

The Agent's Impatience:
A Self-Other Decision Model of Intertemporal Choices

Adelle X. Yang

adelle.yang@nus.edu.sg

National University of Singapore, Singapore, 119245

Oleg Urminsky

oleg.urminsky@chicagobooth.edu

University of Chicago Booth School of Business, Chicago, IL, 60615

First version: 6/2016

Current version: 3/2023

*****PLEASE CONTACT AUTHORS FOR THE CURRENT VERSION
BEFORE CITING OR CIRCULATING*****

Abstract

Intertemporal choices represent one of the most prevalent and fundamental tradeoffs in consumer decision-making. While prior research on intertemporal choices focused on choices for oneself, intertemporal choices often involve one individual choosing on behalf of another. How do intertemporal choices made for another person differ from otherwise identical choices made for oneself? This research introduces a self-other decision model that distinguishes reaction utility (derived from interpersonal feedback) from vicarious utility (derived from imagining the recipient's experience). We tested model-derived hypotheses in thirteen experiments involving decisions between peers ($N = 4,799$). Consistent with the proposed role of reaction utility in the model, we find that intertemporal choices made for others are typically more "impatient" than choices for oneself. Moreover, this "agent's impatience" is attenuated when contextual and individual differences weaken the anticipation of interpersonal feedback. Together, our theoretical model and experimental results highlight the rewarding value of interpersonal feedback in self-other decision-making, shedding new light on interpersonal consumer choices.

Keywords: intertemporal choice, self-other decision-making, reaction utility, interpersonal affective feedback

Every day, consumers make decisions that affect themselves and others in various ways, with immediate and long-term consequences. The tradeoff between the value and time of future outcomes commonly underlies these decisions, typically in the form of an intertemporal choice between a smaller-sooner option and a larger-later option (Scholten and Read 2010; Read, McDonald, and He 2018). These choices are commonly seen in financial planning (e.g., spending now vs. saving to enable more spending later), medical decision-making (e.g., receiving unpleasant vaccines now vs. being exposed to health risks later), and daily consumer purchases (e.g., purchasing the current state-of-the-art laptop vs. waiting a few months to buy the next-generation model). Given its prevalence, intertemporal choice has received extensive research over the past few decades (see reviews in Frederick, O'Donoghue & Rabin 2002; Urminsky & Zauberman 2015).

Existing research typically examines intertemporal choice as individual decisions without interpersonal consequences. However, many decisions affect a recipient other than the decision-maker, resulting in interpersonal consequences. For example, when a person makes a choice as an agent, selects a gift, or gives recommendations to a peer, the future payoffs of the decision will not only impact the peer recipient, but also generate downstream consequences for the decision-maker. How do consumers resolve choices that involve both interpersonal and intertemporal tradeoffs? To date, time preference and self-other decision-making has each been studied separately. However, people live in a socially interactive world where their decisions frequently affect others, with interpersonal consequences which, in turn, shape their own future decision-making. It is therefore important to understand how consumers resolve intertemporal choices beyond the context of individual decision-making.

We investigate the important question of time preferences in interpersonal choice, in line with recent calls for more research on interpersonal decision-making (Liu, Dallas, and Fitzsimons 2019; Lerner and Tetlock 2003). We adopt a multi-method approach involving both a theoretical model and empirical testing. First, we extend existing single-person models of time discounting to develop a theoretical model for self-other decision-making with intertemporal consequences. Integrating converging insights from psychological and consumer research, our model distinguishes the role of the agent's reaction utility (derived from interpersonal feedback from the recipient) from the role of

the agent's vicarious utility (derived from the agent imagining the recipient's utility) in interpersonal decisions.

Based on this distinction, we derive our main hypothesis, "agent's impatience": intertemporal choices made for a similar peer will be generally more "impatient" (i.e., a stronger preference for more immediate options) than the same choices for oneself. We also derive additional hypotheses from the model regarding moderators and boundaries of the main hypothesis. We present thirteen experiments ($N = 4,799$) that test these hypotheses. The experiments span a diverse range of interpersonal decisions, including agent decisions, gift giving, and consumer recommendations. The experimental results support the model predictions and corroborate the pivotal role of reaction utility in interpersonal decision-making. We conclude with the implications and limitations of this research and discuss directions for future research on interpersonal decision-making.

A THEORETICAL MODEL FOR INTERPERSONAL DECISIONS

In classic decision models, a consumer makes a choice among available consumption options to maximize the expected utility from her future consumption. In interpersonal decision-making (e.g., delegated agent decisions, gift choices, and recommendations between people), the decision-maker does not expect to personally experience the chosen consumption. Rather, she considers how her choice will positively (or negatively) impact the future consumption outcomes of another person, typically a peer recipient, such as a friend, a colleague, or an acquaintance.

In these interpersonal decisions, the decision-maker cares about the decision outcome to the extent that she derives some utility for herself from the decision outcome, which motivates her to maximize those utilities. Two primary sources of utility that reward and motivate interpersonal decision-making have been suggested in the psychological literature. First, it has long been posited that people experience some fraction of others' consumption utility via imagining others' experience (Lockwood 2016; Mobbs et al. 2009; Craig 1968; see also "pure altruism" in Andreoni 1990; Batson & Shaw 1991). When choosing for another person, the decision-maker may derive such utility from mentally simulating what the recipient experiences as a result of the decision outcome—an indirect,

vicarious experience for the decision-maker. We thus refer to this type of utility as *vicarious utility*.

Obtaining vicarious utility requires both comprehending and valuing another person's internal state, a high-level perspective-taking process that is effortful and frequently miscalibrated (Eyal, Steffell, and Epley 2018; Epley 2008; Epley et al. 2004).

Second, it has also been theorized that people are emotionally rewarded by experiencing interpersonal feedback from others directly, the expectation of which influences their decision-making (Charlton et al., 2013; Yang & Urminsky, 2018). Interpersonal feedback is affectively rewarding because it entails rich sensory (e.g., visual, auditory, tactile) information that is inherently evaluable (Bhanji and Delgado 2014; Schultz 2006). For instance, consider an appreciative facial expression, a squeal of excitement, or a warm hug—such interpersonal feedback directly gratifies people in emotionally meaningful ways and powerfully influences their subsequent actions. This indicates that, when choosing for another person, people expect to derive utility from obtaining interpersonal feedback from the recipient. We refer to this utility as *reaction utility*.

Research across various branches of psychology converges to suggest that interpersonal feedback is rewarding on its own and that the anticipation of interpersonal feedback can be an important factor in interpersonal decision-making. Even before children develop the capacity for perspective-taking, interpersonal displays of affect have been shown to be highly effective as primary reinforcers that regulate behaviors (Grossmann 2010; Nikitin and Freund 2019; Toates 1988; Tronick 1989; Tsukiura and Cabeza 2008; Wang, Krumhuber, and Gratch 2018). In these reinforcement learning processes, the interpersonal communication of affective feedback rewards actions and thereby shapes subsequent actions through the anticipation of affective feedback.

In fact, the mechanisms specialized for processing interpersonal affect appear to be prioritized (Farah 2000; Fox 2002; Hasselmo, Rolls, and Baylis 1989). For example, emotion-conveying facial expressions attract attention faster than other stimuli and evoke automatic emotional responses from observers (Calvo and Esteves 2005; Stenberg, Wiking, and Dahl 1998; Young-Browne, Rosenfeld, and Horowitz 1977). In contrast, the vicarious understanding of others' internal psychological state emerges at later stages of development (Frick, Möhring, and Newcombe 2014; Van der Graaff et al.

2014), requires motivation and effort (Epley et al. 2004; Eyal, Steffel, and Epley 2018), and presumably involves more effortful and controlled processes.

These important characteristics of interpersonal feedback distinguish it from mere informational feedback (e.g., regarding the objective quality of a consumption outcome). Interpersonal feedback is experience-based and stored in episodic memory, whereas informational feedback is encoded more abstractly and incorporated into general semantic knowledge (Patterson, Nestor, and Rogers 2007). This suggests that the anticipation of interpersonal feedback may enter the decision-making process in the form of rich mental imagery that represents prior social experiences (Moulton and Kosslyn 2009; Gilbert, Gill, and Wilson 2002; Killeen 2009).

These characteristics also help distinguish interpersonal feedback from *intrapersonal* feedback. As an aspect of the external world that we perceive through our senses, interpersonal feedback is obtained from directly experiencing others' external affect display through perceptual encoding. In contrast, intrapersonal feedback is experienced directly as one's own emotions in reaction to one's own chosen outcomes. When a person experiences an emotion, her display of emotion does not provide additional utility to her beyond the experienced emotion itself (assuming that it does not provide her with new information). As such, we argue that reaction utility is a critical component that enters the decision-making process for interpersonal decisions but typically not in individual decisions.

Given the distinct rewarding value of experiencing interpersonal feedback, anticipated interpersonal feedback should also influence interpersonal decisions beyond the effect of anticipated vicarious outcomes. Indeed, an increasing number of behavioral studies (e.g., Knapp & Hall, 2013; Wang et al., 2018; Yang & Urminsky, 2018) have found that the consideration of anticipated interpersonal feedback exerts a direct influence on other-regarding behaviors even when controlling for anticipated vicarious outcomes, such as welfare consequences for the recipient. These findings would be incompatible with self-other decision models that center on vicarious utility alone, which

essentially reduce an interpersonal decision to a prediction of another person's preferences¹. Next, we introduce our theoretical model. To incorporate the insights from past research, the theoretical model characterizes the interpersonal decision-making process as guided by the maximization of both vicarious and reaction utility.

General Framework for Interpersonal Choice

Suppose an agent makes a choice for a recipient. Let the interpersonal indicator $s = 0$ when the agent is deciding for themselves and 1 when deciding for another person as the recipient. Let z denote a vector that represents all individual-specific and relationship-specific variables that may factor into the agent's decision for a recipient (e.g., relationship closeness between the agent and recipient, the agent's ability to imagine the recipient's reaction). Let $u(x; s, z)$ denote the time-independent utility the agent receives from choosing an option with monetary value x for the recipient. We thus specify:

$$u(x; s, z) = \alpha^s v(x; z) + sr(x; z)$$

where $v(x; z)$ is the direct consumption utility the recipient would receive from choosing x for herself, $r(x; z)$ is the reaction utility the agent receives for choosing x for the recipient, and $0 < \alpha < 1$ is a constant that captures how much the agent discounts the utility experienced by the recipient, namely, social discounting (Jones and Rachlin 2006). Thus, the vicarious consumption utility that the agent receives from choosing x for the other person as the recipient is defined by $\alpha v(x; z)$, which, by construction, is strictly less than the recipient's own direct consumption utility. We make standard expected utility theory assumptions: (i) $v(0; z) = r(0; z) = 0$ (no utility if the choice has zero value), and (ii) $v(x; z)$ and $r(x; z)$ are each continuous twice differentiable functions that are positive, increasing, and concave in x for $x > 0$.

When the agent chooses for herself, because the agent does not receive reaction utility from herself (i.e., $s \times (x; z) = 0$), she expects to simply receive utility:

¹ To this end, our distinction between vicarious utility and reaction utility may be reminiscent of prior work (e.g., Andreoni 1989, 1990) that distinguishes "pure altruism" from "warm glow" in the context of charitable giving. We provide extended discussions on this point in section IV in the web appendix.

$$u(x; 0, z) = v(x; z)$$

We make an additional simplifying assumption, that the agent chooses for the recipient, a similar peer, as if they have the same consumption value function v . Specifically, the agent chooses for the recipient based on expected utility:

$$u(x; 1, z) = \alpha v(x; z) + r(x; z)$$

The assumption that the agent uses her own consumption value function can be understood in two ways. First, given that we focus on choice for oneself versus choice for similar peers, the agent and recipient may often have similar preferences. Second, to the degree that the agent is not aware of how the recipient's preferences differ, the agent is likely to project her own preferences for consumption onto the recipient (Mitchell and Phillips 2015; Mobbs et al. 2009). (We discuss extensions to the model that can accommodate the agent assuming preferences for the recipient that differ from her own in section IV in the web appendix.)

Vicarious Utility versus Reaction Utility

To derive useful predictions from the model, we need to specify the relationship between vicarious utility and reaction utility functions. Critical insights regarding this relationship have been offered in prior research in psychology and consumer behavior, demonstrating that affect-based evaluation is more ordinal and less sensitive to magnitude changes (Hsee and Rottenstreich 2004; Hsee, Rottenstreich, and Xiao 2005; Pham et al. 2015; cf. Schley, de Langhe, and Long 2020).

In particular, the general evaluability theory (Hsee and Zhang 2010; Hsee et al. 2009) suggests that the evaluation of more affectively evaluated outcomes is more sensitive to qualitative changes (e.g., more drastic changes around point zero) and less sensitive to quantitative changes (e.g., smaller marginal changes with further value increases). Interpersonal feedback is arguably more affectively evaluated than monetary outcomes, as alluded to earlier. Therefore, we expect that the reaction utility function may be less scope-sensitive than the vicarious utility function. That is, for values greater than zero, the relative marginal increase in reaction utility should be *smaller* than that in vicarious utility. More formally, this relationship can be specified as the following monotone ratio property (MRP):

$$\frac{\partial}{\partial x} \left[\frac{r(x; z)}{v(x; z)} \right] < 0$$

This is a fairly general property. We illustrate this in Figure 1 with three sets of commonly used utility functions that all satisfy the MRP condition. For simplicity, we treat z as a scalar in all following examples. Figure 1a displays vicarious and reaction utility functions that follow power utility functions $v(x; z) = \frac{zx^\theta}{\theta}$ and $r(x; z) = \frac{zx^\gamma}{\gamma}$, $0 < \gamma < \theta < 1$. Figure 1b displays quasi-linear utility functions $v(x; z) = zx$ and $r(x; z) = z \times \ln(x + 1)$. In Figure 1c, $v(x; z)$ is an arbitrary increasing concave function and $r(x; z) = zc$ for $x > 0$. The MRP is always satisfied although the utility functions take different forms² in these three sets of examples (see a full deduction for each set of examples in Appendix I).

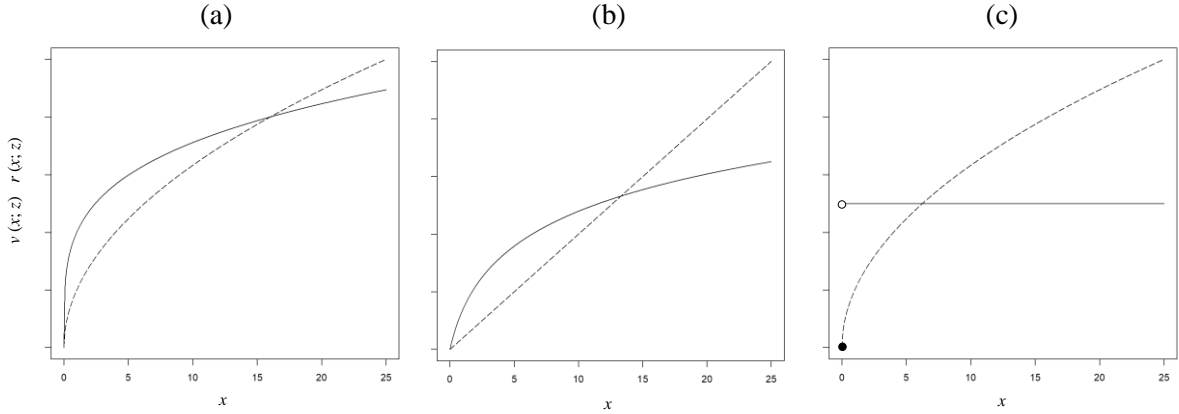


Figure 1. Three sets of vicarious utility (dashed line) and reaction utility (solid line) functions that satisfy MRP: (a) two power utility functions $v(x; z) = \frac{zx^\theta}{\theta}$ and $r(x; z) = \frac{zx^\gamma}{\gamma}$, $0 < \gamma < \theta < 1$, (b) vicarious utility is linear $v(x; z) = zx$ whereas reaction utility is a log function $r(x; z) = z \times \ln(x + 1)$; and (c) vicarious utility is concave whereas reaction utility is a step function, $r(0; z) = 0$ and $r(x; z) = c$.

To our knowledge, this property regarding potential differences in vicarious and reaction utility has not been previously tested. Therefore, we conducted a pilot study to empirically compare the vicarious and reaction utility functions. We recruited 226 participants from Prolific (pre-registered

² It should be noted that the MRP does not require the reaction utility function to be more concave than the vicarious utility function. MRP is based on the marginal increase in utility relative to the marginal increase in current utility. By contrast, concavity is about the change in the slope of the utility function. In fact, the reaction utility functions are more concave than the vicarious utility functions in Figures 1a and 1b but is less concave in Figure 1c.

at https://aspredicted.org/XM3_7S8) and randomly assigned them to three (vicarious utility vs. reaction utility vs. own consumption utility) between-subjects conditions. All participants were first asked to specify a friend and then to imagine referring the friend to a paid online survey, from which the survey-taker would be compensated with a food voucher in value commensurate with the market rate.

In the vicarious-utility condition, participants were asked “How positively do you evaluate the [\$x] voucher from [the listed friend]’s perspective?” In the reaction-utility condition, participants were asked “How positively do you evaluate the pleasure of seeing [the listed friend] receiving the [\$x] voucher?” In the own-consumption-utility condition, participants were asked “How positively do you evaluate the [\$x] voucher for yourself?”, all rated on 9-point scales (1= not at all; 9 = extremely). Each participant was asked to evaluate a series of six outcomes in ascending order of value (from \$0.1 to \$5.1 with \$1.0 increments). All evaluations were time-independent in this study as no intertemporal tradeoffs were introduced.

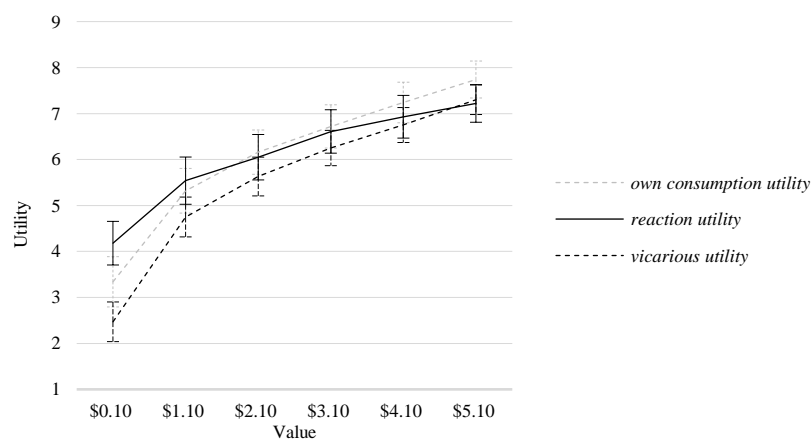


Figure 2. Estimated utility functions for vicarious utility (dashed line), reaction utility (solid line), and consumption utility (grey line) in the pilot study.

As shown in Figure 2, the estimated vicarious and reaction utility functions systematically vary in ways that visually resemble illustrations in Figure 1. Indeed, our analyses reveal that these estimated utility functions satisfy MRP. First, the marginal increases in reaction utility are relatively smaller than those of vicarious utility, as confirmed by a significant interaction between voucher

value as a within-subjects factor and evaluation as a between-subjects factor, in a repeated-measures ANOVA ($F(5, 740) = 16.29, p < .001$). Second, the curvature of the vicarious utility function was similar to the curvature of own consumption utility but was always rated lower. Indeed, using the same repeated-measures ANOVA analyses, we found that the curvature of the vicarious utility function did not significantly differ from participants' own consumption utility function (interaction $F(5, 740) = .96, p = .440$). Last, we also found a main effect for the average difference between vicarious utility and own consumption utility functions ($F(1, 150) = 4.04, p = .046$), consistent with the social discounting assumption ($\alpha < 1$). Additional analyses using different curve estimation regression models (including linear, logarithmic, and quadratic functions; web appendix section II) also estimate different intercepts and slopes for the three utility functions, consistent with the above results.

The Agent's Impatience

Next, we use the proposed model to generate predictions regarding intertemporal choices for oneself versus for others. In an intertemporal choice, a person chooses between a smaller-sooner (*SS*) option, often immediate (i.e., in the “current period” defined by $t = 0$, Jang and Urminsky 2023), and a larger-later (*LL*) option. Various models of temporal discounting have been proposed and tested, in which the agent's likelihood of choosing *SS* over *LL* options is captured by an individual-level discount factor, usually deemed as reflecting the person's “impatience” for consumption outcomes (see reviews in Doyle 2013, Urminsky & Zauberman, 2015).

When the agent only considers expected vicarious utility, the “impatience” revealed in the decision for a similar peer should be similar to one's own “impatience,” based on egocentric projection (Epley et al. 2004). Our theory suggests that the agents consider expected reaction utility when the decision recipient is concrete and specific, such that interpersonal feedback is obtainable and conceivable. As such, an intertemporal choice for another person can be thought of as guided by two related sets of questions: “How will I value the recipient's consumption outcome that results from each option?” and “How will I value the recipient's reactions to my action of choosing each option?”

When this is the case, the relative attractiveness of *SS* versus *LL* options will not only depend on the expected vicarious utility, but also depend on the expected reaction utility of each option.

To reach a decision, the agent evaluates these future outcomes through the present lens such that all future utility components are discounted to the present. This includes reaction utility, which we assume is based on the recipient's experience of receiving the goods and not based on the anticipation of receiving future goods,³ and hence is discounted from the future point of receipt to the present. An individual discounting factor is often used to represent the person's general time preference in decision models. We let $f(t)$ represent the agent's discount factor with delay t . The generic discounting factor $f(t)$ can represent any multiplicative (and potentially time-varying) discounting model including exponential (Samuelson, 1937), hyperbolic (Mazur, 1987, 2001), and quasi-hyperbolic models (Laibson, 1997). For instance, it is common to assume a quasi-hyperbolic model, with $f(t) = \beta^D \delta^t$ where $\beta \in [0,1]$ is the present-bias parameter, $\delta \in [0,1]$ is the long-run discount factor, $D = 1$ if $t > 0$, and $D = 0$ if $t = 0$. Therefore, the utility when a person chooses for herself is:

$$U(x, t, 0) = f(t)v(x; z)$$

Furthermore, because reaction utility can only be derived from the interpersonal feedback after the actual receipt and not prior to it, the utility when that person chooses for another person is:

$$U(x, t, 1) = f(t) \{ \alpha v(x; z) + r(x; z) \}$$

Based on this decision model, we derive our hypotheses. First, our main hypothesis compares a person's choice for a similar peer recipient with her choice for herself:

Hypothesis 1 (The agent's impatience): Agents are more likely to choose *SS* for a peer than to choose *SS* for oneself in an intertemporal choice, all else equal.

This hypothesis is derived as the follows. Consider that the agent faces an intertemporal choice

³ Reaction utility should not be conflated with notions of contemplation emotion (Molouki, Hardisty, and Caruso 2019) or anticipatory utility (Hardisty and Weber 2020; Thakral 2022), which have been posited as the utility (or disutility) that one derives from the experience of actively *anticipating* a future event. In particular, we use *expected reaction utility* to refer to the expected enjoyment of a prospective social interaction, not the enjoyment from expecting the prospective social interaction. For an intertemporal choice model that incorporates anticipatory utility, see Thakral (2022).

today between a smaller sooner option (*SS*) which yields x_1 at t_1 and a larger later option (*LL*) which yields $x_2 > x_1$ at some time $t_2 > t_1$ in the future. When choosing for themselves, the agent prefers *SS* to *LL* if and only if:

$$U(x_1, t_1, 0) = f(t_1)v(x_1; z) > f(t_2)v(x_2; z) = U(x_2, t_2, 0)$$

Thus, when the agent is indifferent between *SS* and *LL*, we have $f(t_1)v(x_1; z) = f(t_2)v(x_2; z)$. This is equivalent to:

$$\frac{v(x_2; z)}{v(x_1; z)} = \frac{f(t_1)}{f(t_2)} \quad (1)$$

Now, when choosing for a similar peer, she will prefer *SS* to *LL* if and only if:

$$U(x_1, t_1, 1) = f(t_1)\{\alpha v(x_1; z) + r(x_1; z)\} > f(t_2)\{\alpha v(x_2; z) + r(x_2; z)\} = U(x_2, t_2, 1)$$

Since $\alpha f(t_1)v(x_1; z) = \alpha f(t_2)v(x_2; z)$, the threshold condition under which the agent will choose *SS* over *LL* for the recipient is $f(t_1)r(x_1; z) > f(t_2)r(x_2; z)$, which is equivalent to:

$$\frac{f(t_1)}{f(t_2)} > \frac{r(x_2; z)}{r(x_1; z)} \quad (2)$$

Combining (1) and (2) implies *SS* will be chosen for the recipient when:

$$\frac{r(x_1; z)}{v(x_1; z)} > \frac{r(x_2; z)}{v(x_2; z)} \quad (3)$$

This is equivalent to the monotone ratio property (MRP): the relative marginal increase in reaction utility is smaller than the relative increase in vicarious utility. In other words, as long as the MRP is satisfied, the agent will prefer the *SS* for the recipient even when indifferent between the *SS* and *LL* for herself. Intuitively, this means, the decision threshold for an agent to choose *SS* is lower in choice for others than that in choice for oneself.

This prediction for “agent’s impatience” may appear to be inconsistent with prior theories positing that impulsivity should be mitigated by social and psychological distance (Trope, Liberman, and Wakslak 2007; Metcalfe and Mischel 1999), such as when a person resolves an intertemporal choice in another person’s shoes. However, this prior theorizing only considered predictions of others’ preferences, and did not take into account the additional impact of interpersonal feedback. Our prediction is obtained because reaction utility from interpersonal feedback is a factor in making

decisions for others, which is not equivalent to *predicting others' preference* (although sometimes conflated).

A few papers have reported that people make either similar (Takahashi 2007) or “more patient” intertemporal choices for others (e.g., Albrecht et al., 2011; Pronin, Olivola, and Kennedy 2008; Ziegler & Tunney, 2012) than for themselves. However, a closer examination of these studies reveals that they operationalized “*decision for others*” as choices for hypothetical or abstract others, from whom the agent would not anticipate (and might not even be able to simulate) interpersonal feedback. In fact, we derive recipient specificity as a theoretical moderator of agent’s impatience (see H3). When the recipient is entirely abstract and nonidentifiable, we expect agent’s impatience should be mitigated, because in that case, deciding for others indeed reduces to making a prediction of others’ preference. As a first model of self-other decision-making in intertemporal choice, our proposed model is a simplification that is, at best, incomplete. Nevertheless, we believe this model provides a useful starting point, and we hope that it can spur subsequent discussions that will contribute to a more thorough and rigorous understanding of interpersonal decision-making. Next, we focus on the novel role of reaction utility in this model to generate additional predictions regarding critical boundary conditions to agent’s impatience.

Model-Derived Boundary Conditions

First, we consider how the reception time of interpersonal feedback (relative to the recipient’s consumption) influences our main prediction. In the baseline model, feedback is expected to occur during the same period as the consumption of the *SS* and *LL*, t_1 and t_2 , respectively. When a delay of interpersonal feedback occurs, our model predicts that the agent’s impatience will be mitigated and potentially reversed:

Hypothesis 2: Delaying interpersonal affective feedback will mitigate agent’s impatience, and potentially reverse it.

Let T denote when the earliest interpersonal feedback occurs. Because feedback can only occur after the earliest consumption, we have $T > t_1$. An expected delay in feedback affects reaction utility only, and does not affect vicarious utility. More specifically, for $t_1 < T < t_2$, the reaction utility

for *SS* is discounted to the present from a later time T instead of t_1 so the threshold for the agent to choose *SS* for the recipient now becomes:

$$f(t_1)\alpha v(x_1; z) + f(T)r(x_1; z) > f(t_2)\alpha v(x_2; z) + f(t_2)r(x_2; z)$$

As we shown in Appendix II, the above condition is less likely to be satisfied than the baseline condition in (2). In other words, as T approaches t_2 , the agent's choice for the recipient will be increasingly similar to her choice for herself, mitigating the agent's impatience. Intuitively, this means that choosing *SS* becomes less attractive for the agent because delaying the earlier gratification from obtaining interpersonal feedback associated with *SS* reduces its rewarding value.

Further, for even longer delays of interpersonal feedback such that $T > t_2$, the equivalent condition for choosing *SS* is instead:

$$f(t_1)\alpha v(x_1; z) + f(T)r(x_1; z) > f(t_2)\alpha v(x_2; z) + f(T)r(x_2; z)$$

As we also show in Appendix II, this suggests that the threshold condition no longer holds. In other words, as interpersonal feedback is delayed, occurring only after both options have been received, the relative attractiveness of the *SS* option diminishes, hence the agent's choice for others becomes increasingly similar to her choice for herself and eventually favors the *LL* option (as its greater magnitude will result in more reaction utility).

Next, we consider the role of recipient specificity. This factor is important because when the agent considers the reaction utility from the recipient, the assessment of reaction utility largely depends on the conceivability of the recipient's reaction, an element of z . Our model also predicts that recipient specificity is a moderator to the agent's impatience:

Hypothesis 3: Agent's impatience is mitigated when the recipient is unspecified.

Thus far, our theorizing has focused on cases where the recipient is a concrete and specific peer, so that the recipient's reactions are conceivable. However, when the recipient is abstract and non-specified, the recipient's reactions are arguably less conceivable. Converging evidence shows that social cognition is remarkably sensitive to the specificity and identifiability of others. Decisions regarding specified and identifiable others qualitatively differ from those made for non-specified, abstract others, as documented in studies across domains of risky decision-making (Hsee and Weber 1997; Wagenaar, Keren, and Lichtenstein 1988), charitable giving (Small and Loewenstein 2003; Kogut

and Ritov 2005), and policy making (Kogut and Ritov 2015; Yang and Teow 2023).

In line with this insight, we assume that $r(x; z)$ is an increasing function of reaction specificity. When the choice is for a completely non-specified recipient, $r(x; z) \rightarrow 0$, and therefore choice for others should increasingly resemble choice for oneself. Meanwhile, recipient specificity should have little effect on vicarious utility, which is based on projection of the agent's own preference and experience. Thus, when the recipient is an utterly unspecified abstract "other," our decision model simplifies the decision to a preference estimation problem alone, and therefore it no longer predicts the agent's impatience.

This moderator reconciles our main "agent's impatience" hypothesis with the limited prior studies reporting findings inconsistent with H1. In these studies, participants made choices for a hypothetical "someone else" (Takahashi 2007), "a stranger they would never meet" (Albrecht et al., 2011), a generic unknown participant with whom the agent would not interact (Study 4, Pronin, Olivola, and Kennedy 2008), or were only asked to make a prediction (e.g., "How would the person choose?"; Ziegler & Tunney, 2012). Put differently, in the studies finding seemingly inconsistent results with our theorizing about choices for specific peers, the study designs made interpersonal feedback unobtainable and hard to imagine, essentially eliminating this key aspect of interpersonal decisions. Given that reaction utility was presumably absent from participants' decision process in these studies, the lack of "agent's impatience" is compatible with our model, as specified in H3.

Last, we consider individual differences in actively anticipating interpersonal feedback, another potential element of z that is relevant to reaction utility. Previous research has suggested that the anticipation of interpersonal feedback is experience-based and largely relies on mental imagery (Moulton and Kosslyn 2009), such as the mental simulation of others' facial expressions and body language. While such visual, non-verbal information generally dominates the communication and interpretation of emotions in social interactions (Argyle et al. 1970; Burns and Beier 1973; Walker and Trimboli 1989), people differ in their spontaneous reliance on visual imagery in decision making (Marks 1973; Nelis et al. 2014). This means that the agent's impatience may be mitigated for people whose decision-making involves little mental imagery:

Hypothesis 4: People who tend to engage little mental imagery in decision-making will exhibit agent's impatience to a lesser degree.

The formal deduction is similar to H3 only except that here the reliance on mental imagery is an individual-level characteristic, instead of a relationship-level characteristic.

Overview of Studies

We test predictions of the model in thirteen experiments ($N = 4,799$), as shown in Table 1. We first test the agent's impatience effect in Study 1 with choices between *SS* and *LL* financial rewards. We then present replications of this finding in seven studies (2A - 2G) across various decision contexts and stimuli, with consequential choices in two studies (2B & 2C). Next, we examine how agent's impatience is moderated by critical situational factors implied by the model, including delays in interpersonal affective feedback (Studies 3A and 3B), and lack of recipient specificity (Study 4). Finally, we explore if the agent's individual differences in trait empathy (Study 5A) or visual processing (Study 5B) moderate the effect. These thirteen experiments yielded results highly congruent with our theorization and model predictions. We report all methods and measures in all studies and report secondary analyses in the supplementary web appendix. We share all data on OSF (https://osf.io/faj3r/?view_only=fb10bade1db44ceaa363f41ae1f7e56a).

Table 1. Summary of main results.

Study	<i>n</i>	Choice of <i>SS</i>		Other conditions/factors	The agent's impatience effect
		For a specified peer	For oneself		
Study 1	440	28.1%	18.8%	--	$\chi^2(1, N = 440) = 3.93, p = .015, \eta = .12$
Study 2A	403	49.2%	39.4%	--	$\chi^2(1, N = 403) = 3.93, p = .048, \eta = .10$
Study 2B	88	61.4%	34.1%	--	$\chi^2(1, N = 88) = 6.6, p = .018, \eta = .27$
Study 2C	116	41.4%	19.0%	--	$\chi^2(1, N = 116) = 6.9, p = .015, \eta = .24$
Study 2D	155	50.6%	27.6%	--	$\chi^2(1, N = 155) = 8.6, p = .003, \eta = .24$
Study 2E	420	51.4%	43.1%	--	GEE Wald $\chi^2(1, N = 840) = 14.44, p < .001$
Study 2F	383	56.3%	49.0%	--	GEE Wald $\chi^2(1, N = 1532) = 6.64, p = .010$
Study 2G	208	55.7%	41.8%	--	GEE Wald $\chi^2(1, N = 1872) = 13.51, p < .001$
Study 3A	637	43.0%	33.5%	with delayed recipient feedback: 31.0%	$b_{\text{for_other}} = .40, \text{Wald} = 4.01, p = .045;$ $b_{\text{delay}} = -.52, \text{Wald} = 6.65, p = .010$

Study 3B	605	67.5%	45.3%	<i>with delayed recipient feedback: 33.8%</i>	$b_{\text{for_other}} = .92$, Wald = 19.7, $p < .001$; $b_{\text{delay}} = -1.40$, Wald = 44.88, $p < .001$
Study 4	533	60.0%	35.8%;	<i>For unspecified other: 42.1%</i>	McNemar's χ^2 (1, $N = 271$) = 51.25, $p < .001$
Study 5A	407	45.5%	33.4%	<i>Tested interaction with spontaneous usage of imagery</i>	McNemar's χ^2 (1, $N = 407$) = 27.76, $p < .001$; GEE $b_{\text{interaction}} = .19$, Wald = 13.33, $p < .001$
Study 5B	404	41.1%	31.9%	<i>Tested interaction with trait empathy</i>	McNemar's χ^2 (1, $N = 404$) = 17.28, $p < .001$; GEE interaction <i>n.s.</i>

STUDY 1: IMMEDIATE VS. DELAYED FINANCIAL REWARDS

In Study 1, we compared how participants made an intertemporal choice between *SS* and *LL* compensation options for another person, with how participants made the same choice for themselves, between subjects. Our main hypothesis (H1) of agent's impatience suggests that participants will be more likely to choose the *SS* payment (vs. *LL* payment) when choosing for another person than when choosing for themselves, all else equal. We pre-registered this study (<https://aspredicted.org/blind.php?x=re5ur7>).

Method

We planned for a sample size of at least 400 and received 467 surveys from Prolific UK respondents. Per the pre-registered exclusion criteria, we obtained 440 valid responses ($M_{\text{age}} = 35$, 69% female) after excluding 15 incomplete entries, 12 participants who failed a generic instructional manipulation check (IMC), and 23 participants who failed an additional attention check about the content of the survey. Similar screening procedures were used in the other online samples. Details of the screening procedures and pre-registration links for all studies are reported in full detail in the web appendix (Table S1).

Participants were asked for the first name of a friend with whom they often spent time. Then participants were asked to imagine that a local pizza franchise invited customers to fill out an extensive online survey about their food delivery services. In the scenario, survey-takers were

compensated with digital vouchers that could be used at any outlet of the franchise, and the digital vouchers would be sent to the survey-taker via email and have no expiration date.

Participants were randomly assigned to one of two (choice for self vs. choice for other) between-subjects conditions. In the choice-for-self condition, participants were asked to imagine that they had taken part in the survey and were given a choice between two options for the digital voucher: “to receive a £8 voucher today,” or “to receive a £10 voucher in two weeks.” Participants were asked “Which option would you choose?” In the choice-for-other condition, participants were asked to imagine that the friend took part in the survey and was given a choice between two options for the digital voucher, as in the for-self condition. Participants were then asked, “If [the friend] asked you to choose between the options on behalf of him/her, which option would you choose for [the friend]?” Participants made a binary choice between the two options, completed a generic IMC, and indicated their gender and age.

Results

Consistent with the hypothesized agent’s impatience, participants in the choice-for-other condition were more likely to choose the *SS* payment (£8 voucher today) than were participants in the choice-for-self condition (28.1% for other vs. 18.8% for oneself, $\chi^2(1, N = 440) = 3.93, p = .015, \eta^2 = .12; b_{\text{recipient}} = -.55, \text{Wald} = 5.92, p = .015$; Figure 3). Gender and age did not influence choice or moderate this effect.

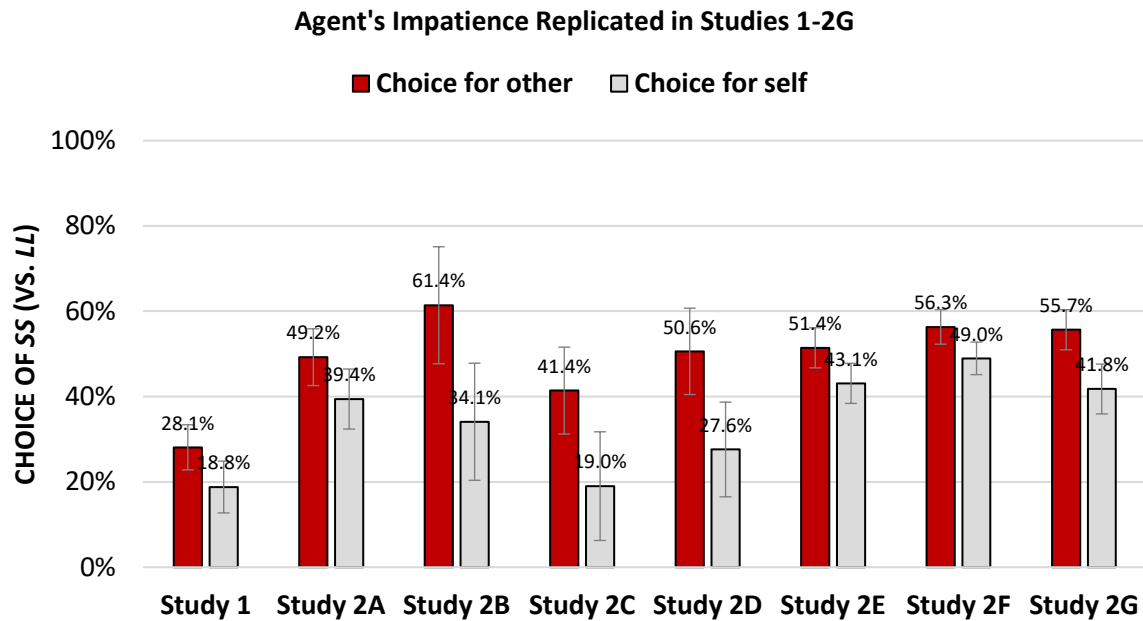


Figure 3. Summary of main effects across Studies 1-2G. Participants were more likely to choose the *SS* payment when deciding for a peer than when deciding for themselves. Error bars represent 95% confidence intervals.

Discussion

Study 1 supports the agent's impatience hypothesis (H1): participants were more likely to choose the *SS* option when making an intertemporal choice for a specified friend than when asked to make an otherwise identical intertemporal choice for themselves. Next, in Studies 2A-2G, we test the robustness and generalizability of this effect across a variety of choice stimuli and decision contexts, including decisions with behavioral consequences.

STUDIES 2A–2G:

REPLICATION AND GENERALIZATION ACROSS STIMULI AND CONTEXTS

Each of the seven studies (2A-2G) followed the basic paradigm in Study 1, having participants choose between an *SS* and an *LL* option, either for themselves or for another specified person. All studies randomly assigned participants to either a choice-for-self or a choice-for-other between-subjects condition, except Study 2E in which this factor was varied within-subjects. More specifically, Study 2A tested choices between *SS* and *LL* financial rewards for online freelance work

in a different population and context than Study 1. Studies 2B, 2C, and 2D each tested the effect in consequential decisions between gift cards. Studies 2E, 2F, and 2G tested the effect's generalizability to non-monetary rewards, using choices between consumer goods.

We also varied the type of peer relationships across these studies: either two strangers who had been randomly paired up and became acquainted during the study (Study 2B), a pair of friends who visited the lab together (Study 2C), or the participant and a friend specified by the participant (all other studies). We pre-registered Studies 2A, 2E, and 2F. Studies 2B, 2C, 2D, and 2G predated the practice of pre-registration and were the only non-pre-registered studies (see Table S1 in the web appendix).

Method

We summarize here the key details that distinguish the studies, and report additional details, including screening procedures and secondary exploratory measures, in the web appendix (section II).

Study 2A. We recruited participants from Amazon Mechanical Turk (MTurk) and received 403 valid responses ($M_{\text{age}} = 38$, 51% female, $M_{\text{closeness}} = 8.71$). The procedure was similar to Study 1, except that the financial rewards (“receive \$8 today” versus “receive \$10 in two weeks”) were from completing MTurk HITs and were presented as either regular remuneration or a bonus payment (to test generalizability to windfall gains). Thus, the study had a 2 (recipient: choice for self vs. choice for other) x 2 (description: remuneration vs. bonus payment) factorial design. In addition, participants were asked to indicate how close they felt toward the listed friend on a 10-point scale (1 = not close at all, 10 = extremely close).

Study 2B. We recruited 88 participants in the behavioral lab of a large US Midwestern university ($M_{\text{age}} = 26$, 52% female, $M_{\text{closeness}} = 4.5$ out of 10). We randomly paired up the participants and asked each pair to first engage in a 5-minute relationship-closeness induction task (RCIT; Sedikides et al. 1999). Then, the paired participants were split up into two different rooms, played and won an online game together as a team. We asked one participant (randomly assigned to be the agent) to choose between two bonus payments for the other participant (assigned to be the recipient): either a \$4 Amazon e-gift card redeemable right away or a \$5 Amazon e-gift card redeemable in ten days,

both of which would be delivered via email immediately after the experiment. The recipients learned that they would receive the bonus payment and were asked which of the two options they preferred. Participants then rated their interpersonal closeness and mood and indicated their gender and age. The experimenter debriefed and paid them and then immediately emailed the recipient the bonus payment chosen by the agent.

Study 2C. We recruited pairs of friends to the behavioral lab of a large US Midwestern university and received 116 participants ($M_{\text{age}} = 19$, 53% female, $M_{\text{closeness}} = 6.3$). Because the participants were already friends, the RCIT was not used. Agents chose between a \$5 Starbucks gift card redeemable right away and a \$6 Starbucks gift card redeemable in two weeks, and the agent (instead of the experimenter) handed the gift card to the recipient at the end of the experiment.

Study 2D. We recruited students from two MBA class sessions at a large US Midwestern university for a 5-minute “Thanksgiving Survey” on paper during a class break and received 155 participants ($M_{\text{age}} = 29$, 39% female, 3 gender undisclosed, $M_{\text{closeness}} = 7.0$). We offered each student a small candy bar and a chance to receive a monetary bonus in return for participation. Participants first wrote down a specific friend to whom they would like to express gratitude and with whom they would meet up in the coming weeks (near Thanksgiving), and a short thank-you message to that friend. On the second page, participants were presented with two Starbucks gift cards (\$5 now or \$6 in two weeks). In the choice-for-self condition, participants were asked first to choose between the two options for themselves, and then to indicate what they would have chosen if they were choosing a gift for their listed friend instead. In the choice-for-other condition, participants were asked first to make a choice for the friend they had listed, and then to indicate what they would have chosen if the choice had been for themselves instead. In both conditions, it was made clear that the first and second choices were independent to each other. Participants then answered questions about their perceived closeness with the friend, perceived similarity between the friend and the participant, as well as participant’s mood, gender and age. Upon completing the survey, the participants in the choice-for-self condition received the gift card that they had chosen for themselves, whereas the participants in the choice-for-other condition received the gift card that they had chosen for the listed friend, with the instruction to give the gift card to the friend when they met up in the coming weeks.

Study 2E. We recruited participants from MTurk and received 420 valid responses ($M_{\text{age}} = 38$, 48% female). This study had a mixed design with 2 (recipient: choice for self vs. choice for other) within-subjects conditions and 2 (consumer goods: affect-rich vs. affect-poor) between-subjects conditions, with the order between recipients counterbalanced. Motivated by debates about whether time discounting is domain-specific, such that the discount factor is steeper for affect-rich goods than affect-poor goods (e.g., Odum and Rainaud 2003, Tsukayama and Duckworth 2010; see critiques in Holt et al. 2016; Sawicki, Markiewicz, & Bialek 2019; Urminsky & Kim 2021), we tested the generalizability of agent's impatience across consumer goods of different affective values. Participants were asked to read a scenario in which an online store rewarded its loyal customers (including the participant) with store credits as part of their customer loyalty program. Similar to Study 2D, each participant made two decisions in a counterbalanced order: choosing store credits for themselves and for a friend they had listed, based on the same scenario, yet independent of each other. The two options were “store credits of \$18 value redeemable immediately on the website” and “store credits of \$25 value redeemable in 4 weeks (when the website is updated to accept the code).” We also randomly assigned participants to either an affect-rich condition, in which the store credits could be redeemed for chocolate candies only, or an affect-poor conditions, in which the store credits could be redeemed for vitamin supplements only. We included a manipulation check for the affective value of the products, adapted from Rottenstreich and Hsee (2001).

Study 2F. We recruited participants from MTurk and received 383 valid responses ($M_{\text{age}} = 38$, 47% female). Participants were randomly assigned to either choice-for-self or choice-for-other conditions, and then made four different types of consumer choices, which have been theorized as involving explicit or implicit intertemporal tradeoffs (Khan, Dhar, and Wertenbroch 2005; Milkman, Rogers, and Bazerman 2008). Thus, the study had a mixed design with 2 (recipient: choice for self vs. choice for other) between-subjects conditions and 4 (choice type) repeated choice measures. The four choices were between financial rewards (\$50 cash vs. \$60 cash in two weeks), product purchases (standard headphones now vs. premium headphones when back in stock in a month), entertainment (a sit-com episode vs. an educational documentary), and food (a tempting dessert vs. a healthier salad).

Study 2G. We recruited participants from MTurk and received 208 valid responses ($M_{\text{age}} = 35$, 50% female). The study had a mixed design with 2 (recipient: choice for self vs. choice for other) between-subjects conditions and 9 (product domains) repeated measures. Each of the nine consumer choices had an explicit intertemporal tradeoff with both *SS* and *LL* options from the same product category (cash, e-gift cards, dinnerware, snacks, wallets, dinner reservations, concert tickets, iTunes songs, and ice cream vouchers; Table S3 in the web appendix). For example, for dinnerware, participants chose between “a set of 6 pieces of sturdy dinnerware shipped and delivered this week” (the *SS* option) and “a set of 10 pieces of sturdy dinnerware shipped and delivered next month” (the *LL* option); for concert tickets, participants chose between “a back-section ticket for a big concert this weekend” (the *SS* option) and “a middle-section ticket for a big concert in six months” (the *LL* option).

Results

Participants in the choice-for-other condition were more likely to choose the *SS* option than participants in the choice-for-self condition across all the studies, as shown in Figure 3 (Study 2A: 49.2% vs. 39.4%, $\chi^2(1, N = 403) = 3.93, p = .048, \eta = .10$; Study 2B: 61.4% vs. 34.1%, $\chi^2(1, N = 88) = 6.6, p = .018, \eta = .27$; Study 2C: 41.4% vs. 19.0%, $\chi^2(1, N = 116) = 6.9, p = .015, \eta = .24$; Study 2D: 50.6% vs. 27.6%, $\chi^2(1, N = 155) = 8.6, p = .003, \eta = .24$; Study 2E: 51.4% vs. 43.1%, GEE Wald $\chi^2(1, N = 840) = 14.44, p < .001$ correcting for repeated measures; Study 2F: 56.3% vs. 49.0%, GEE Wald $\chi^2(1, N = 1532) = 6.64, p = .010$; Study 2G: 55.7% vs. 41.8%, GEE Wald $\chi^2(1, N = 1872) = 13.51, p < .001$).

The results were robust to the numerous factors that were manipulated or measured. Agent’s impatience generalized to a variety of financial rewards (Studies 2A, 2B, 2C, and 2D) and to consumer choices (Studies 2E, 2F and 2G), including consequential choices (Studies 2B, 2C and 2D), repeated choices (Studies 2F and 2G), and within-subjects tests (Studies 2E and 2D). Further, agent’s impatience was robust to a variety of contextual factors not predicted to matter in the model: We found no evidence that the difference in choices for self versus choices for a peer depended on

framing the financial rewards as remuneration vs. bonus (Study 2A, interaction $p = .892$), affective-richness of the rewards (Study 2E, interaction $p = .326$), or explicitness of the intertemporal tradeoff (Study 2F, interaction $p = .575$).

Moreover, in Studies 2D and 2E where participants made both choices for self and for other, we regressed choice for others on choice for self (choices coded as $SS = -1$ and $LL = 1$) and found that the intercept was significant and negative (Study 2D: $b = -1.28$, Wald = 25.2, $p < .001$; Study 2E: $b = -.50$, Wald = 14.7, $p < .001$), verifying the agent's impatience effect while controlling for own preferences. Furthermore, in the same regressions, choice for self positively predicted choice for others (Study 2D: $b = 1.22$, Wald = 22.7, $p < .001$; Study 2E: $b = 1.43$, Wald = 121.9, $p < .001$), consistent with our model assumption that vicarious utility involves egocentric projection of one's own intertemporal preferences onto the recipient.

Last, closeness of relationship to the recipient, mood, gender, and age did not consistently moderate the effect of decision recipient (self vs. other) on choice, and the effect persisted when we controlled for mood or other covariates.

Discussion

These seven replication studies revealed strong support for our hypothesis (H1) that people are more likely to make an “impatient” choice when choosing for a peer than when making an otherwise identical choice for themselves. Moreover, because choice of SS for a specified peer was not only higher than choice for oneself in all studies, but also significantly higher than 50% in Study 2B (as well as Studies 3B and 4 later; see Table 1), the agent's impatience effect cannot be explained by indifference between the options when making choices for others (which predicts choice shares to be generally closer to 50%-50% in choice-for-other conditions than in choice-for-self conditions).

STUDY 3A & 3B: WHEN INTERPERSONAL FEEDBACK IS DELAYED

Our model also predicts circumstances under which agent's impatience should be reduced or even eliminated. A key boundary condition is the timing of the interpersonal feedback, which we test

in two parallel studies. Both Studies 3A and 3B had 3 between-subjects conditions (choice for self vs. choice for other with an immediate reaction vs. choice for other with the reaction delayed). Given that the value of reaction utility will be lower when more delayed, agents' choices for another person are predicted in our model to be more patient and more similar to choices for themselves when the recipient reaction is delayed (H2). We pre-registered both Study 3A (<https://aspredicted.org/blind.php?x=4gs7xr>) and Study 3B (<http://aspredicted.org/blind.php?x=ky4ez2>).

Method

In Study 3A, we recruited 700 participants from MTurk and obtained 637 valid responses ($M_{\text{age}} = 39$, 48% female). Participants were asked to imagine that they have two friends, Alex and Blair, who also work on MTurk from time to time. In the scenario, both Alex and Blair are similar to the participant in many ways. The participant's friendships with Alex and Blair were equally close, and the participant meets up with both Alex and Blair equally often. Participants then read that, due to upcoming events that they had committed to, "You are going to meet up with Alex and hang out this evening. You won't be able to see Blair until after about a month." Therefore, the two recipients differ in the timing of the interpersonal feedback: feedback from Alex is presumably not delayed for either option (since Alex will still be around), whereas feedback from Blair for both the *SS* (received today) and *LL* (received in two weeks) will be delayed to the same future point of time (in at least a month).

Participants were randomly assigned into one of the three conditions. In the choice-for-self condition, participants were asked to imagine that they would be receiving a payment from one of their recent HITs and needed to choose between two options: \$5 today or \$6.50 in two weeks. In both choice-for-other conditions, participants read that their friend [Alex/Blair] had asked the participant to take care of their MTurk account for one day since they did not have access to internet that day. Participants logged into [Alex/Blair]'s account and found that they had to make a choice between two payment options, identical to that in the choice-for-self condition. Thus, in the immediate reaction version, participants were asked to make a choice for Alex, and in the delayed reaction version,

participants were asked to make a choice for Blair. After participants indicated their choice, they completed a generic IMC and indicated their gender and age.

In Study 3B, we recruited 650 MTurkers and obtained 605 valid completes ($M_{\text{age}} = 37$, 48% female). The procedure was similar to that of Study 3A, except that the scenario and intertemporal choice involved choosing between Starbucks reward points instead of work payment. We asked participants to imagine that they often visited Starbucks and used a Starbucks rewards phone application, which awards stars as reward points for purchases. Participants read that they had just received a message via their Starbucks app and were asked to make a choice (for themselves, Alex, or Blair) between “receive 100 stars (US\$10) today” and “receive 125 stars (US\$12.50) in three weeks.” Every ten stars are worth US\$1, and customers can apply these stars to any in-store purchases with no expiration date.

Results

In Study 3A, participants' choices differed significantly across the three conditions ($\chi^2(1, N = 637) = 7.56, p = .023$). Participants who were asked to choose for Alex (whose affective feedback would occur sooner) were more likely to choose the *SS* option (43.0%) than participants who were asked to choose either for Blair (whose affective feedback would be delayed; 31.0%), or than participants who were asked to choose for themselves (33.5%; Figure 4).

We dummy-coded recipient (choosing for self = 0, for other = 1) and reaction delay (immediate: choosing for self or for Alex = 0, delayed: for Blair = 1). Using these predictor variables, a binary logistic regression predicting choice of *SS* ($SS = 1, LL = 0$) revealed that participants who chose for another person with immediate interpersonal feedback were more likely to choose *SS* than participants who chose for themselves ($b = .40$, Wald = 4.01, $p = .045$), and participants who chose for another person with delayed feedback scenario were less likely to choose *SS* than those choosing for another person with immediate feedback ($b = -.52$, Wald = 6.65, $p = .010$).

In Study 3B, participants' choices likewise differed significantly across the three conditions ($\chi^2(1, N = 605) = 48.35, p < .001$). Participants who were asked to choose for Alex (whose affective

feedback would occur immediately) were more likely to choose the *SS* option (67.5%) than participants who were asked to choose for Blair (whose affective feedback would be delayed; 33.8%), or participants who were asked to choose for themselves (45.3%; Figure 4; see additional discussion in Appendix IV). Using the same dummy coding as Study 3A, a binary logistic regression revealed that participants who chose for another person with immediate feedback were more likely to choose *SS* than participants who chose for themselves ($b = .92$, Wald = 19.7, $p < .001$), and participants who chose for another person with delayed feedback were less likely to choose *SS* than those choosing for another person with immediate feedback ($b_{\text{delay}} = -1.40$, Wald = 44.88, $p < .001$).

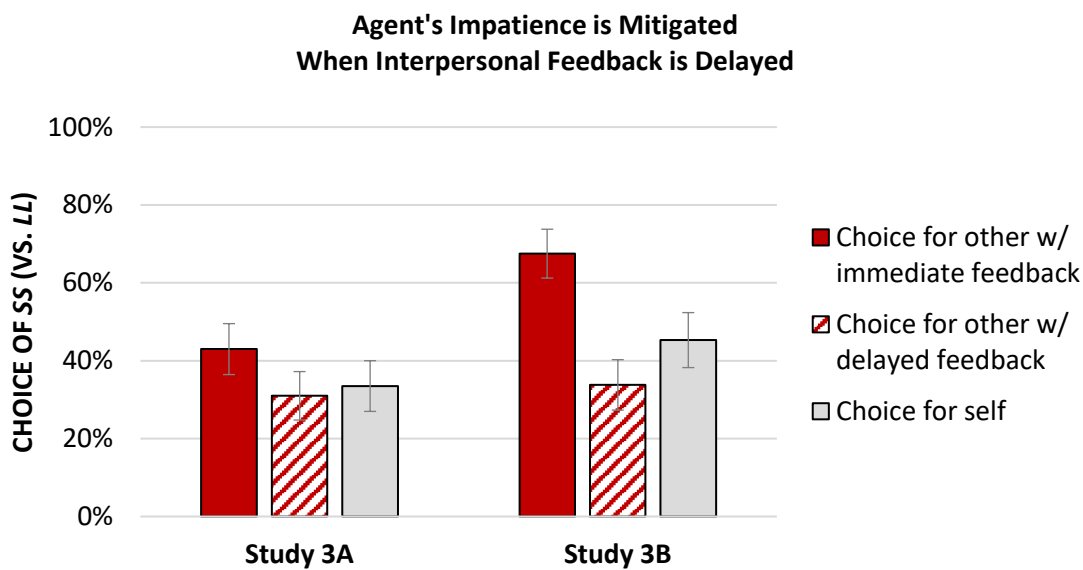


Figure 4. Summary of results in Studies 3A and 3B. Error bars represent 95% confidence intervals.

Discussion

Study 3A supported our prediction, per H2, that agent's impatience occurs only when the agent anticipates immediate interpersonal feedback, and not when the agent anticipates delayed interpersonal feedback. These findings were fully replicated in study 3B.

STUDY 4: THE ROLE OF RECIPIENT SPECIFICITY

Another critical proposed moderator (H3) of the agent's impatience effect is recipient specificity—whether the agent was choosing for a specified or generic other person. We test this

moderator in Study 4 using a mixed design, with 2 (decision recipient: for self vs. for other) within-subjects repeated measures and 2 (recipient specificity: specified vs. unspecified) between-subjects conditions. When the decision recipient was specified, the model predicts that participants who chose for another will be more impatient than participants who chose for themselves, because the specificity of the decision recipient facilitates the vivid mental simulation of interpersonal affective reactions, which increases the relative impact of reaction utility. When the recipient was unspecified, we expect that participants who chose for another will be less likely to visualize an affective reaction, which renders their decision for the other person more similar to their choice for self because the choice for other would be based relatively more on vicarious utility.

Another purpose of this study was to directly test the relative impact of expected vicarious utility and expected reaction utility in the decision process of choosing for specified versus unspecified others. We asked participants to predict their recipient's evaluation of each option and to predict their recipient's reaction to each option. We then tested whether these differences mediated the difference between choices for a specified vs. unspecified other person. We pre-registered this study (<https://aspredicted.org/blind.php?x=jj7ia3>).

Method

We received 533 valid responses ($M_{\text{age}} = 37$, 49% female) from MTurk after applying the pre-registered screening procedure (Table S1, web appendix).

Participants were first instructed, "Think of a person that you do not know very well but frequently interact with (e.g., a barista at a local coffee shop) [and] briefly describe the person you are thinking about." We referred to the listed person as Person A in the subsequent scenario. Participants then read that many consumers, including Person A, filled out a large-scale online survey from Starbucks and were compensated with store credit. These consumers were given a choice between two options: receive \$28 in store credit today or receive \$35 in store credit in three weeks. We randomly assigned participants to two conditions. In the specified-recipient condition, participants read, "Imagine that Person A took part in the survey and was given these two options. If you were asked to choose on behalf of Person A, which option would you choose for Person A?" In the

unspecified-recipient condition, participants read, “Imagine the average customer who took part in the survey and was given these two options. If you were asked to choose on behalf of the average customer, which option would you choose?”

After participants made a choice, they were asked to predict how the recipient would react to each option (“How do you think [the recipient] would react to receiving [option] (i.e., with facial and bodily expressions of emotion)?”) and how the recipient would evaluate each option (“How do you think [the recipient] would evaluate (i.e., objectively assess) the receipt of [option]?”, on two 9-point scales; -4 = very negatively, 4 = very positively). Next, in the choice for self, participants were asked, “Imagine instead that you took part in the survey and were given the two options of compensation. Which option would you choose for yourself?” Last, participants indicated the perceived closeness between themselves and the recipient on a 10-point scale (1 = not close at all, 10 = extremely close), completed a generic IMC, completed an additional attention check about the content of the study, and indicated their gender and age.

Results

Comparing the first choice made by each participant across conditions, those who chose for a specified other were more likely to choose *SS* (60.0% for person A) than participants who chose for an unspecified other (42.1% for the average customer; $\chi^2(1, N = 533) = 13.50, p < .001, \eta = .16$; $b_{\text{recipient_specificity}} = .64$, Wald = 13.38, $p < .001$). Participants’ choices for themselves did not differ significantly between specificity conditions (35.8% vs. 37.4%, $\chi^2(1, N = 533) = .15, p = .699$).

Next, comparing the within-subjects choices, participants were much more likely to choose *SS* for a specified other (60.0%) than to choose *SS* for themselves (35.8%; McNemar’s $\chi^2(1, N = 271) = 51.25, p < .001$). Participants also were somewhat more likely to choose *SS* for an unspecified other (42.1%) than to choose *SS* for themselves (37.4%; McNemar’s $\chi^2(1, N = 262) = 5.03, p = .025$), but the difference was smaller when the recipient was specified vs. unspecified ($\Delta = 24.2\%$ vs. 4.8%). Generalized estimation equations confirmed that the non-specific recipient significantly reduced the

agent's impatience effect (interaction between self vs. other and recipient specificity condition, Wald $\chi^2(1, N = 1066) = 20.71, p < .001$).

Next, we examined agents' anticipation of recipient reactions and recipient evaluations. First, recipient specificity influenced participants' anticipation of both recipient reactions and recipient evaluations: participants expected larger differences in recipient reactions to the two options when the decision recipient was a specified person than when the decision recipient was unspecified ($\Delta_{\text{reaction}} = 1.05$ vs. $.47$; $F(1, 531) = 12.64, p < .001$; Table S5, web appendix), with more positive reactions for the sooner option. Participants also expected larger differences between recipient evaluations of the two options when the decision recipient was a specified person than when the decision recipient was unspecified ($\Delta_{\text{evaluation}} = .82$ vs. $.29$; $F(1, 531) = 8.78, p = .003$). More importantly, the difference in anticipated recipient reactions to the options mediated the effect of recipient specificity on agent choices (indirect effect = $.24, SE = .09, CI_{95\%} = [.09, .44]$), even when controlling for the difference in anticipated evaluations (indirect effect = $.18, SE = .08, CI_{95\%} = [.05, .36]$).

We also conducted separate multivariate binary logistic regressions to examine the predicted impact of anticipated recipient reactions and recipient evaluation on choices, controlling for egocentric projection. Among participants who chose for a specified other person, the difference in anticipated reactions significantly predicted choice ($b_{\Delta\text{reaction}} = -.54, \text{Wald} = 15.13, p < .001$) whereas the difference in anticipated recipient evaluations only had a directional effect ($b_{\Delta\text{evaluation}} = -.17, \text{Wald} = 1.94, p = .164$). Among participants who chose for an unspecified other, however, the difference score of anticipated reactions was only borderline significant ($b_{\Delta\text{reaction}} = -.31, \text{Wald} = 3.89, p = .049$) while the difference score of anticipated recipient evaluations was significant ($b_{\Delta\text{evaluation}} = -.37, \text{Wald} = 6.34, p < .012$). In both regressions, choices for oneself also strongly predicted choices for others (for the specified other $b = 3.19, \text{Wald} = 45.18, p < .001$; for the unspecified other $b = 3.48, \text{Wald} = 68.49, p < .001$), consistent with the assumption that own impatience is projected. In sum, anticipated reactions significantly explained the other-oriented decision process, separately from the role of anticipated evaluations, particularly when the recipient was specified.

Last, as intended, interpersonal closeness with the decision recipient did not differ between the specified and unspecified other ($M_{\text{closeness}} = 4.07$ for the specified other, $SD = 2.29$ vs. $M_{\text{closeness}} =$

3.91 for the unspecified other, $SD = 2.66$, $t(514.3) = -.73$, $p = .463$). Closeness, gender, and age did not moderate the effect.

Discussion

We observed a large agent's impatience effect when the decision recipient was specified, and this effect was nearly eliminated when the recipient was unspecified. In other words, agents are more likely to make an "impatient" intertemporal decision for another person if they can imagine the decision recipient's affective reactions, compared to when choosing for a person for whom the interpersonal consequences are hard to imagine. These results support model predictions that recipient specificity is a critical moderator of the effect (H3).

This moderator also helps reconcile our findings with prior research, which had concluded that choices for another (unspecified) person were not as "impatient" as choices for oneself (Albrecht et al. 2010; Pronin, Olivola, and Kennedy 2008; Takahashi 2007; Ziegler and Tunney 2012). Our results in Study 4 suggest that recipient specificity largely reconciles the differences between our findings and prior results by modulating the extent to which the agent considers interpersonal consequences in their decision process. When the decision recipient is a specified, identifiable individual—as in our studies, and as is typically the case in real-world choices for others—choices for another person are more "impatient" than choices for oneself. By contrast, agent's impatience no longer holds when the recipient is an arbitrary, unspecified other person—as was the case in the prior research (see also General Discussion).

This study also provided additional process evidence that support the distinction between vicarious utility and reaction utility in our model. Reaction utility was the primary factor that gave rise to agent's impatience. Further complementing these results, we found that choice for oneself correlated more strongly with choice for unspecified other ($r = .70$, $p < .001$) than with choice for specified other ($r = .53$, $p < .001$), suggesting that egocentric projection was a relatively larger component in choice for the unspecified other than in choice for the specified other, consistent with our model assumptions.

It is notable that the predicted moderation occurred despite the use of a hypothetical scenario in this study. Obviously, in this setting, agents are not anticipating actual reaction utility from a post-decision interaction with the recipient. However, because specifying the recipient facilitates participants' simulation of a hypothetical anticipated affective reaction, the model predicts a stronger agent's impatience effect for the specified recipient, even in hypothetical choice. This feature of our model is consistent with findings in the charitable giving literature that donations increase when the funds would go to an identifiable victim even though no subsequent social interactions or reactions would ensue (Small & Loewenstein, 2003, 2005). Therefore, our model predicts similar results for real and hypothetical decisions as long as the recipient is a specified person whose affective reactions are vividly imaginable.

STUDIES 5A AND 5B: INDIVIDUAL DIFFERENCES IN IMAGERY USE VS. EMPATHY

Next, we examine the degree to which agent's impatience is moderated by individual differences. In addition to testing our proposed moderator (H4), reliance on mental imagery, in Study 5a, we also test the effects of individual differences in empathy in Study 5b. While our model yields a straightforward prediction regarding imagery reliance, because of its direct connection to reaction utility, the model does not make a clear prediction about whether empathy would moderate agent's impatience. This is because empathy is a multi-faceted construct (Davis 1983; Preston and de Waal 2002; Reniers et al. 2011) that arguably can influence both vicarious utility and reaction utility. For instance, if the agent has greater empathy for the recipient, then both her expected vicarious utility and expected reaction utility should increase, and how her choice for the recipient compares to her choice for herself will therefore depend on the relative increase between the two utility components. Because empathy has been posited to influence self-other decisions in general (Davis 1983), we explore its potential influence in the current context.

We test these two individual difference measures in otherwise identical but separate studies so that measurement of one factor that does not affect measurement of the other. Both studies had a within-subjects design of 2 (recipient: for oneself vs. for other) decisions, with individual differences

in imagery usage (Study 5A) and in empathy (Study 5B) measured at the end of the studies. We pre-registered both studies https://aspredicted.org/X1Q_SN8 and https://aspredicted.org/64C_Z2R.

Method

In Studies 5A and 5B, we received 407 and 404 valid responses ($M_{\text{age}} = 39.6$, 66% female, 8 non-binary; $M_{\text{age}} = 36.3$, 69% female, 8 non-binary) after applying the pre-registered screening procedure, respectively. The procedure in both studies was identical to the specific other condition in Study 4: participants were asked to imagine an acquaintance, indicated a decision they would make for the acquaintance, and then indicated a decision they would make for themselves under the same circumstances.

After that, participants completed additional measures. In Study 5A, we included three measures. First, participants were asked to indicate how vivid the mental imagery of the recipient was in their mind, a 5-point scale adapted from the Vividness of Visual Imagery Questionnaire (Marks 1973), where a lower number indicates greater vividness (1= “Perfectly clear and as vivid as normal vision” and 5 = “No image at all, you only “know” that you are thinking of the object”). Second, participants completed a spontaneous usage of imagery scale (SUIS; Nelis et al. 2019), which measures spontaneous engagement in visual processing during decision making, where a higher score indicates greater reliance on visual processing. Last, participants completed the style of processing questionnaire (Childers et al. 1985), which measures a general tendency to engage in visual vs. verbal processing of information. In Study 5B, participants were asked to complete the full empathy scale from Reniers et al. (2011), which included five subscales capturing different aspects of empathy, including perspective taking and emotion contagion.

Results

In Study 5A, participants were again more likely to choose *SS* when choosing for another person (45.5%) than when choosing for self (33.4%; McNemar’s $\chi^2 (1, N = 407) = 27.76, p < .001$).

Participants chose more impatiently for others (but not for themselves) the more they reported vividly imagining the recipient. Participants who chose *SS* for the specified other person reported

more vivid mental imagery (on the adapted VVIQ measure) than participants who chose *LL* for that person ($M_{SS} = 2.37$, $SD = 1.01$, vs. $M_{LL} = 2.61$, $SD = 1.01$, $t(405) = 2.34$, $p = .020$). In contrast, participants who chose *SS* versus *LL* for themselves reported similarly vivid mental imagery, $t > -1$, $p = .594$. A significant interaction between decision recipient (other vs. self) and imagery vividness confirmed these differences ($F(1, 405) = 4.36$, $p = .037$).

We then explored whether the individual differences in visual processing tendencies likewise moderated agent's impatience. We found that participants with a higher tendency to engage in spontaneous use of imagery (measured by the SUIS score) were more impatient in their choice for the specified other person but not for themselves ($F(1, 405) = 14.73$, $p < .001$; GEE $b_{\text{interaction}} = .19$, Wald = 13.33, $p < .001$; Figure 5). Indeed, the SUIS score negatively correlated with low mental imagery vividness ($r = -.240$, $p < .001$), validating the relevance of the general trait for engaging in visual processing specifically in the decision process.

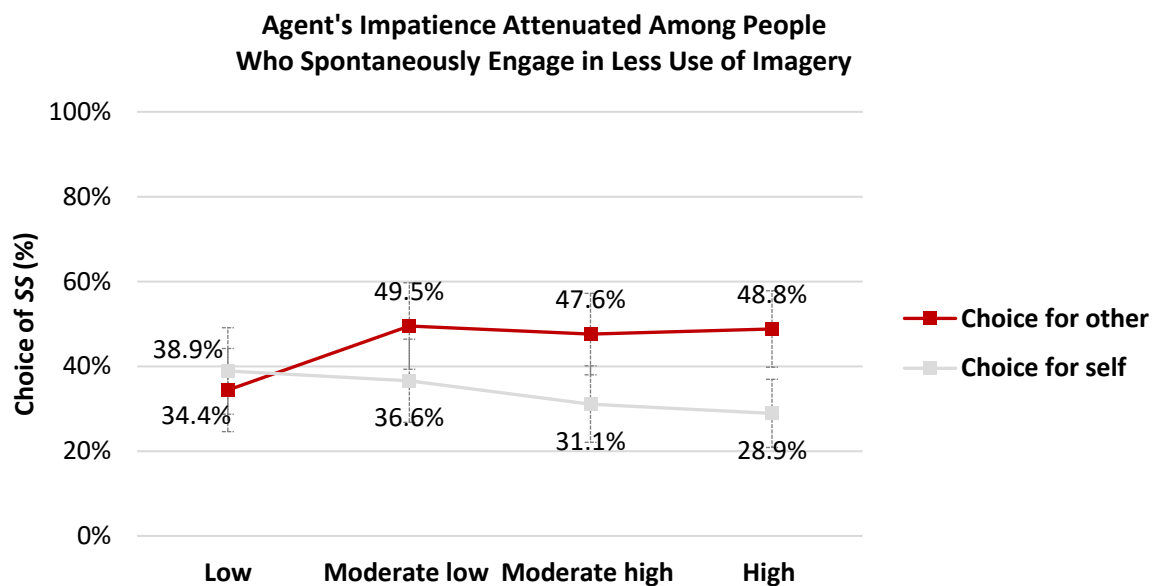


Figure 5. The x -axis represents four levels of spontaneous imagery use (SUIS); low = first quartile (< 37), moderate low = between first and second quartiles (37 - 42), moderate high = between second and third quartiles (42, 46), high = fourth quartile (≥ 46).

By contrast, we found that the more general visual vs. verbal style of processing scale did not moderate the effect ($p = .74$) and was not correlated with self-reported imagery vividness ($r = .035$, $p = .48$). Overall, our results based on two of the three included measures suggest that spontaneously

engaging in more visualization during the decision process predicts greater impatience in choosing for others. This is consistent with the model prediction, under the assumption that greater visualization increases expected reaction utility.

In Study 5B, as in Study 5A, participants were again more likely to choose *SS* when choosing for another person (41.1%) than when choosing for self (31.9%; McNemar's $\chi^2(1, N = 404) = 17.28$, $p < .001$). However, neither the overall QCAE empathy scale nor any of its subscales moderated the within-subjects agent's impatience effect ($ps > .34$).

Discussion

The agent's impatience effect was stronger among participants who tend to rely spontaneously on visual processing in Study 5A. These results support H4 and are consistent with our theorization that agent's impatience arises primarily from the steeper discounting of reaction utility tied to interpersonal affective reactions. In contrast, participants' trait empathy did not moderate the effect, either in Study 5B or in another three studies (using different empathy measures, see section III in the web appendix). These results point specifically to use of imagery as important for the impact of reaction utility, as opposed to the more general construct of empathy.

GENERAL DISCUSSION

We develop a general model of intertemporal choice for both oneself and for others. We then present the first set of experiments that systematically test differences between intertemporal choices for another person and choices for oneself. Consistent with our model, these experiments revealed that intertemporal choices for a specified peer recipient are typically more "impatient" than otherwise identical choices for oneself, different than previously theorized or reported. Additional experiments identify boundary conditions that are consistent with the predictions of the self-other decision model, incorporating interpersonal feedback into the intertemporal tradeoff.

This research joins a growing body of research on self-other decision-making and highlights the pivotal yet previously overlooked role of interpersonal feedback in shaping other-oriented

decisions. While the extant literature on intertemporal choice has examined various psychological mechanisms that contribute to “impatience” in individual decision-making (Soman et al. 2005; Read, Olivola, and Hardisty 2017; Hardisty and Pfeffer 2017), the present research shows that “impatience” in interpersonal decision-making can come from a distinct source—the rewarding value of interpersonal feedback. Our results suggest that the role of this largely overlooked source of utility should also be investigated in other types of self-other decision making.

Limitations, model extensions, and future directions

Domain-specific discounting. In our model, the critical assumption for our hypotheses is the monotone ratio property (MRP) between vicarious and reaction utility functions. This basic assumption is theoretically parsimonious and congruent with the common view that future outcomes are first construed atemporally (e.g., as mental imagery) before adjusting subjective value for the delay (Friedman 1993; Gilbert, Gill, and Wilson 2002). It should be noted that an alternative assumption about domain-specific discounting could also generate similar hypotheses. That is, if the discount rate varies across different utility sources and is larger for reaction utility than for vicarious utility, then we can also derive (with a few additional assumptions) that choice for others will be more “impatient” than otherwise identical choice for oneself. Given that MRP is a sufficient condition for our hypotheses, we do not need to adopt this additional assumption about domain-specific discounting, which has been a topic of disagreement in the literature (Sawicki, Markiewicz, and Białek 2019; Killeen 2009).

Explicit preference differences and prediction errors. In this research, we focused on intertemporal choices between peers whose preferences are presumably similar to one another. Accordingly, in our baseline model, the calibration of beliefs about others’ preference is based primarily on the accuracy of egocentric projection for a given decision. Admittedly, this is a simplification of interpersonal decisions. Our model can be extended to cases in which preference calibration is also influenced by the agent’s beliefs about how the recipient’s preferences differ from one’s own. Sometimes an agent could know a specific recipient well enough to have accurate direct knowledge about how the recipient’s specific preferences differ from her own. Alternatively, as proposed by Pronin et al. (2008), the agent may perceive others’ affective experiences in general to be

less intense than her own, and therefore believe that others will have more “patience” in intertemporal tradeoffs. If people have such prediction errors, the value of expected vicarious utility will be shifted in favor of the *LL* option, presumably without influencing the reaction utility component. While such cases are beyond the scope of the current research, we discuss model extensions in section IV in the web appendix that can accommodate such beliefs. Future research could test the predictions of this extended model in contexts where such beliefs are likely to occur.

Learning in repeated interactions. In our model, we focused our discussion of interpersonal feedback on its affectively rewarding component. However, interpersonal feedback can also provide informational feedback about the success of the agent’s preference calibration, or the fit between the recipient’s true preference and the agent’s selection. An interesting extension of the model would then involve repeated choices, in which such feedback on the fit in turn influences how the agent constructs the expected vicarious utility from each option in subsequent decisions. Furthermore, interpersonal feedback may also be more dynamic than assumed here, involving one or more potential interactions at different times (i.e., potentially including notification prior to receipt, time of receipt, one or more consumption occasions and post-consumption recollection), with implications for agents’ choices. . Future research may consider exploring the implications of such dynamic interactions.

Theoretical and practical implications

It has been often presumed or implied that the interpersonal delegation of intertemporal choices leads to more “far-sighted” decision outcomes. The present findings suggest that interpersonal decision-making may yield decisions that are more *short*-sighted, as long as interpersonal feedback is anticipated. These findings have implications for both consumers and marketers. Consumers should take this finding into account when delegating decisions to their peers, particularly when seeking choice outcomes that are better aligned with their long-term welfare. Marketers may use this insight to better promote products and services that involve interpersonal consequences, such as gift marketing and referral programs, by highlighting options that are likely to induce immediate interpersonal reactions.

Beyond decisions between peers, many other types of interpersonal decisions involve goals that introduce additional, potentially competing, considerations in the decision process, distinct from

those that we focused on in this research. For example, parents making decisions for their children not only anticipate their children's immediate affective feedback, but also expect their decisions to shape character and deliver substantial benefits in other regards. When doctors give medical advice or decisions to their patients, these decisions bear a host of physical, emotional, and legal consequences. When people donate to others that they do not know nor will ever meet, the agent is anonymous and will not receive concrete interpersonal feedback such that these decisions are likely guided primarily by vicarious utility besides other considerations (e.g., image motives, moral obligations), unless specific interventions are used to promote imagined reaction utility. In these decisions, while we expect the influence of interpersonal affective component to hold to varying degrees, we also conjecture that its influence can be overridden by other considerations, many of which tilt the overall intertemporal tradeoff toward beneficial future consequences (i.e., favoring larger-later options).

In everyday life, we are constantly interacting with others, making decisions that affect them, and experiencing how they react to our actions, immediately and in the future. There is a growing consensus that decisions for others involve potentially gratifying social outcomes that give rise to complex intertemporal tradeoffs (Charlton et al., 2013; Galak et al., 2016; Yang and Urminsky 2018), and the attainment of the social outcomes further shape subsequent choices (Liu, Dallas, and Fitzsimons 2019; Wang, Krumhuber, and Gratch 2018; Yang and Urminsky 2018). To truly understand self-other decision making, a comprehensive framework must incorporate not only intrapersonal processes of projection, estimation, and vicarious experience, but also the role of interpersonal feedback. By taking both into account, our model suggests that intertemporal choice for others is not only a matter of trying to guess what others want, but also the desire for immediate gratification from our social partners.

References

- Argyle, Michael, Veronica Salter, Hilary Nicholson, Marilyn Williams, and Philip Burgess. 1970. "The Communication of Inferior and Superior Attitudes by Verbal and Non-Verbal Signals*." *British Journal of Social and Clinical Psychology* 9 (3): 222–31. <https://doi.org/10.1111/j.2044-8260.1970.tb00668.x>.
- Bartels, Daniel M., and Oleg Urminsky. 2015. "To Know and to Care: How Awareness and Valuation of the Future Jointly Shape Consumer Spending." *Journal of Consumer Research* 41 (6): 1469–85. <https://doi.org/10.1086/680670>.
- Bhanji, Jamil P., and Mauricio R. Delgado. 2014. "The Social Brain and Reward: Social Information Processing in the Human Striatum." *WIREs Cognitive Science* 5 (1): 61–73. <https://doi.org/10.1002/wcs.1266>.
- Burns, Kenton L., and Ernst G. Beier. 1973. "Significance of Vocal and Visual Channels in the Decoding of Emotional Meaning." *Journal of Communication* 23 (1): 118–30. <https://doi.org/10.1111/j.1460-2466.1973.tb00936.x>.
- Calvo, Manuel, and Francisco Esteves. 2005. "Detection of Emotional Faces: Low Perceptual Threshold and Wide Attentional Span." *Visual Cognition* 12 (1): 13–27. <https://doi.org/10.1080/13506280444000094>.
- Craig, Kenneth D. 1968. "Physiological Arousal as a Function of Imagined, Vicarious, and Direct Stress Experiences." *Journal of Abnormal Psychology* 73: 513–20. <https://doi.org/10.1037/h0026531>.
- Davis, Mark H. 1983. "Measuring Individual Differences in Empathy: Evidence for a Multidimensional Approach." *Journal of Personality and Social Psychology* 44 (1): 113–26. <https://doi.org/10.1037/0022-3514.44.1.113>.
- Epley, Nicholas. 2008. "Solving the (Real) Other Minds Problem." *Social and Personality Psychology Compass* 2 (3): 1455–74. <https://doi.org/10.1111/j.1751-9004.2008.00115.x>.
- Epley, Nicholas, Boaz Keysar, Leaf Van Boven, and Thomas Gilovich. 2004. "Perspective Taking as Egocentric Anchoring and Adjustment." *Journal of Personality and Social Psychology* 87 (3): 327–39. <https://doi.org/10.1037/0022-3514.87.3.327>.

- Eyal, Tal, Mary Steffell, and Nicholas Epley. 2018. "Perspective Mistaking: Accurately Understanding the Mind of Another Requires Getting Perspective, Not Taking Perspective." *Journal of Personality and Social Psychology* 114 (4): 547–71. <https://doi.org/10.1037/pspa0000115>.
- Farah, Martha J. 2000. *The Cognitive Neuroscience of Vision*. The Cognitive Neuroscience of Vision. Malden: Blackwell Publishing.
- Fox, Elaine. 2002. "Processing Emotional Facial Expressions: The Role of Anxiety and Awareness." *Cognitive, Affective, & Behavioral Neuroscience* 2 (1): 52–63. <https://doi.org/10.3758/CABN.2.1.52>.
- Frederick, Shane, George Loewenstein, and Ted O'donoghue. 2002. "Time Discounting and Time Preference: A Critical Review." *Journal of Economic Literature* 40 (2): 351–401. <https://doi.org/10.1257/jel.40.2.351>.
- Frick, Andrea, Wenke Möhring, and Nora S. Newcombe. 2014. "Picturing Perspectives: Development of Perspective-Taking Abilities in 4- to 8-Year-Olds." *Frontiers in Psychology* 5. <https://www.frontiersin.org/articles/10.3389/fpsyg.2014.00386>.
- Friedman, William J. 1993. "Memory for the Time of Past Events." *Psychological Bulletin* 113: 44–66. <https://doi.org/10.1037/0033-2909.113.1.44>.
- Galak, Jeff, Julian Givi, and Eleanor F. Williams. 2016. "Why Certain Gifts Are Great to Give but Not to Get: A Framework for Understanding Errors in Gift Giving." *Current Directions in Psychological Science* 25 (6): 380–85. <https://doi.org/10.1177/0963721416656937>.
- Garcia-Rada, Ximena, Lalin Anik, and Dan Ariely. 2019. "Consuming Together (versus Separately) Makes the Heart Grow Fonder." *Marketing Letters* 30 (1): 27–43. <https://doi.org/10.1007/s11002-019-09479-7>.
- Gilbert, Daniel T., Michael J. Gill, and Timothy D. Wilson. 2002. "The Future Is Now: Temporal Correction in Affective Forecasting." *Organizational Behavior and Human Decision Processes* 88 (1): 430–44. <https://doi.org/10.1006/obhd.2001.2982>.
- Grossmann, Tobias. 2010. "The Development of Emotion Perception in Face and Voice during Infancy." *Restorative Neurology and Neuroscience* 28 (2): 219–36. <https://doi.org/10.3233/RNN-2010-0499>.

- Hardisty, David J., and Jeffrey Pfeffer. 2017. "Intertemporal Uncertainty Avoidance: When the Future Is Uncertain, People Prefer the Present, and When the Present Is Uncertain, People Prefer the Future." *Management Science* 63 (2): 519–27. <https://doi.org/10.1287/mnsc.2015.2349>.
- Hardisty, David J., and Elke U. Weber. 2020. "Impatience and Savoring vs. Dread: Asymmetries in Anticipation Explain Consumer Time Preferences for Positive vs. Negative Events." *Journal of Consumer Psychology* 30 (4): 598–613. <https://doi.org/10.1002/jcpy.1169>.
- Hasselmo, Michael E., Edmund T. Rolls, and Gordon C. Baylis. 1989. "The Role of Expression and Identity in the Face-Selective Responses of Neurons in the Temporal Visual Cortex of the Monkey." *Behavioural Brain Research* 32 (3): 203–18. [https://doi.org/10.1016/S0166-4328\(89\)80054-3](https://doi.org/10.1016/S0166-4328(89)80054-3).
- Hsee, Christopher K., and Yuval Rottenstreich. 2004. "Music, Pandas, and Muggers: On the Affective Psychology of Value." *Journal of Experimental Psychology: General* 133 (1): 23–30. <https://doi.org/10.1037/0096-3445.133.1.23>.
- Hsee, Christopher K., Yuval Rottenstreich, and Zhixing Xiao. 2005. "When Is More Better?: On the Relationship Between Magnitude and Subjective Value." *Current Directions in Psychological Science* 14 (5): 234–37. <https://doi.org/10.1111/j.0963-7214.2005.00371.x>.
- Hsee, Christopher K., and Elke U. Weber. 1997. "A Fundamental Prediction Error: Self–Others Discrepancies in Risk Preference." *Journal of Experimental Psychology: General* 126 (1): 45–53. <https://doi.org/10.1037/0096-3445.126.1.45>.
- Hsee, Christopher K., Yang Yang, Naihe Li, and Luxi Shen. 2009. "Wealth, Warmth, and Well-Being: Whether Happiness Is Relative or Absolute Depends on Whether It Is about Money, Acquisition, or Consumption." *Journal of Marketing Research* 46 (3): 396–409. <https://doi.org/10.1509/jmkr.46.3.396>.
- Hsee, Christopher K., and Jiao Zhang. 2010. "General Evaluability Theory." *Perspectives on Psychological Science* 5 (4): 343–55. <https://doi.org/10.1177/1745691610374586>.
- Jones, Bryan, and Howard Rachlin. 2006. "Social Discounting." *Psychological Science* 17 (4): 283–86. <https://doi.org/10.1111/j.1467-9280.2006.01699.x>.

- Killeen, Peter R. 2009. "An Additive-Utility Model of Delay Discounting." *Psychological Review* 116: 602–19. <https://doi.org/10.1037/a0016414>.
- Knapp, Mark, and Judith Hall. 2013. "Nonverbal Communication in Human Interaction 8th Edition Knapp Test Bank," 27.
- Kogut, Tehila, and Ilana Ritov. 2005. "The 'Identified Victim' Effect: An Identified Group, or Just a Single Individual?" *Journal of Behavioral Decision Making* 18 (3): 157–67. <https://doi.org/10.1002/bdm.492>.
- . 2015. "Target Dependent Ethics: Discrepancies between Ethical Decisions toward Specific and General Targets." *Current Opinion in Psychology* 6 (December): 145–49. <https://doi.org/10.1016/j.copsyc.2015.08.005>.
- Laibson, D. 1997. "Golden Eggs and Hyperbolic Discounting." *The Quarterly Journal of Economics* 112 (2): 443–78. <https://doi.org/10.1162/003355397555253>.
- Lerner, Jennifer S., and Philip E. Tetlock. 2003. "Bridging Individual, Interpersonal, and Institutional Approaches to Judgment and Decision Making: The Impact of Accountability on Cognitive Bias." In *Emerging Perspectives on Judgment and Decision Research*, edited by Sandra L. Schneider and James Shanteau, 1st ed., 431–57. Cambridge University Press. <https://doi.org/10.1017/CBO9780511609978.015>.
- Liu, Peggy J, Steven K Dallas, and Gavan J Fitzsimons. 2019. "A Framework for Understanding Consumer Choices for Others." Edited by Linda L Price and Rebecca Walker Reczek. *Journal of Consumer Research* 46 (3): 407–34. <https://doi.org/10.1093/jcr/ucz009>.
- Lockwood, Patricia L. 2016. "The Anatomy of Empathy: Vicarious Experience and Disorders of Social Cognition." *Behavioural Brain Research* 311 (September): 255–66. <https://doi.org/10.1016/j.bbr.2016.05.048>.
- Loewenstein, G., and D. Prelec. 1992. "Anomalies in Intertemporal Choice: Evidence and an Interpretation." *The Quarterly Journal of Economics* 107 (2): 573–97. <https://doi.org/10.2307/2118482>.

- Malkoc, Selin A., and Gal Zauberman. 2006. "Deferring versus Expediting Consumption: The Effect of Outcome Concreteness on Sensitivity to Time Horizon." *Journal of Marketing Research* 43 (4): 618–27. <https://doi.org/10.1509/jmkr.43.4.618>.
- Marks, David F. 1973. "VISUAL IMAGERY DIFFERENCES IN THE RECALL OF PICTURES." *British Journal of Psychology* 64 (1): 17–24. <https://doi.org/10.1111/j.2044-8295.1973.tb01322.x>.
- Mazur, James. 1987. *The Effect of Delay and of Intervening Events on Reinforcement Value: Quantitative Analyses of Behavior, Volume V*. Psychology Press.
- . 2001. "Hyperbolic Value Addition and General Models of Animal Choice." *Psychological Review* 108 (1): 96–112. <https://doi.org/10.1037/0033-295X.108.1.96>.
- Metcalf, Janet, and Walter Mischel. 1999. "A Hot/Cool-System Analysis of Delay of Gratification: Dynamics of Willpower." *Psychological Review* 106 (1): 3–19. <https://doi.org/10.1037/0033-295X.106.1.3>.
- Mitchell, Rachel L. C., and Louise H. Phillips. 2015. "The Overlapping Relationship between Emotion Perception and Theory of Mind." *Neuropsychologia* 70 (April): 1–10. <https://doi.org/10.1016/j.neuropsychologia.2015.02.018>.
- Mobbs, Dean, Rongjun Yu, Marcel Meyer, Luca Passamonti, Ben Seymour, Andrew J. Calder, Susanne Schweizer, Chris D. Frith, and Tim Dalgleish. 2009. "A Key Role for Similarity in Vicarious Reward." *Science* 324 (5929): 900–900. <https://doi.org/10.1126/science.1170539>.
- Molouki, Sarah, David J. Hardisty, and Eugene M. Caruso. 2019. "The Sign Effect in Past and Future Discounting." *Psychological Science* 30 (12): 1674–95. <https://doi.org/10.1177/0956797619876982>.
- Moulton, Samuel T., and Stephen M. Kosslyn. 2009. "Imagining Predictions: Mental Imagery as Mental Emulation." *Philosophical Transactions of the Royal Society B: Biological Sciences* 364 (1521): 1273–80. <https://doi.org/10.1098/rstb.2008.0314>.
- Nelis, Sabine, Emily A. Holmes, James W. Griffith, and Filip Raes. 2014. "Mental Imagery during Daily Life: Psychometric Evaluation of the Spontaneous Use of Imagery Scale (SUIS)." *Psychologica Belgica* 54 (1): 19–32. <https://doi.org/10.5334/pb.ag>.

- Nikitin, Jana, and Alexandra M. Freund. 2019. "The Motivational Power of the Happy Face." *Brain Sciences* 9 (1): 6. <https://doi.org/10.3390/brainsci9010006>.
- Patterson, Karalyn, Peter J. Nestor, and Timothy T. Rogers. 2007. "Where Do You Know What You Know? The Representation of Semantic Knowledge in the Human Brain." *Nature Reviews Neuroscience* 8 (12): 976–87. <https://doi.org/10.1038/nrn2277>.
- Pham, Michel Tuan, Ali Faraji-Rad, Olivier Toubia, and Leonard Lee. 2015. "Affect as an Ordinal System of Utility Assessment." *Organizational Behavior and Human Decision Processes* 131 (November): 81–94. <https://doi.org/10.1016/j.obhdp.2015.08.003>.
- Preston, Stephanie D., and Frans B. M. de Waal. 2002. "Empathy: Its Ultimate and Proximate Bases." *Behavioral and Brain Sciences* 25 (1): 1–20. <https://doi.org/10.1017/S0140525X02000018>.
- Pronin, Emily, Christopher Y. Olivola, and Kathleen A. Kennedy. 2008. "Doing Unto Future Selves As You Would Do Unto Others: Psychological Distance and Decision Making." *Personality and Social Psychology Bulletin* 34 (2): 224–36. <https://doi.org/10.1177/0146167207310023>.
- Read, Daniel, Rebecca McDonald, and Lisheng He. 2018. "Intertemporal Choice: Choosing for the Future."
- Read, Daniel, Christopher Y. Olivola, and David J. Hardisty. 2017. "The Value of Nothing: Asymmetric Attention to Opportunity Costs Drives Intertemporal Decision Making." *Management Science* 63 (12): 4277–97. <https://doi.org/10.1287/mnsc.2016.2547>.
- Reniers, Renate L. E. P., Rhiannon Corcoran, Richard Drake, Nick M. Shryane, and Birgit A. Völlm. 2011. "The QCAE: A Questionnaire of Cognitive and Affective Empathy." *Journal of Personality Assessment* 93 (1): 84–95. <https://doi.org/10.1080/00223891.2010.528484>.
- Samuelson, Paul A. 1937. "A Note on Measurement of Utility." *The Review of Economic Studies* 4 (2): 155. <https://doi.org/10.2307/2967612>.
- Sawicki, Przemysław, Łukasz Markiewicz, and Michał Białek. 2019. "Magnitude Effect Contributes to the Domain Specificity in Delay Discounting." *Journal of Behavioral Decision Making*, December, bdm.2159. <https://doi.org/10.1002/bdm.2159>.
- Schley, Dan R, Bart de Langhe, and Andrew R Long. 2020. "System 1 Is Not Scope Insensitive: A New, Dual-Process Account of Subjective Value." Edited by Vicki G Morwitz, Amna

- Kirmani, and Chris Janiszewski. *Journal of Consumer Research* 47 (4): 566–87.
<https://doi.org/10.1093/jcr/ucaa015>.
- Scholten, Marc, and Daniel Read. 2010. “The Psychology of Intertemporal Tradeoffs.” *Psychological Review* 117 (3): 925–44. <https://doi.org/10.1037/a0019619>.
- Schultz, Wolfram. 2006. “Behavioral Theories and the Neurophysiology of Reward.” *Annual Review of Psychology* 57 (1): 87–115. <https://doi.org/10.1146/annurev.psych.56.091103.070229>.
- Small, Deborah A., and George Loewenstein. 2003. “Helping a Victim or Helping the Victim: Altruism and Identifiability.” *Journal of Risk and Uncertainty* 26 (1): 5–16.
<https://doi.org/10.1023/A:1022299422219>.
- Soman, Dilip, George Ainslie, Shane Frederick, Xiuping Li, John Lynch, Page Moreau, Andrew Mitchell, et al. 2005. “The Psychology of Intertemporal Discounting: Why Are Distant Events Valued Differently from Proximal Ones?” *Marketing Letters* 16 (3–4): 347–60.
<https://doi.org/10.1007/s11002-005-5897-x>.
- Stenberg, Georg, Susanne Wiking, and Mats Dahl. 1998. “Judging Words at Face Value: Interference in a Word Processing Task Reveals Automatic Processing of Affective Facial Expressions.” *Cognition and Emotion* 12 (6): 755–82. <https://doi.org/10.1080/026999398379420>.
- Toates, Frederick M. 1988. “Motivation and Emotion from a Biological Perspective.” In *Cognitive Perspectives on Emotion and Motivation*, edited by Vernon Hamilton, Gordon H. Bower, and Nico H. Frijda, 3–35. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-009-2792-6_1.
- Tronick, Edward Z. 1989. “Emotions and Emotional Communication in Infants.” *American Psychologist* 44 (2): 112–19. <https://doi.org/10.1037/0003-066X.44.2.112>.
- Trope, Y, N Liberman, and C Wakslak. 2007. “Construal Levels and Psychological Distance: Effects on Representation, Prediction, Evaluation, and Behavior.” *Journal of Consumer Psychology* 17 (2): 83–95. [https://doi.org/10.1016/S1057-7408\(07\)70013-X](https://doi.org/10.1016/S1057-7408(07)70013-X).
- Tsukiura, Takashi, and Roberto Cabeza. 2008. “Orbitofrontal and Hippocampal Contributions to Memory for Face–Name Associations: The Rewarding Power of a Smile.” *Neuropsychologia* 46 (9): 2310–19. <https://doi.org/10.1016/j.neuropsychologia.2008.03.013>.

- Urminsky, Oleg, and Gal Zauberman. 2015. "The Psychology of Intertemporal Preferences." In *The Wiley Blackwell Handbook of Judgment and Decision Making*, edited by Gideon Keren and George Wu, 141–81. Chichester, UK: John Wiley & Sons, Ltd.
<https://doi.org/10.1002/9781118468333.ch5>.
- Van der Graaff, Jolien, Susan Branje, Minet De Wied, Skyler Hawk, Pol Van Lier, and Wim Meeus. 2014. "Perspective Taking and Empathic Concern in Adolescence: Gender Differences in Developmental Changes." *Developmental Psychology* 50: 881–88.
<https://doi.org/10.1037/a0034325>.
- Wagenaar, Willem A., Gideon Keren, and Sarah Lichtenstein. 1988. "Islanders and Hostages: Deep and Surface Structures of Decision Problems." *Acta Psychologica* 67 (2): 175–89.
[https://doi.org/10.1016/0001-6918\(88\)90012-1](https://doi.org/10.1016/0001-6918(88)90012-1).
- Walker, Michael B., and Antonietta Trimboli. 1989. "Communicating Affect: The Role of Verbal and Nonverbal Content." *Journal of Language and Social Psychology* 8 (3–4): 229–48.
<https://doi.org/10.1177/0261927X8983005>.
- Wang, Xijing, Eva G. Krumhuber, and Jonathan Gratch. 2018. "The Interpersonal Effects of Emotions in Money versus Candy Games." *Journal of Experimental Social Psychology* 79 (November): 315–27. <https://doi.org/10.1016/j.jesp.2018.08.014>.
- Yang, Adelle X., and Oleg Urminsky. 2018. "The Smile-Seeking Hypothesis: How Immediate Affective Reactions Motivate and Reward Gift Giving." *Psychological Science* 29 (8): 1221–33. <https://doi.org/10.1177/0956797618761373>.
- Young-Browne, Gail, Howard M. Rosenfeld, and Frances Degen Horowitz. 1977. "Infant Discrimination of Facial Expressions." *Child Development* 48 (2): 555–62.
<https://doi.org/10.2307/1128653>.
- Zauberman, Gal, B. Kyu Kim, Selin A. Malkoc, and James R. Bettman. 2009. "Discounting Time and Time Discounting: Subjective Time Perception and Intertemporal Preferences." *Journal of Marketing Research* 46 (4): 543–56. <https://doi.org/10.1509/jmkr.46.4.543>.

Appendix I

Example 1: Power Utility (Figure 1a)

Assume $v(x; z) = \frac{zx^\theta}{\theta}$ and $r(x; z) = \frac{zx^\gamma}{\gamma}$, $0 < \gamma < \theta < 1$. Observe that:

$$v'(x; z) = zx^{\theta-1}$$

$$r'(x; z) = zx^{\gamma-1}$$

Therefore, for $x > 0$ we have:

$$\begin{aligned} \frac{\partial}{\partial x} \left[\frac{r(x; z)}{v(x; z)} \right] &= \frac{r'(x; z)v(x; z) - v'(x; z)r(x; z)}{v(x; z)^2} \\ &= \frac{\theta^{-1}z^2x^{\gamma+\theta-1} - \gamma^{-1}z^2x^{\gamma+\theta-1}}{z^2x^{2\theta}} = (\theta^{-1} - \gamma^{-1})x^{\gamma+\theta-1} \end{aligned}$$

which is negative since $0 < \gamma < \theta$, and therefore the MRP is satisfied.

Example 2: Quasi-Linear Utility (Figure 1b)

Assume $v(x; z) = zx$ and $r(x; z) = z \ln(x + 1)$. Observe that:

$$v'(x; z) = z$$

$$r'(x; z) = \frac{z}{x + 1}$$

Therefore, for $x > 0$ we have:

$$\frac{\partial}{\partial x} \left[\frac{r(x; z)}{v(x; z)} \right] = \frac{r'(x; z)v(x; z) - v'(x; z)r(x; z)}{v(x; z)^2} = \frac{x - (x + 1)\ln(x + 1)}{x^2(x + 1)}$$

Now, if $x = 0$, then $(x + 1)\ln(x + 1) = 0$. Moreover, for $x > 0$:

$$\frac{\partial}{\partial x} [(x + 1)\ln(x + 1)] = 1 + \ln(x + 1) > 1$$

It follows that $x < (x + 1)\ln(x + 1)$ for $x > 0$, and therefore the MRP is satisfied.

Example 3: Step Function (Figure 1c)

Assume $r(x; z) = zc$ for $x > 0$, and $v(x; z)$ is an increasing concave function. Thus, for $x > 0$, we have $r'(x; z) = c$, $r''(x; z) = 0$, and hence $v''(x; z) < r''(x; z)$; i.e. $v(x; z)$ is more concave than $r(x; z)$. Moreover, the MRP is satisfied since for $x > 0$:

$$\frac{\partial}{\partial x} \left[\frac{r(x; z)}{v(x; z)} \right] = \frac{r'(x; z)v(x; z) - v'(x; z)r(x; z)}{v(x; z)^2} = -c \frac{v'(x; z)}{v(x; z)^2} < 0.$$

Appendix II

On the delay of interpersonal feedback

For $t_1 < T < t_2$, the reaction utility for *SS* is discounted to the present from a later time T instead of t_1 so the condition for the agent to choose *SS* for the recipient now becomes:

$$f(t_1)\alpha v(x_1; z) + f(T)r(x_1; z) > f(t_2)\alpha v(x_2; z) + f(t_2)r(x_2; z)$$

When the agent is indifferent between *SS* and *LL* when choosing for oneself, $f(t_1)v(x_1; z) = f(t_2)v(x_2; z)$. Thus, the above condition becomes:

$$\Delta = f(T)r(x_1; z) - f(t_2)r(x_2; z) > 0 \quad (4)$$

Because $f(t)$ is a monotonically decreasing function of t , it follows that the difference in (4) shrinks as T increases. Formally, we have:

$$\frac{\partial \Delta}{\partial T} < 0$$

It follows that the condition in (4) will be harder to satisfy than the baseline condition in (2). Thus, the agent will be increasingly indifferent between choosing *SS* and *LL* for the recipient as T increases.

Further, for long delays of interpersonal feedback that satisfy $T > t_2$, the condition for choosing *SS* is:

$$f(t_1)\alpha v(x_1; z) + f(T)r(x_1; z) > f(t_2)\alpha v(x_2; z) + f(T)r(x_2; z)$$

Now for an agent who is indifferent between the options for oneself, the threshold that the agent will choose *SS* over *LL* for the recipient is:

$$f(T)r(x_1; z) > f(T)r(x_2; z)$$

Since $f(T) > 0$, and r is an increasing function of x , this condition no longer holds.

In summary, the relative attractiveness of the *SS* option diminishes with the delay such that the agent's choice for others becomes increasingly similar to her choice for herself and eventually favors the *LL* option as the interpersonal feedback is delayed into the far future.

SUPPLEMENTARY WEB APPENDIX

I. Pre-registration and screening details

Table S1. Summary of screening procedure and results in all studies

Study	Recruited sample	Exclusions	Final sample	Pre-registration link
Study 1	Received 467 data entries from Prolific respondents (UK).	Per the pre-registered exclusion criteria (same for all pre-registered studies), we excluded 0 participants from duplicate IP addresses, 15 incomplete entries, 12 participants who failed a generic IMC, and 23 participants who failed an additional attention check about the content of the survey.	440	https://aspredicted.org/blind.php?x=re5ur7
Study 2A	Received 479 data entries on MTurk.	14 data entries for duplicate IP addresses, 27 incomplete entries, 12 participants who failed a generic IMC, and 23 participants who failed an additional attention check about the content of the survey.	403	https://aspredicted.org/blind.php?x=fv4un6
Study 2B	Received 88 lab participants.	N/A	88	N/A
Study 2C	Received 116 lab participants.	N/A	116	N/A
Study 2D	Recruited 117 MBA students during class break.	2 participants did not complete the questionnaire	115	N/A
Study 2E	Received 530 data entries on MTurk.	41 data entries from duplicate IP addresses, 23 incomplete entries, 28 participants who failed a generic IMC, and 18 participants who failed an additional attention check about content of the survey.	420	https://aspredicted.org/blind.php?x=y4kc7v
Study 2F	Received 484 data entries on MTurk.	24 data entries from duplicate IP addresses, 30 incomplete entries, 14 participants who failed a generic IMC, and 35 participants who failed an additional attention check about the content of the survey.	383	https://aspredicted.org/blind.php?x=94ib9j
Study 2G	Received 230 data entries on MTurk.	8 data entries from duplicate IP addresses, 4 incomplete entries, and 10 participants who failed a generic IMC.	208	N/A
Study 3A	Received 794 data entries on MTurk.	95 data entries from duplicate IP addresses, 51 incomplete entries, and 10 participants who failed a generic IMC.	637	https://aspredicted.org/blind.php?x=4gs7xr
Study 3B	Received 739 data entries on MTurk.	84 data entries from duplicate IP addresses, 38 incomplete entries, and 12 participants who failed a generic IMC.	605	http://aspredicted.org/blind.php?x=ky4ez2
Study 4	Received 663 data entries on MTurk.	26 data entries from duplicate IP addresses and 54 incomplete entries, 16 participants who failed a generic IMC, and 34 participants who failed an additional attention check about the content of the survey.	533	https://aspredicted.org/blind.php?x=jj7ia3
Study 5A	Received 442 data entries on MTurk.	12 data entries from duplicate IP addresses, 18 incomplete entries, and 5 participants who failed a generic IMC.	407	https://aspredicted.org/X1Q_SN8
Study 5B	Received 435 data entries on MTurk.	8 data entries from duplicate IP addresses, 11 incomplete entries, and 2 participants who failed a generic IMC.	404	https://aspredicted.org/64C_Z2R

II. Additional materials and results

Pilot study additional results

Table S2. Curve estimates for the three utility functions.

Utility function	Equation	a	b_1	b_2	p -value
<i>Own consumption</i>	Linear	3.26	0.81		< .001
	Logarithmic	3.47	2.39		< .001
	Quadratic	1.81	1.89	-0.16	< .001
<i>Vicarious utility</i>	Linear	2.45	0.88		< .001
	Logarithmic	2.66	2.61		< .001
	Quadratic	0.76	2.15	-0.18	< .001
<i>Reaction utility</i>	Linear	4.10	0.57		< .001
	Logarithmic	4.25	1.68		< .001
	Quadratic	3.07	1.34	-0.11	< .001

Table S2 displays coefficient from three sets of curve estimation regression models: linear, logarithmic, and quadratic. The main differences identified in Figure 2 and the ANOVA analyses are confirmed by the regression coefficients: reaction utility has a “flatter” curvature away from zero (smaller b s) than both vicarious utility and own consumption utility; vicarious utility has similar curvature as own consumption utility but lower intercepts (smaller a s).

We can also use the data in the pilot study to verify the MRP holds. The MRP assumption requires $\frac{\partial}{\partial x} \left[\frac{r(x;z)}{v(x;z)} \right] = \frac{r'(x)v(x) - r(x)v'(x)}{v^2(x)} < 0$, which is equivalent to $\frac{r'(x)}{r(x)} < \frac{v'(x)}{v(x)}$. Take the first two values, $x = \$0.1$ and $x = \$1.1$. We can use them to estimate the values of $r(0.6)$, $r'(0.6)$, $v(0.6)$, and $v'(0.6)$.

$$r'(0.6) = \frac{r(1.1) - r(0.1)}{1.1 - 0.1} = 1.36, r(0.6) = \frac{r(1.1) + r(0.1)}{2} = 4.86,$$

$$v'(0.6) = \frac{v(1.1) - v(0.1)}{1.1 - 0.1} = 2.28, v(0.6) = \frac{v(1.1) + v(0.1)}{2} = 3.61.$$

As such, we can check the MRP for five intervals based on the pilot study data, which we show in Table S3. In all sets of estimates, as can be seen in the last two rows, $\frac{r'(x)}{r(x)} < \frac{v'(x)}{v(x)}$. These estimates further help demonstrate the applicability of MRP.

Table S3. MRP verification.

x	\$0.60	\$1.60	\$2.60	\$3.60	\$4.60
$r'(x)$	1.36	0.51	0.56	0.32	0.29
$r(x)$	4.86	5.80	6.33	6.77	7.08
$v'(x)$	2.28	0.88	0.62	0.50	0.55
$v(x)$	3.61	5.19	5.94	6.50	7.03
$r'(x)/r(x)$	0.28	0.09	0.09	0.05	0.04
$v'(x)/v(x)$	0.63	0.17	0.10	0.08	0.08

Study 2

In Study 2C, the agent's impatience was stronger among female participants than among male participants ($b_{\text{condition} \times \text{gender}} = 1.76$, $SE = .78$, Wald = 5.04, $p = .025$), but this moderation by gender was not replicated in any other study in this paper.

In Study 2D, having participants make both the for-self and for-friend decisions within-subjects did not eliminate the agent's impatience. Within-subjects analyses revealed that a sizable subset of participants indicated a more "impatient" preference for the friend than for themselves: in the choice-for-another condition, 40.8% of those who chose *SS* for their friend indicated that they would have chosen *LL* for themselves, whereas only 3.9% of those who chose *LL* for the friend indicated that they would have chosen *SS* for themselves; in the choice-for-oneself condition, 19.2% of those who chose *LL* for themselves would have chosen *SS* for their friend, whereas only 2.6% of those who chose *SS* for themselves would have chosen *LL* for their friend. Together, participants in both conditions were more likely to choose the *SS* gift card for their friend than for oneself (choice-for-another condition: 50.6% for another vs. 34.2% for oneself; choice-for-self condition: 64.5% for another vs. 27.6% for oneself, $\chi^2(1)s > 14.2$, $ps < .001$).

In Study 2E, the chocolate candies were rated as significantly more affect-rich than vitamin supplements ($M_{\text{chocolate}} = 6.11$, $SD = 1.08$, $M_{\text{vitamin}} = 3.90$, $SD = 1.90$, $t(328.9) = 14.64$, $p < .001$). We tested if choice was predicted by decision orientation, affective value, choice order, and any interactions between them. Only decision orientation had a main effect on choice (GEE Wald $\chi^2(1, N = 840) = 14.44$, $p < .001$; GLMM $b = -.34$, $p < .001$), and none of the other factors had an effect or interacted with decision orientation ($ps > .250$). Moreover, the effect held irrespective of the affective value of consumer goods (affect-rich: 51.18% for another person vs. 41.23% for oneself, McNemar's $\chi^2(1, N = 211) = 9.30$, $p = .002$; affect-poor: 51.67% for another person vs. 44.98% for oneself, McNemar's $\chi^2(1, N = 211) = 3.84$, $p = .050$).

Table S3. Nine pairs of choices in Study 2G.

<i>Choice Category</i>	<i>SS</i>	<i>LL</i>
Cash	\$100 cash in a red envelope	A check in a red envelope, redeemable for \$150 cash in a month
Amazon e-gift card	\$50 Amazon gift card that can be redeemed immediately	\$75 Amazon gift card that can be redeemed a month from now
Dinnerware	A set of 6 pieces of sturdy dinnerware shipped and delivered this week	A set of 10 pieces of sturdy dinnerware shipped and delivered next month
Snacks	A box of healthy unsalted mixed nuts available now	Two boxes of healthy unsalted mixed nuts available next week
Wallet	A name-brand wallet delivered this week	A premium designer wallet delivered in a month
Dinner booking	A dinner reservation at a Michelin one-star restaurant this weekend	A dinner reservation at a Michelin two-star restaurant three months from now
Concert tickets	A back-section ticket for a big concert this weekend	A middle-section ticket for a big concert in six months
iTunes songs	A voucher for 10 iTunes songs this month	A voucher for 15 iTunes songs, one redeemable each month starting now
Ice cream vouchers	A waffle cone with one big scoop of the receiver's favorite ice cream now	Two waffle cones, each with one big scoop of the receiver's favorite ice cream, next week

Table S4. Separate choices in Study 2G.

Decision Orientation	Cash	Amazon e-gift card	Dinnerware	Snacks	Wallet	Dinner booking	Concert tickets	iTunes songs	Ice-cream vouchers
<i>Choice for another</i>	<i>SS %</i>	57.69%	50.00%	54.81%	55.77%	45.19%	75.00%	31.73%	64.42%
	<i>SD</i>	0.50	0.50	0.50	0.50	0.50	0.44	0.47	0.48
<i>Choice for oneself</i>	<i>SS %</i>	39.42%	22.12%	36.54%	35.58%	35.58%	55.77%	25.00%	61.54%
	<i>SD</i>	0.49	0.42	0.48	0.48	0.48	0.50	0.44	0.49

Study 4

Table S5. Anticipated reactions and anticipated evaluations from recipients who receive the *SS* or *LL* option in Study 4.

	Choosing for a specified other		Choosing for an unspecified other	
Option	<i>SS</i>	<i>LL</i>	<i>SS</i>	<i>LL</i>
Anticipated reaction	3.02 (1.03)	1.97 (1.72)	2.62 (1.32)	2.15 (1.72)
Anticipated evaluation	2.75 (1.29)	1.93 (1.89)	2.35 (1.47)	2.05 (1.73)

III. Additional replications

In addition to Study 5A, we ran three other studies (A1-A3) testing whether trait empathy influences the size of agent's impatience. These studies used slightly different stimuli and empathy measures than Study 5A. Study A1 used choices similar to those in Study 1, Study A2 had each participant make three choices, similar to those in Study 2F, and Study A3 used the same choices as in Study 5A. The empathy scales included those developed in Davis (1980), Reniers et al. (2011), and Zoll and Enz (2010). While the agent's impatience effect was always replicated in these studies ($p < .010$), trait empathy did not consistently moderate this main effect; in all cases, moderation by empathy was either non-significant (five tests across Studies A1-A3, $p > .25$) or weakly significant (one test in A3, $p = .030$). Correcting for multiple comparisons, no effect is found. Overall, we conclude, consistent with Study 5A, that empathy does not moderate the agent's impatience effect more than would be expected by chance.

Additional details on these studies can be found in the OSF repository (https://osf.io/faj3r/?view_only=fb10bade1db44ceaa363f41ae1f7e56a).

IV. Extensions to the model

General and specific beliefs about the recipient's preference

In our main results, we make a reasonable simplifying assumption that the agent's vicarious utility is based on socially discounting what their own utility would have been as a recipient: αv_i . Deviating from this simplifying assumption, we can introduce a more general term $\alpha [w_s v_i + w_m v_m + w_r v_j]$, where $w_s + w_m + w_r = 1$. This expanded term for vicarious utility is a weighted average of three factors: the agent's own utility as a recipient (v_i), the (believed) median person's utility (v_m), and the recipient's actual utility (v_j). In our baseline model, we consider the pure projection case, where $w_s = 1$.

In some situations, the agent may have a belief that their own utility is not representative of the recipient's utility. In such cases, anchoring and adjusting takes place such that the agent starts with their own utility and then adjusts in the direction of the utility of a median recipient to estimate the recipient's vicarious utility. This would be captured by $0 < w_s, w_m < 1$ and $w_r = 0$. When the agent believes that others might generally more "patient" than themselves, as Pronin et al. (2008) suggested, then this extension allows choices for others to be even more "patient" than choices for oneself when reaction utility is sufficiently low (as we found in Study 4B, but not Study 4A; see also Figure 4 in the main text).

Last, when the agent has existing knowledge of how the recipient's preference differs from their own, the agent may instead adjust in the direction of the recipient's actual preferences, denoted by $0 < w_s, w_r < 1$ and $w_m = 0$. When $w_r = 1$, the model captures the most extreme case, in which the

agent bases their decision on perfect information about the recipient's preference (e.g., given explicit instructions from the recipient).

Gift giving and charitable giving

Our focus in applying the model is comparing choices for the self to choices for other people. The model could also be used to consider resource allocation decision between self and others. Notably, our model allows for the possibility of preferring that another person receive a resource instead of receiving it oneself. In the basic model, this will occur when α is sufficiently high (i.e., the utility is not strongly discounted for being received by another person) and reaction utility is sufficiently large. This captures the case where the giver and recipient similarly value the outcome, but seeing the recipient's positive reaction makes giving more rewarding than keeping, which has been discussed in relation to gift giving behaviors (Thaler 1985; Yang and Urminsky 2018). Additionally, if we extend the model of vicarious utility to include the recipients' potentially different valuation (see above), then the person may give rather than keep a resource in part because they believe that the recipient values it more than they do. In sum, the motives that lead people to give a valuable resource to others rather than keeping it for themselves could be tied to both vicarious utility and reaction utility. We note that this parallels some related discussions about the distinction between "pure altruism" and "warm glow", as explored in the charitable giving literature (Andreoni 1990; 1989).

Deriving the likelihood of SS choice for others based on the agent's preference for self.

In the main paper, we derive H1 (Agent's impatience) from the Marginal Ratio Property in the "threshold case" when the agent is indifferent between the *SS* and *LL* in choosing for themselves. Here, we demonstrate in full detail why agent's impatience is more likely to occur than the opposite when the agent has a preference in choices for themselves.

First, we identify two determinate cases:

SS-self case: When the agent prefers the *SS* over the *LL* for themselves:

$$\frac{v(x_2; z)}{v(x_1; z)} < \frac{f(t_1)}{f(t_2)}$$

By the MRP:

$$\frac{v(x_2; z)}{v(x_1; z)} > \frac{r(x_2; z)}{r(x_1; z)}$$

Therefore:

$$\frac{f(t_1)}{f(t_2)} > \frac{v(x_2; z)}{v(x_1; z)} > \frac{r(x_2; z)}{r(x_1; z)}$$

This shows that when the agent prefers the *SS* over the *LL* in choices for self, the agent will choose the *SS* for the other person.

LL-other case: When the agent prefers to give the recipient the *LL*:

$$\frac{r(x_2; z)}{r(x_1; z)} > \frac{f(t_1)}{f(t_2)}$$

By the MRP:

$$\frac{v(x_2; z)}{v(x_1; z)} > \frac{r(x_2; z)}{r(x_1; z)}$$

Therefore:

$$\frac{f(t_1)}{f(t_2)} < \frac{r(x_2; z)}{r(x_1; z)} < \frac{v(x_2; z)}{v(x_1; z)}$$

This shows that when the agent prefers to give the recipient the *LL* instead of the *SS*, the agent will choose the *LL* when choosing for self.

Next, we identify two indeterminate cases:

LL-self case: When the agent prefers the *LL* for themselves, all we know is that:

$$\frac{v(x_2; z)}{v(x_1; z)} > \frac{f(t_1)}{f(t_2)} \text{ and } \frac{v(x_2; z)}{v(x_1; z)} > \frac{r(x_2; z)}{r(x_1; z)}$$

As a result, the agent could choose either the *SS* or the *LL* for the other person.

SS-other case: When the agent prefers to give the recipient the *SS*, all we know is that:

$$\frac{f(t_1)}{f(t_2)} > \frac{r(x_2; z)}{r(x_1; z)} \text{ and } \frac{v(x_2; z)}{v(x_1; z)} > \frac{r(x_2; z)}{r(x_1; z)}$$

As a result, the agent could choose either the *SS* or the *LL* for themselves.

In sum, analysis of the cases where the agent may have a preference between *SS* and *LL* shows that the agent will choose the *SS* for the recipient when choosing *SS* for themselves but may or may not choose the *SS* for the recipient when choosing *LL* for themselves. Thus, we see that the agent will either choose the same option for themselves and the recipient or will choose the *SS* for the recipient and *LL* for themselves but will not choose *LL* for the recipient and *SS* for themselves. Thus, H1 is supported when agents have a preference between options.