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Social choice for one: On the rationality of intertemporal decisions

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ABSTRACT

When faced with an intertemporal choice between a smaller short-term reward and a larger long-term prize, is opting for the latter always indicative of delay tolerance? And is delay tolerance always to be regarded as a manifestation of self-control, and thus as a rational solution to intertemporal dilemmas? I argue in favor of a negative answer to both questions, based on evidence collected in the delay discounting literature. This highlights the need for a nuanced understanding of rationality in intertemporal choice, to capture also situations in which waiting is *not* the optimal strategy. This paper suggests that such an understanding is fostered by adopting *social choice theory* as a promising framework to model intertemporal decision making. Some preliminary results of this approach are discussed, and its potential is compared with a much more studied formal model for intertemporal choice, i.e. game theory.

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1. Introduction

Imagine you are considering whether to buy a pricey new dress, an expensive car, or an apartment in some fancy location. While mulling it over, you will probably also take into account whether it is better to invest your money to purchase that particular good right now, or save it for some future purpose, e.g. paying tuition fees for the kids you do not yet have, enjoying your retirement when older, or perhaps just save enough to afford the summer vacation you always wanted and never could have. Similar decisions are referred to in the economic and neuro-psychological literature as *intertemporal choices* (Rachlin, 2000; Ainslie, 2001; Frederick et al., 2002; Read, 2004; Soman et al., 2005; Berns et al., 2007; Ariely, 2008; Kalenscher and Pennartz, 2008; Madden and Bickel, 2010), and have attracted philosophical interest for their implications on diacronic rationality (Hájek, 2005; Ross et al., 2007; Holton, 2009; Paglieri, 2012). Given that the decision maker experiences a conflict between present preferences and (expected) future goals, what is the right thing to do? Should you indulge in the bout of consumerism you currently desire, or should you give precedence to future concerns? Nor is the dilemma limited to purchase and investment choices: Should you sacrifice your weekend to prepare a difficult examination in one month time, or should you just enjoy two days at the beach house with your friends? Should you give in to your cravings for a lavish meal at your favorite restaurant tonight, or should you remain steadfast and follow your diet for some long-term gain?

In everyday life, the received wisdom is that keeping an eye on the future is better than just focusing on the present. Transferred in laboratory settings, this view would imply that a choice for the larger and later reward (LL) is indicative of self-control, whereas opting for the sooner and smaller prize (SS) is a manifestation of impulsivity. Luckily, scholars are fully aware that

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both self-control (Rachlin, 2000) and impulsivity (Evenden, 1999; Madden and Bickel, 2010) are complex, multi-faceted phenomena, that cannot be simply reduced to, respectively, delay tolerance and delay aversion. Nonetheless, it is tempting to start using the former loaded labels as shorthand for the latter, less imposing concepts: this is why we find excellent scholarly work on intertemporal choice presented as having a direct bearing on patience (Stevens et al., 2005a) and impatience (Van den Bergh et al., 2008). Whenever this happens, it is based on the assumption that (i) LL responses are indicative of a certain type of self-control, whereas SS choices manifest a form of impulsivity, albeit not the only possible one. This in turn may lead to a further value judgment: i.e., the idea that (ii) manifesting self-control in intertemporal choices is always better, i.e. more rational, than the alternative.[1]

In this paper I question both these claims. Contra (i), I begin by reviewing some methodological problems of interpreting LL responses as a manifestation of self-control, or even delay tolerance, and point to some evidence of such problems (Section 2). Contra (ii), I argue that, even when LL responses do in fact measure delay tolerance, this is not enough to automatically qualify them as rationally superior to SS choices (Section 3). The upshot of this analysis is that the simplistic equation LL response = self-control = rational choice is flawed and in many cases refuted by evidence. This in turn raises the question of how scholars interested in intertemporal behaviour ought to react to such a conclusion. Should we simply "abandon ship" and refrain from any further comment on the rationality, or lack thereof, of the observed intertemporal behaviours, thus contenting ourselves with a mere descriptive level of analysis? I think not, and in Section 4 I suggest adapting tools typically used to analyze rationality in social interaction to get a better grasp on the rationality of our inner society of selves, i.e. different preference profiles that are realized at different points in time. This suggestion is not new (early proponents include Schelling, 1984; Elster, 1986; Ainslie, 1992), but the tool chosen to put it into practice has often been game theory. For instance, Ainslie proposed to analyze the type of intrapsychic conflict generated by hyperbolic discounting as an iterated Prisoner's Dilemma (Ainslie, 1992; a suggestion later criticized by Bratman, 1999), and the term "intrapersonal dilemmas" was later coined to describe a whole family of problematic interactions among different selves in time (Read and Roelofsma, 1999; Read, 2001). While game-theoretical models of intrapersonal dilemmas are certainly worth exploring, here I suggest behavioural scientists ought to consider also another, complementary tool: *social choice theory*. In particular, I summarize what has been, to the best of my knowledge, the only attempt so far to apply social choice theory to intertemporal problems (Steedman and Krause, 1986; see also Krause, 2010), in order to emphasize both its implications for assessing the rationality of intertemporal choice, and its relevance for designing new experimental protocols to study preference shifts and their effects on behaviour.

2. When refusing to wait has nothing to do with delay aversion

Interpreting LL responses as indicative of delay tolerance runs into two methodological problems. On the one hand, since the delayed reward in a standard intertemporal choice task happens to be also the larger one, and going for the larger prize is a prepotent response in most species (as demonstrated by studies on the reward contingency task, for instance; see Boysen, 2006), LL responses could actually indicate failed inhibition of such prepotent behavioural tendency, rather than delay tolerance (the *"go for more" problem*). On the other hand, the extent by which delay reduces the propensity to maximize a certain type of reward is dependent upon the strength of such propensity in the absence of any delay (if someone does not care for the long term option more than for the short term one, deciding not to wait has nothing to do with delay aversion), yet some experimental protocols[2] do not measure that strength, thus neglecting to provide a reference point for delay tolerance (the *"ground zero" problem*). Both these problems have been discussed at length in recent work (Paglieri et al., 2015a), so here I will just summarize the main results that confirm their import for correctly interpreting intertemporal choices.

The "go for more" problem applies mostly to tasks in which the amounts of reward are directly visible (e.g., arrays of food pellets or piles of coins), instead of being symbolically represented (e.g., operant keys or linguistic descriptions of monetary sums). In the former case, all species tested so far, including *Homo sapiens*, have demonstrated a prepotent response towards the larger amount, not surprisingly; what is more, such prepotent response has proven to be very hard to overcome, even when pointing to the larger amount leads subjects to receive the smaller one, and vice versa, as it happens in the reverse reward contingency task (Russell et al., 1991). In this task, a correct performance is achieved only after the contingencies of the task are modified to facilitate training (e.g., using a large-or-none method with Japanese macaques and squirrel monkeys; Silberberg and Fujita, 1996; Anderson et al., 2000, 2004), or by replacing the actual amounts with their symbolic representation (e.g., in chimpanzees with Arabic numerals and in capuchin monkeys with high-symbolic tokens; Boysen and Berntson, 1995; Boysen et al., 1999; Addessi and Rossi, 2011); similar results are observed also using symbolic representations of rewards with 3-years-old children (Carlson et al., 2005). Interestingly, symbolic representations are effective in facilitating performance in the reverse reward contingency task only when they do not have a one-to-one correspondence with the actual rewards: replacing arrays of food pellets with arrays of dots does not lead to correct performance, although it does sometimes slightly reduce the frequency of incorrect responses (possibly due to the removal of the "hot" features of the reinforcer, in the sense of Metcalfe and Mischel, 1999). Only highly symbolic representations, i.e. representations that do not make the larger quantity perceptually salient, are truly effective in helping subjects to correctly perform the task (Boysen et al., 1996; Carlson et al., 2005; Boysen, 2006; Addessi and Rossi, 2011), showing that the prepotent "go for more response" is tied to the perception of quantity, and not so much to the nature (appetitive or otherwise) of the reward. Small children and non-human primates tested so far have a prepotent response towards the larger pile of stuff, whether it is food, rocks, dots, or any other type of object, as long as it is associated with a reward.

These results call into question the interpretation of LL responses in intertemporal choices where actual amounts of rewards are used as choice stimuli, as it is customary in primatological studies. How many of these choices are actually indicative

[1] My aim is not to establish whether many behavioural scientists are committed to these assumptions (this would require a much more extensive literature review, and personally I suspect this is not the case), but rather to highlight what problems such assumptions raise, whenever endorsed – either together or disjointedly. The fact that they are sometimes endorsed is, however, demonstrated by some of the facts discussed later on, e.g. the frequent lack of control conditions in intertemporal choice tasks (see Section 2). This is sufficient to justify the search for a more nuanced normative model of intertemporal decision making, as discussed in Section 3.

[2] The problem is mostly avoided by adjusting procedures, in which either the amount of reward or the amount of delay are adjusted based on previous choices: these protocols typically start with a choice between equal amounts or equal delays, thereby taking care of the ground zero issue. This, unfortunately, does not often happen with studies that use a non-adjusting protocol, such as the so called Kirby questionnaire (Kirby and Marakovic, 1996; Kirby et al., 1999; for recent discussion, Myerson et al., 2014).