Original Papers

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Overlapping defaults. The case of intertemporal choices

Abstract: People make different choices depending on which decision is the default option. In intertemporal choices, the default option is typically imposed externally. For example, people expect more for delaying the gain (default in the present) than are willing to pay for accelerating the future gain over the same period (default in the future). We claim that apart from the external default, people's choices are also influenced by the internal (natural) default such as the time perspective resulting in the reference point in the present. By manipulating the congruency between the internal and external defaults, we show that incongruence between defaults decreases the strength of discounting of gains, but not of losses.

Keywords: intertemporal choices, delay discounting, defaults, direction effect

Our choices depend on defaults

In a famous experiment, half of the participants received a mug as a gift (Kahneman, Knetsch, & Thaler, 1990). Next, all participants provided the lowest price they would sell/buy the mug respectively to whether they had it or not. Results show that those who received a free mug expected more than twice the price than participants who did not receive such a gift were willing to pay for it. In short – endowing the mug doubled its price. For explanation of this effect it is suggested that the endowed option became a reference point – a option to which other options are compared, and which attracts most of human attention. This focus of attention, in turn, biases their preferences toward the default option (Dinner, Johnson, Goldstein, & Liu, 2011; E.J. Johnson, Häubl, & Keinan, 2007).

Discoveries such as the mentioned above endowment effect allowed practitioners presenting choices so that one option becomes more preferred. For example, instructing people that solution A will happen but they can change it to solution B boosts the preference for option A regardless of its properties. Illustratively, the Polish government proposed that people move their retirement savings from the private sector (OFE) to the government institution

(ZUS). This transfer would happen unless one declared he is willing to leave his savings in the OFE. Despite poor reputation of ZUS, with about 70% of people declaring low trust and only 5% high trust for the latter institution (Cichońska & Iltchev, 2011), almost 80% of Poles transferred their savings to this institution.

In this paper we will investigate how such default options (or reference points) overlap, sometimes being congruent and sometimes incongruent, and what is their impact on the impulsivity in intertemporal choices.

Intertemporal choices

Intertemporal choice, a decision between smaller sooner and larger later payoffs, is also affected by defaults (Appelt, Hardisty, & Weber, 2011; Weber et al., 2007). The reference points can be imposed externally or have internal origins, and can be made explicitly by instruction, or more subtle, i.e. by priming (Israel, Rosenboim, & Shavit, 2014), perspective taking (Bialek & Sawicki, 2014; Białaszek, Bakun, McGoun, & Zielonka, 2016) or slight changes to the experimental procedure (Sawicki & Białek, 2016).

In typical experiments investigating the intertemporal choice (sometimes called delay discounting), a cover story

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presents either a smaller sooner or a larger later payoff as a default, (un)intendedly increasing this way the preference toward the default option. For example, studies on the direction effect show that the way alternatives are presented influences people's choices (Shelley, 1993, 1994). In a typical experiment, the participants are divided into two conditions. In the accelerating condition participants are asked to provide a smaller sooner (SS) equivalent for the larger later one (LL). In the delaying condition participants are asked to provide a larger later equivalent for the smaller sooner one. The direction effect indicates that in the delaying condition – where the default lies in the present – people expect a higher premium for waiting than are willing to pay in the accelerating condition with their default lying in the future. In other words, this indicates greater impulsivity when one has the reference point in the present compared to when having the reference point in the future.

We claim that there are two types of defaults which may influence intertemporal choices: internal (e.g., how people perceive the concept of time), and external (e.g., the order of presented alternatives).

Internal default: time perceived (natural time direction)

People are predesignated to organize the world they live in in a certain way (Spelke, 2000; Spelke & Kinzler, 2007). For example, mental representation of abstract concepts such as time and numbers is sequentially organized in a back-front or left-right order (at least in Western cultures). The spatial-numerical association of response codes (SNARC) effect suggests that people see numbers ordered in a left to right increasing sequence (Dehaene, Bossini, & Giraux, 1993). This effect, observed for adults and preliterate children (Nuerk et al., 2015; Patro & Haman, 2012), exemplifies one of the predesignated templates for internal organization of the external world. On the other hand, time is perceived as a linear sequence of events: from the past toward the future, which is illustrated in the way people speak – they look back to the past and forward to the future (Münte, Schiltz, & Kutas, 1998). Studies show that small children reproduce stories in chronological order: they start in the past and move toward the present when the story is in the past, and start in the present and move toward the future when describing possible future events (Bauer & Mandler, 1992).

To sum up the way people perceive time, from the present to the future (left to right) may play an important role as a contextual default for intertemporal choices.

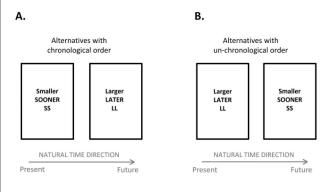## External default: order of alternatives

Intertemporal choices are investigated by allowing people to make choices between the SS and the LL alternative. We claim that the order of presented alternatives plays a significant role and influences people's choices. Presenting alternatives in chronological order (SS on the left and LL on the right) should impose a default in the present, while the presentation in a reverse chronological order (LL on the left and SS on the right) should impede people's natural way of considering problems by making the future option more salient.

Overlapping defaults

Taken together, we claim that the natural time direction (internal default), and order of presented alternatives (imposed default) influence participants' intertemporal choices. Depending whether congruent or incongruent they are expected to differently influence people's choices. When the order of presented alternatives is congruent with the natural time direction (SS first) – greater time discounting is expected. When the order of alternatives is incongruent (LL first) with the natural time direction – weaker time discounting is expected. The reasoning behind such claim is that when two defaults work they can add their strengths when working in the same direction, but they can also cancel each other out when working in the opposite direction. If our reasoning is correct, then presenting choice alternatives in chronological order (SS on the left and LL on the right) should influence greater time discounting while presenting in reverse chronological order (LL on the left and SS on the right) should influence weaker time discounting. The conceptual overlap between defaults is presented on Figure 1.

Figure 1. Two conditions differentiated in terms of congruity

Condition A presents the order of two alternatives which are congruent with the natural time direction, whereas condition B presents overlapping defaults which are incongruent with each other.

Method

Participants

The original sample of participants consisted of $n = 110$ US or Canadian citizens enrolled from Amazon's MTurk worker pool. Exclusionary criteria, applied prior to any analysis, were based on a simplified version of those proposed by M. Johnson and Bickel (2002). After employing the exclusionary criteria, the final sample consisted of 91 participants (49% female, $M_{age} = 33.74$ years, $SD = 11.12$).
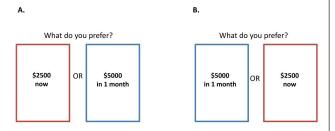
Experimental manipulation

Participants were divided into two experimental conditions. In one group intertemporal choices were presented in chronological order (SS on the left and LL on the right); in the other group, the order was reversed (LL was on the left and SS on the right). This design did not permit the creation of a control condition as there were only two possible presentation orders. In each condition individuals discounted two types of payoffs: gains and losses of \$5,000 over three delays (1, 6, 24 months).

The adjusting procedure

To measure the discounting strength, we used one of the most prominent methods of measuring intertemporal choice – the adjusting procedure (Killeen, 2014; McKerchar et al., 2009). In the adjusting procedure, the participant's task is to choose between two alternatives – SS or LL (Figure 2). The LL card was fixed and the SS was adjusted depending on previous choices made by the participants.

Figure 2. Two conditions presented in the study. Red card is adjusted and the blue one is fixed

Condition A presents alternatives which are congruent with the natural time direction (SS first), whereas condition B presents alternatives which are incongruent (LL first) with the natural time direction. The SS alternative was always adjusted, with the LL becoming the reference point (Sawicki & Białek, 2016).

In the first step, participants were given a choice of \$2,500 immediately or \$5,000 after a specific delay (1 month is assumed for this example). The next set of alternatives depended on this choice, i.e. in the first step, the SS alternative was adjusted by half of the difference between alternatives so that the choice is more challenging. Hence if a participant in a gain condition decided on the SS option, its value decreased from \$2,500 by half of the difference between SS and LL (i.e. by \$1,250) to \$1,250. However, if having the same choice the participant preferred the LL, it's value increased by the same amount, equalling to \$3,750. In the next step, the adjusted SS alternative was again presented with \$5,000 delayed by one month so that participants could make another choice[1].

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[1] Note that the direction of adjustment for losses was reversed, i.e. selecting the larger later gain increased the smaller sooner amount in the subsequent step, while selecting the larger later loss decreased the smaller sooner amount in the subsequent step.

The degree of adjustment decreased by half with each consecutive choice. After making the sixth choice, the program calculated the equivalence point as the mean value of the last two steps.
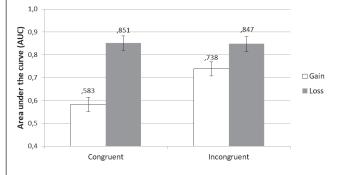
Calculation of discount rates

Discounting strengths of each individual were analysed by calculating the area under the curve (Myerson, Green, & Warusawitharana, 2001) using the formula $(a_2 - a_1)[(b_1 + b_2)/2]$, where standardized a_1 and a_2 are consecutive delays and b_1 and b_2 represent consecutive subjective values of gains or losses. We opted for this formula as it produces less skewed discount rates compared to the alternative, the k parameter. Additionally, the AUC is assumption free and needs not to be fitted to exponential or hyperbolic curve. Using the AUC, we established discounting strength of each individual, with the lower AUC indicating greater discounting strength.

Results

The mean discounting strength of gains and losses in congruent and incongruent defaults is presented in Figure 3. A 2 (congruity of defaults, between-subject) x 2 (sign, within-subject) ANOVA replicated the well-established sign effect with gains being discounted stronger than losses, $F(1,87) = 35.38$, $p < .001$, $\eta_p^2 = .289$. Additionally, we found the main effect of congruity, in which congruent defaults resulted in greater discounting strength, $F(1,87) = 5.74$, $p = .019$, $\eta_p^2 = .062$ compared to task with incongruent defaults.

Figure 3. The impact of congruency on discounting rates for gains and losses

Smaller AUC represents higher discounting strength. Error bars show 95% confidence intervals.

Surprisingly, we found a sign by congruity interaction effect, $F(1, 87) = 6.28$, $p = .014$, $\eta_p^2 = .067$. Decomposing the interaction with tests of simple effects, we discovered that the difference in discount rates between gains and losses with congruent defaults was greater; $\Delta_{AUC} = .268$, $F(1, 87) = 35.33$, $p < .001$, $\eta_p^2 = .289$, than with incongruent defaults, $\Delta_{AUC} = .109$, $F(1, 87) = 5.96$, $p = .016$, $\eta_p^2 = .064$. This interaction showed that the sign effect has been

reduced in incongruent condition, with more consistent discount rates displayed.

Alternative interpretation of the interaction is that incongruity among defaults affected gains $\Delta_{AUC} = .155$, $F(1, 87) = 12.15$, $p = .001$, $\eta_p^2 = .123$, but not losses, $\Delta_{AUC} = .003$, $F(1, 87) = 0.06$, $p = .939$, $\eta_p^2 < .001$. The former decomposition of the interaction is, however, more informative because comparing two within-subject effects (i.e. the direction effect) obtained in different conditions has more power (Charness, Gneezy, & Kuhn, 2012) than conducting two between-subject independent comparisons of discounting strengths of gains and losses. In other words, we make better use of the design using the former decomposition with within-subject effects as the main item of our analysis, while the latter analysis can be more interesting from the theoretical perspective. Hence, we discuss both results in the subsequent section.

General discussion

The aim of the presented study was to investigate how overlapping defaults influence intertemporal choices. We distinguished two types of defaults – order of presented alternatives and natural time direction. The experiment showed stronger discounting of gains when the order of presenting the alternatives was congruent with the natural time direction compared to when the order of alternatives was incongruent with the natural time direction (LL first). Our research supports the claim that attitudes toward waiting are affected by task characteristics. In particular, most intertemporal choices frame for some alternative, making this alternative a default option and thereby affecting the decision made. We know that more patient individuals are less likely to fall into debt, suffer from addictions and have a happier life in general (Moffit et al., 2011). More accurate knowledge of a person's impulsivity may enhance the chances of choosing the correct treatment to alleviate or prevent such behaviour.

Consistently with other researchers who have attempted to counter the impact of defaults in decision-making (i.e. Appelt et al., 2011), our findings suggest that human decision-making can be made less impulsive by presenting intertemporal choices with incongruent defaults. Surprisingly, we found that incongruence between defaults is affecting delay discounting of the gains, but not of losses. This difference can be caused by the natural attitude toward losses so that they are considered with more in-depth processing (type 2). This makes them relatively resistant to subtle contextual manipulations of the problem. We cannot decide whether such reflective processing and associated with it resilience to contextual manipulations occurs for all losses in general, or only for high losses.

Reliability of reported here null finding for losses could be validated by investigating discounting task in which the SS card would be fixed instead of the LL. It's worth mentioning that consistently with our findings, Appelt et al. (2011) also reported no effect of incongruent defaults on the discount rates when accelerating losses, but the discount rates decreased for incongruent defaults when delaying losses. Hence, the effects on incongruent defaults for delaying losses requires further investigation.

This experiment has three implications: one methodological, one practical, and one theoretical.

For the methodological implication, our results can account for the heterogeneity of discounting rates reported in intertemporal studies (for a review see Frederick, Loewenstein, & O'Donoghue, 2002; Karbowski, 2016). Specifically, the heterogenity occurs because even a minor modification to experimental procedures can have a significant impact on discounting strength since an additional default option is often imposed. This additional default is increasing (when the default is congruent) or decreasing (when incongruent) the impact of the core experimental manipulation. For example, a slight change in the experimental design, where in the titration procedure intended to establish discount rates one alternative is varying, and the other is fixed, can affect the results. Specifically, the unvarying alternative becomes the reference point and creates (often unintendedly) the accelerating or delaying condition. We suggest that researchers should put more attention to control experimental procedures relating to default options to eliminate their uncontrolled impact on discounting rates.

For the practical implication of our experiment, we show how to reduce decision biases such as the sign effect. Many researchers agree that decisions made after considering alternatives are better than those made after accepting the first choice that comes to a person's mind (Hess, Lipner, Thompson, Holmboe, & Graber, 2015). Thus, researchers have tried to increase the salience of thoughts supporting alternatives. This increases the chances of overcoming biases such as those resulting from framing effects. As part of these efforts, researchers developed the *consider the opposite* technique which became a prominent method of debiasing human cognition. For example, Appelt, Hardisty and Weber (2011) asked individuals to consider the opposite first, i.e. to describe the future alternative when presented with a delaying scenario. In this type of scenario the NOW thoughts are more prominent, but the manipulation was intended to change this. Results showed that the direction effect was significantly reduced. Taking the perspective of an expert also had an effect on discounting with people becoming more risk averse and more patient (Białek & Sawicki, 2014), while "standing in peer's shoes" resulted in increased risk seeking and impatience (Białaszek, Bakun, McGoun, & Zielonka, 2016).

The theoretical implication is that incongruent defaults can be alternative to loss aversion and query theory explanation to varying discounting strength with different reference points. Specifically, these external reference points are congruent or incongruent with natural defaults, and in turn, facilitate or reduce the impulsivity. For example, all accelerating scenarios are incongruent with the natural, chronological way of consideration; hence the observed discounting strength when accelerating gains (but not losses) is weaker than when delaying gains.

Of course, our studies have limitations. The effects of incongruence in delaying framework were not tracked, and we are therefore unable to generalize our findings to all intertemporal choices. Also, only financial decisions were analysed, and it is unknown whether the present manipulations work in other domains. Despite these limitations, our studies provide scope for future research. Specifically, tests of the present manipulations in real-life cases would be useful. For example, application forms for loans could provide applicants with a temporally incongruent decision task. Finally, using eye tracking in the study of decision making provides insight into the underlying process (Weber & Johnson, 2009), and recently this method was efficiently used when investigating delay discounting and risky choice (Franco-Watkins, Mattson, & Jackson, 2016). Using such method would allow us to track the order and time individuals spent on considering particular choice options, and assess how differences in inspecting alternatives predict the strength of discounting.

Another issue is related to the suggested natural default associated with having the reference point in the present. An alternative to the presented explanation suggests the effect of order, where first considered alternative is the more prominent one. One way to solve this problem would be investigating cultures in which people read from right to left, but have the same time perception (i.e. Israel). They would consider the right-hand side alternative first but also have the default in the present. If the results in different cultures would be the same, the evidence supports time perspective hypothesis. If the results are opposite in different cultures, we could decide in favour the sequence of consideration hypothesis.

To conclude, our experiment suggests that people can consider simultaneously multiply reference points. Depending on whether these reference points are congruent or incongruent, people subsequently become more or less impulsive respectively. However, we find this true only for gains condition but not for losses.

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