and to be consistent in the considerations used in decision making (as in dissonance reduction). It is also possible that the decision makers infer their own attitude from their past choices (as suggested by the Theory of Self-Perception) or the bias may be an outcome of pre-choice construction of preferences that aim to differentiate the alternatives and make the decision easier (as suggested by pre-decision process theories, such as differentiation and consolidation theory). While the studies in this paper do not distinguish between these explanations, they make it possible to rule out the preference-driven account offered by Chen and Risen (2010) and the explanation of re-choosing as an outcome of inertia rather than attitude change.

The effect of interim decisions on subsequent ones may play an important role in a consumer's sequential search since the order in which the various products are encountered and compared may affect the subjective value attributed to them. Furthermore, a seller who is aware of this tendency may prompt the consumers to compare the available products in a specific order with the goal of manipulating them into choosing a particular product or to increase the probability of a purchase. Similarly, the order in which job candidates are interviewed may affect the final hiring decision. Thus, incorporating the effect of past decisions on future ones may enrich the existing models of choice and strategic interactions.

Relationship to status quo bias

The phenomenon observed here can be viewed as related to default bias and status quo bias, which involve an individual's tendency to choose the default option and to stick with the "current state" option (Johnson & Goldstein, 2003; Samuelson & Zeckhauser, 1988).

A typical example of default bias is when a decision maker is to choose from among several pension plans, one of which is designated as a default option. It has been observed that people tend to stick to the default option in such cases (see, for example, Madrian & Shea, 2001). A typical example of status quo bias is when an individual who is already contributing to a particular pension plan has the option of switching to a new one. It has been observed that people exhibit inertia and tend not to switch to a new plan even when the switch is worthwhile. It has been suggested that in many cases the status quo serves as a default option and allows the individual to avoid making a proactive decision when the choice is a difficult one (Ritov & Baron, 1992).

In the present paper, the alternative chosen in the first phase is not carried over to the second phase and is not described as the default option in the second phase. Thus, the choice made in the first phase does not affect the starting conditions of the second phase. One possible interpretation of the findings is that the previous choice of an alternative makes it a "mental status quo" and induces a similar effect to that reported in the status quo literature, even when the previously chosen alternative is not physically carried over to subsequent choice situations. This may be relevant in a number of contexts, such as a consumer's sequential search, in

which identifying a preferred alternative early on in the search does not make it a physical status quo.

The results of Study 2 suggest that there is a more fundamental difference between the phenomenon explored in this paper and status quo bias. It appears that when a decision maker chooses alternative A from between A and B, the importance attributed to criteria according to which A is (subjectively) preferable to B increases relative to the criteria according to which B is preferable to A. This shift in the weights of the criteria for choosing between the alternatives will lead to different predictions of future choices than status quo bias. For example, if C is inferior to A according to the criteria by which A is superior to B, then the act of choosing A over B is likely to decrease the probability that C will be chosen from a set that includes A and C. However, this wouldn't necessarily be the case if C is superior to A according to these criteria. Namely, the specific context in which A was chosen in the past plays a role and replacing B in some other alternative B' may reverse the prediction of a future choice between A and C.

The scope of the effect of past decisions

The present paper demonstrates that past decisions may affect future ones. However, one can think of circumstances in which it is not likely that the mere act of choosing an alternative will influence future decisions.

Note that in the present paper, participants were not previously familiar with the alternatives between which they were choosing (i.e. the candidates for adopting a child and the charitable organizations). Even if participants had complete preferences over characteristics of the alternatives, they would still have to decide on the tradeoff between them (i.e., the weights placed on the characteristics) when choosing. Namely, participants had to construct their preferences over the alternatives as part of the decision making process. This choice problem is somewhat different from choosing between art prints, where participants may initially have instinctive preferences over the drawings. The malleability of the participants' preferences may have been crucial. It is likely that in situations where the alternatives are already familiar, individuals may have more stable preferences over the alternatives and that a previous choice between them will not affect future choices. This idea is consistent with the differences that were expected between the 'high' and 'low' conditions (i.e. choosing between "far" alternatives vs. "close" alternatives) in papers that studied the moderators and mediators of dissonance using the free-choice paradigm, following Brehm (1956).

The time between two sequential decisions may be another key factor. In the current research, the second decision immediately followed the first. It is possible that if there were a longer gap between them the decision makers would not remember the details of the previous choice and the reasons that led them to make it. Thus, unless a particular alternative became their actual status quo (as in the case of a pension plan to which they contribute), it is unclear whether a past decision will have a significant effect on future ones. Interestingly, the findings in Ritov (2006) suggest that satisfaction with a chosen alternative may decrease over time.

The type of situations that lead to a choice-induced change in attitude and the duration of the effect are potentially fruitful topics for future research. It would be interesting to measure the size of the effect in different contexts and in particular to compare the bias in favor of a previously chosen alternative to status quo bias. The method I suggest in Study 1 may be useful in studying various aspects of how a previous choice affects subsequent ones. As Study 3 demonstrates, minor modifications of the design make it possible to explore the effect for various types of decisions. For instance, one may study whether choice effects also arise when making a choice for others. Given the finding in Study 2 that particular

criteria become more important following a choice, one may study whether an alternative that is similar to a previously chosen alternative according to these criteria is also more likely to be preferred to other alternatives. Thus, the experimental design introduced here may provide a useful methodology for research into choice effects.

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