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When time is (not) money: Preliminary guidance on the interchangeability of time and money in laboratory-based risk research

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Abstract

The familiar adage that “time is money” may not be entirely accurate according to research involving hypothetical choice: People’s decisions are less sensitive to temporal expenditures and outcomes than monetary ones. We provide a novel examination of whether similar patterns of risky choice are found for time and money when choices are consequential (i.e., monetary outcomes are obtained and temporal outcomes are experienced) – both for one-shot and repeated choices, over gains and losses. On the aggregate, across decision contexts (described and experienced), choices are similar for time and money. However, on the level of the individual, little relationship between risk preferences for time and money are observed. We discuss the theoretical and practical implications of these findings.

Keywords: Risky choice; time delays; decisions-from-experience; incentivization; laboratory risk research; loss-gain framing.

1. Introduction

Descriptive theories of decision making, risk taking, and laboratory research on risky choice are important components of risk research that aims to inform our understanding of how people respond to risk and uncertainty across a variety of situations (e.g., in work, at home). Both decision theory and laboratory research make generic assumptions. For example, Prospect Theory (Kahneman and Tversky 1979; Tversky and Kahneman 1992) posits that outcomes on an interval scale are (*as if*) transformed onto a scale of subjective value; where outcomes are usually monetary losses/gains, but in principle can be any scalar quantity. Likewise, decision research in the laboratory is assumed to model decisions made outside the lab, whereby research participants' reactions to choices between gambles involving hypothetical monetary amounts, or those involving small (actual) monetary stakes, are indicative of choices in larger-stakes decisions not only in finance but also in other domains (e.g., health, environmental concerns, etc.). Some questionnaire-based research has considered whether individuals' propensity for risk taking generalizes across domains (Nicolson et al. 2005; Weber Blais and Betz 2002). However, little experimental research has *directly* compared people's propensity to take risks across different types of actually experienced outcomes. The current paper is the first (to our knowledge) to address this gap by examining individual consistency in risk taking over consequential decisions involving both experienced time delays and monetary outcomes for both gains and losses.

While some important decisions involve financial (i.e., monetary) risk, we suggest that *risky monetary decisions* are rare in comparison to everyday decisions where completion times can vary (e.g., take the freeway or the side streets; take the stairs or the elevator; use the reliable printer across the department or the close but frequently malfunctioning printer). Taken together, *risky temporal decisions* have considerable impact on what can be accomplished. Moreover, many of the behaviors that cause concern to risk managers (e.g.,

rule violations; Reason 1990) often involve ‘cutting corners’ to save time. Therefore, it is important to understand how people take risks involving different amounts of time, and to determine whether theories derived from financial risk taking apply to decisions involving time.

1.1 Time is money?

The familiar adage that “time is money” suggests that we recognize time as a valuable resource or commodity. This contention is supported by research suggesting that how we spend our time is a major factor in how we feel (Aaker Rudd and Mogilner 2011; Borgonovi 2008). Normative economic theory proposes that the value of time should be measured by its opportunity costs (Becker 1965; Graham 1981). Specifically, according to Becker (1965), an hour of time should typically be equivalent in value to one’s hourly wage. Intuitively this makes sense: If we are willing to work for a given amount that should reflect how much we value our time. As such, decisions involving temporal or monetary outcomes should be treated equivalently.

However, it seems that money is often valued greater than time. Chang, Chang, Chang, and Chien (2013) reported that participants preferred money saving options over time saving options. Okada and Hoch (2004) reported that in risky betting scenarios individuals were more willing to risk losing time than money. One explanation for why time and money are treated differently is that the value of time is hard to quantify (Okada and Hoch 2004; Saini and Monga 2008). As a result, it is hard to assign a precise and consistent monetary value to a specific amount of time – a phenomenon termed the *infungibility of time* by Leclerc, Schmitt, and Dube (1995). Time is proposed to be infungible because it cannot be saved for future use (Mogilner and Aaker 2009; Gross 1987; Soman 2001) or transferred like money can (Zauberman and Lynch 2005).

It has been suggested that the apparent inconsistencies existing between time and money do not result from a true inequality, but, rather, from the difficulty of constructing an exchange rate for time and money. Support for this explanation comes from studies in which priming individuals to think about time in monetary terms (e.g., by reflecting on one's hourly wage) reduces the disparity between choices involving time and money (Chang et al. 2013; DeVoe and House 2011; DeVoe and Pfeffer 2007; Saini and Monga 2008; Soman 2001). Unfortunately, the majority of research investigating risky choices with temporal outcomes has employed hypothetical outcomes¹. Given evidence that concrete representations make a difference, this restricts one's ability to apply research beyond the lab (Falk and Heckman 2009) to decisions where consequences are experienced.

1.2. Current study and hypotheses.

The current study is the first (to our knowledge) to make a direct and equitable comparison of risky choices for time and money by ensuring that decisions are not biased by a lack of incentivization – a critical shortcoming present in previous research. Based on research testing the proposition that time is perceived to be infungible (e.g., Leclerc et al. 1995) we predict that choices over monetary outcomes will differ from those involving time. Specifically, decision makers should show less sensitivity to the value of temporal outcomes.

H₁: Time and money will be treated differently with there being less sensitivity to the magnitude of temporal outcomes.

¹ In a rare (perhaps unique) study of repeated decisions involving experienced time delays, Munichor, Erev, and Lotem (2006) reported similar choice phenomena for decisions involving time (i.e., for delays imposed on the participant) to those observed with monetary outcomes in other studies. Notably, their experiments made no direct comparison between choice problems with temporal and monetary outcomes, only included losses over very small amounts of time (all less than 6 seconds), did not make comparisons between described and experiential choice, and set the majority of the options to have equivalent expected values (EVs), limiting the number of inferences regarding risk preferences for time and money.

Given that priming participants to think about the value of time seems to bring the value of time and money closer to equivalency (e.g., Chang et al. 2013; DeVoe and House 2012; Saini and Monga 2008) we suggest that experience with temporal outcomes should make them more salient, and therefore more comparable to monetary outcomes.

*H*₂: Preferences for time and money will become more similar following experience.

2. Methods

2.1. Participants

Seventy-nine participants ($M_{age} = 20.63$; 67% female)² were recruited from a UK university human subject pool and received £10.00 plus/minus payment based on their choices (see *online supplementary materials A1* for the recruitment advertisement). While information regarding participants' level/program of study was not collected, the subject pool was open to all members of the university (undergraduate/graduate students and staff) but consisted primarily of undergraduate students who constitute 77% of the university's attendees. All choices were incentivized with either money or time delays - actual amounts of time that the participant had to wait. The study lasted 75 to 125 minutes depending on participant's choices and decision speed: As described in the *online supplementary materials A1* the study was advertised as lasting up to 120 minutes though some participants who took more time to make their decisions took slightly longer.

2.2. Task and materials

² The university's student body is 54% female and no effort was made to recruit equal numbers of males and females as we did not have any *a priori* predictions regarding gender differences. We note that in the analysis reported gender had no effect on choice (all $ps > .33$), nor did its inclusion change the direction or significance of any of the effects reported. This is in line with recent work by Sarin and Wieland (2016) who reported no gender differences in decisions involving uncertainty.

We employed two-option choice sets (gamble pairs) with each option having two probabilistically determined outcomes (see *Table 1*). Eight choice sets were employed; each set having a riskier option (with more outcome variance) and a safer option (with less outcome variance). Four of these choice sets consisted of monetary gains (MG) or losses (ML), and four delivered outcomes as gains (TG) or losses of time (TL). In each outcome type (time or money) and frame (gain or loss), one set had the riskier option as the higher EV option, while the safer option had the higher EV in the other set. Notably, our selection of gamble pairs was constrained by the demands of the task and our judgment of what duration of session was reasonable. We judged that adding more pairs, while informative, would lead to participants losing interest in their decisions (e.g., consistent with Ashby and Rakow 2015) and possibly opting to quit the study early.

The time delays in the TG and TL choice sets were equated to the monetary gains and losses in the monetary outcome choice sets using an “exchange rate” of £6.19 per hour; participants were not aware of this exchange rate. This was the UK minimum wage rate for 21-year-olds at the time of the study (February 2013), and closely matched the typical pay rate for research participation and for employment opportunities available to members of the participant pool. Importantly, this is *not* a “generic” exchange rate appropriate to all settings and decision makers. Rather, for our participants – and consistent with Becker (1965) – this represents a best estimate of the monetary value of time spent in the psychology lab and the opportunity cost of time that could otherwise be devoted to paid work. Therefore, this should create (approximate) equivalence in magnitudes for the two types of outcomes.

To ensure that the delays in the TG and TL choice sets provided a realistic amount of stimulation, outcomes were presented as varying delays in which participants watched a video of waiting at a red light or sitting in traffic for the duration indicated in *Table 1* (each outcome was associated with a unique video). Specifically, when participants experienced an

immediate delay following one of their experiential choices they were played a first-person point-of-view video filmed from the passenger seat of a car looking through the front windshield. The videos used showed either a line of cars in the street directly in front (being stuck in traffic), or a red light hanging overhead at an intersection (being stuck at a red light; see *online supplementary materials A2* for a screen shot). The videos were recorded locally (and contained no audio), thus the scenes were familiar to participants and provided no novelty interest.

Because how one learns about one's options varies from situation to situation, we examined risk preference in these choice sets for *decisions-from-description* and *decisions-from-experience* (Barron and Erev 2003). Decisions-from-description represent the “traditional” (full information) approach to examining risk preference, in which participants are informed of the possible outcomes and their probabilities (Weber Shafir and Blais 2004). Decisions-from-experience model choices where one can only learn outcomes and their probabilities by making choices and observing the outcomes that occur (for review see Rakow and Newell 2010).

Insert *Table 1*

2.3. Procedure

Upon arrival participants completed a consent form (see *online supplementary materials A3*), which emphasized that the total time of the study and their payment would depend on their decisions. Before entering their individual testing booth, participants gave their belongings (i.e., cellphone, bag, etc.) to the experimenter because “distractions” could mitigate the annoyance of experienced time delays. Participants read instructions informing them that they would be choosing between different options consisting of either time delays, which would increase or decrease their participation time, or amounts of money, which would

be added to or subtracted from their £10.00 participation payment (see *online supplementary materials A4*).

Participants were told that they would start out with a two-and-a-half-minute delay (an opening delay balance) which, together with any other delay amounts they accumulated in the experiment (detailed below), would be experienced at the end of the study. To ensure that participants had a current/realistic perception of what a specified time delay felt like they experienced a 30-second delay (watched a loading icon for 30 seconds) which was subtracted from their delay balance. Participants then made one-shot described choices for each choice set and did so again following all of the experiential decisions (choice sets were presented in random order); the initial and final described choices, respectively. No immediate feedback was given in either instance, though outcomes were added/subtracted from the participant's earnings or delay balance.

Participants then made 30 repeated choices in each choice set (presented in random order for each participant) and received immediate outcome feedback (i.e., watched a video which delayed the continuation of the study, or saw the amount of money they had gained/lost) following each choice. We instructed participants in the time outcome choice sets that they should imagine that they were choosing between different routes to take to the university. Just like the monetary choice sets, participants were told that different options contained different outcomes that had different probabilities of occurrence and they would have to select the options in order to know what outcomes were possible and their frequency (probability) of occurrence (see *online supplementary materials A5–A7*).

For the time gain (TG) choice sets participants were informed that a 30-minute delay, representing 30 route choice decisions with 1-minute delay each, had been applied to that part of the study. They were told that they could gain some of this time back by making choices for routes which were less than a minute each, which they would experience as a shorter

delay: The delay in these choices was equivalent to one minute minus the outcome of their choice. Following their 30 choices, participants were asked which route they would choose if they had to take the same route five times. This question was included to examine whether a stated preference (“policy”) following from experience would be strongly predicted by previous choices. The outcomes of this policy choice were not experienced immediately, but were incremented to the participant’s delay or money balance (see *online supplementary materials A8–A10*). Once all choices were made, participants experienced the time delay accumulated from their described and final policy choices for time, during which they watched a loading icon rotate on the computer screen. Participants were not informed of how long the delay would be; it was over 20 minutes in several cases. Participants then received their accumulated monetary payout and were thanked for participating.

3. Results

3.1 Described choices

We first examined the described choices (see *Table 2*) using a logistic regression predicting choice (coded 0 for safer, 1 for riskier) by frame (gain coded 0, loss coded 1), option EV (coded 0 if the riskier option had a lower EV than the safer option, coded 1 if the riskier option had a higher EV than the safer option), type of outcome (monetary coded 0, time coded 1), order (initial choice coded 0, final choice coded 1)³, as well as all their interactions. In all analyses that follow we cluster on the level of subject to correct for repeated measurement (Moulton 1990; Rogers 1993). *Table 3* reports this regression⁴.

³ We coded initial choices as 0 and final choices as 1 to reflect their temporal position in the task.

⁴ A backward stepwise logistic regression returned a best fitting model containing which option had a higher EV, order, and their interaction (effects consistent with the full model reported above) as well as multiple interactions without their corresponding main effects. A forward stepwise logistic regression returned a best fitting model containing only which option had a higher EV as well as its interactions with frame (an increase in choices for the riskier option when it was better and involved losses) and outcome type (a decrease in choices for the riskier option when it was better and involved time). Including which type of outcome (time or money) was encountered first showed no significant effect.

The main effect of order was significant: The riskier option was chosen less often in the final choices (42%) than the initial choices (45%). The interaction between option EV and order was also significant, with more choices being made for riskier options that were of higher EV in the final choices. No other effects or interactions reached significance. Thus, with respect to the comparison between time and money: no robust differences in risk preferences were observed (counter to H_1); nor did the similarity of these risk preferences increase following experience (counter to H_2).

Insert Table 2 and Table 3

Risk preference in experiential choices

We regressed option picked (coded 0 for safer, 1 for riskier) on option EV, outcome type, frame, and choice number (coded as above), as well as their interactions (choice number centered; see *Table 4*). We find that the likelihood of choosing the riskier option was greater for choices involving time (47%) rather than money (46%). As one would expect, we find the likelihood of picking the riskier option was greater when it was the higher EV option (57%) than when it was not (36%). Choice number was found to be a significant negative predictor indicating that the likelihood of choosing the riskier option decreased with experience (see *Figure 1*). However, this was qualified by a significant interaction between choice number and option EV, with selection of the riskier option increasing over choices when it had a higher EV (see *Figure 1*). None of the other effects or interactions reached significance⁵. Thus, comparing time and money we find no robust differences nor did experience have any significant effect on the convergence of preferences for temporal and monetary outcomes counter to our predictions (H_1 and H_2).

⁵ Both backward and forward stepwise logistic regressions found that the best fitting model contained choice number, which option had a higher EV, and their interaction (all effects consistent with those of the full model reported above). What type of outcome was encountered first (money or time) was not a significant predictor, though it did decrease the main effect of outcome type to non-significance ($p = .056$). This suggests that order likely had some (mediating) impact on participant's behavior.

Insert Figure 1 & Table 4

To examine whether individuals had similar risk preferences across outcome types and frames we collapsed across choices within frame and outcome type creating a variable indicating a participant's average rate of selecting the riskier option. Correlating these averaged rates of selecting the riskier option with one another (separately) we find only the relationship between choices involving (different frames for) time to be significant ($r = .56, p < .001$), all other r s $< .17$, p s $> .14$ (see *Figure 2*)⁶. Notably, this correlation ($r = .56$) differs significantly from all other correlations, all p s $< .005$. Thus, for experiential choice, risk preferences over temporal outcomes show greater consistency across frames than do monetary outcomes, and risk preferences within an individual are not significantly correlated across outcomes involving time and money. In other words, while choices involving monetary and temporal outcomes are similar on the aggregate (group) level, they are *not* similar at the level of the individual⁷.

Insert Figure 2

3.2. Policy Choice

We examined whether policy choices made after experience (see *Table 2*) differed from the 30th experience-based choice, and whether such choices were influenced by outcome type. To do so, we regressed the option picked (coded 1 for riskier, 0 for safer) on choice (30th choice coded as 0, policy choice coded as 1), and (as above) by option EV, outcome type, frame, and their interactions. The analyses revealed a high degree of consistency between the

⁶ Examining the same correlations but separately for the first and last (30th) experiential choices only the last choices for gains and losses of time were significantly related ($r = .26, p = .02$).

⁷ In addition to the similarity in risk preference between time and money reported here, we also find that these preferences develop over time in similar ways for time and for money, being affected by rewards and punishments in similar ways. Thus in decisions-from-experience, in which people must learn which option they prefer (because they do not initially know the details of each option) it seems similar learning processes underlie decisions about time and money. Details of the analysis of switching behavior (i.e., alternations between options on successive choices) that suggest this to be the case are reported in the *Online Supplementary Materials*.

30th experience-based choice and the policy choice (78% selecting the same option for both). There were no significant effects or interactions involving choice, all $ps > .10$ (see *Table 5*).

Insert Table 5

4. Discussion

In line with normative economic theory (Becker 1965), we find that choices involving time or money are fairly similar to each other in both experiential and described choices, and for both losses and gains on the aggregate (group) level. For the initial set of described choices, we also see evidence of risk seeking over losses and risk aversion over gains as predicted by prospect theory (Kahneman and Tversky 1979; Tversky and Kahneman 1992). To provide a clearer test of the equivalence of risk preferences for time and money in the final block of 10 choices, we conducted a Bayesian t -test (Rouder et al. 2009) of the mean difference in the number of risky choices between time and money separately for each of the four choice sets. Testing the null hypothesis of no mean difference against a unit normal prior for the alternate hypothesis yielded Bayes Factors (BF) varying from 4.0 to 8.1 in favor of the null hypothesis (range of BFs: 5.1 to 10.2 with a Jeffrey-Zellner-Siow prior). Notably, BFs of this size are conventionally taken as “substantial” evidence for the null hypothesis. Thus, with respect to our first hypothesis, we do not find any robust differences between choices involving money and time on the group level. And, counter to our second hypothesis, we do not find a direct effect of experience on increasing the similarity of choices involving time and money.

4.1. Theoretical implications

At first blush, our findings appear at odds with theories that posit fundamental differences between time and money. Indeed, our findings highlight that the conclusions often drawn from previous research – that people on average show less sensitivity to temporal outcomes than to monetary ones, or that they value money more than time – cannot be

sustained as general conclusions. Our results suggest that when the outcomes of monetary *and* temporal choices are fully incentivized aggregate patterns of choice across outcome types are similar. This supports current theory, suggesting that the (perceived) infungibility of time as a possible cause for some of the disparities between temporal and monetary choices (Leclerc et al. 1995). For instance, the finding that priming individuals to think of time like money attenuates disparities in how time and money are treated (Chang et al. 2013; DeVoe and House 2012; Saini and Monga 2008; Soman 2001) is in line with our current findings indicating that when participants *experience* time delays aggregate choices are similar for time and money. Note, however, that we gave no specific instruction to our participants to think about time in monetary terms. Rather, we posit that the concrete experience of delays was sufficient to make the average participant treat time like money. Also, our participants were aware that they were being paid for their time and also made similar choices involving monetary outcomes. This might have resulted in thinking about time as money, which may have contributed to the observed similarity between the two commodities.

Even though we readily speak of “gaining time” and “losing time” – one finding from the current investigation suggests that time is less susceptible to loss-gain framing than money. This places a boundary condition on the general conclusion that time *is* like money in consequential decisions. Specifically, in experiential choice, there was a strong relationship between the degree of risk aversion shown for losses and that shown for gains for temporal outcomes, which was not present for money. One possibility is that when time is made concrete via experience then *the outcome is the outcome* no matter how it is labeled, with all delays perceived as losses (be they longer or shorter than expected). This speaks to the non-transferable nature of time (Leclerc et al. 1995): Experienced delays are “spent”, whereas monetary outcomes are incremented to a balance for future expenditure (or recovery from losses). This is an important set of findings, not least because it supports the assertion of some

decision analysts (Razo and Gao 2013) that cost-benefit analyses must necessarily value completion times (e.g., journey times) as losses of varying degrees, *not* as mixtures of losses and gains relative to some reference point.

4.2. Methodological and pragmatic implications

The monetary gamble has been described as the “fruit fly” of decision research. It serves as a convenient laboratory model for a host of everyday decisions. Part of its efficacy as a model rests on the *critical assumption* that money is a valid substitute for other commodities and quantities – such as fame, happiness, and security – that are not readily manipulated/delivered in the lab. The current studies put this assumption to the test, and found a high degree of similarity between choices for money and time on the aggregate (group) level. Specifically, we find descriptive choices were reasonably similar within a participant for outcomes involving time and money⁸, and fairly stable on the aggregate level across outcome types in experiential choice. Therefore, one important contribution of our investigation is to confirm that, in the laboratory, money can, *on the aggregate level* substitute for at least one other valuable and ubiquitous quantity – time. This provides some validation for a standard assumption underlying decision research (Ben-Elia et al. 2008, 2013). Thus, under these conditions, one could use time-delays as proxies for monetary losses, should that be more conducive to one’s research budget or participant payment procedures.

However, *within an individual*, risk preferences for time and money were *not* related across experiential choices – in line with previous results indicating that risk preferences are domain specific (Bromiley and Curley 1992).⁹ As such, it is important to note that one cannot

⁸ At the level of the individual participant, we find that the consistency of choices for time and money with equivalent payoff distributions (e.g., MGB and TGB) approaches the test-retest consistency of choices over identical payoffs and outcome types: In initial and final described choices participants selected identical options for 60% of monetary and 64% of temporal choices; whereas the same option was chosen in equivalent temporal and monetary choices 57% of the time in initial and 60% of the time in final described choices.

⁹ One might not be surprised that, in the absence of full information, experiencing sampling variability in outcomes makes it difficult to form stable risk preferences (because it is uncertain what risk one is facing).

guarantee a reliable assessment of an *individual's* risk preference for time based on their preferences for money, or vice-versa. This dissociation between group and individual-level consistency across temporal/financial risk preferences could imply that our time-money “exchange rate” (£6.19 per hour) was appropriate *on average*, but that individual differences in *personal exchange rates* meant that some participants had higher (or lower) values for the temporal outcomes relative to the monetary ones. The implication is that if one is interested in temporal/monetary preferences on the individual level, one should first precisely determine the financial value of each individual's opportunity costs for time. Note also that individual risk preferences did not correlate significantly between the loss and gain frames for experiential monetary choices. Thus our data caution that – even when incentivized – an individual's *financial* risk attitudes elicited in the gain domain may not be a reliable guide to their risk preferences in the loss domain. Highlighting the value of considering *both* domains when eliciting risk preferences (Holt and Laury 2002; Kahneman and Tversky 1979; Tversky and Kahneman 1992).

4.3. Limitations

While our study is, to our knowledge, the first to provide an incentivized test of the equivalency of time and money in risky choices, in both descriptive and experiential formats, and for both gains and losses, there are some limitations that should be noted. First, our participants were drawn from a convenience sample consisting primarily of undergraduate students. As such the generalizability of our results to other populations is open to question (Peterson 2001). Second, our option pairs varied only in their outcomes and thus did not allow us to test for varying degrees of risk sensitivity. While our decision to use a small subset of possible outcome-probability mixes is justified given findings that attention to tasks reduces

However, this feature of decisions-from-experience would predict a similar lack of concordance between losses and gains – which was *not* the case for temporal outcomes.

rapidly over time (Ashby and Rakow 2015) future studies should include varied levels of outcomes and probabilities (cf. Holt and Laury 2002). Such investigations will provide a more holistic understanding of risky choices involving time and money. In a similar vein, our option pairs contained relatively small payouts and our participants' behavior suggests that they were relatively strong risk-seekers (e.g., 34% of participants selected lower EV risky options in the gain frame). Given that previous research has shown that increasing the value of outcomes increases risk aversion (Holt and Laury 2002) it will be important to see if the results are robust to situations involving larger monetary outcomes and greater time delays. Specifically, one might predict that as outcomes increase so will risk-aversion, with decision makers preferring safer options even in the loss domain (i.e., a reduction in the reflection effect). It is also possible that when outcomes are large greater differences between outcomes involving time and money might be observed.

4.4. Conclusions

The current investigation provides a novel and thorough analysis of the equivalency of fully incentivized risky choices made for time and money in *decisions-from-feedback* and *decisions-from-description*. When aggregated across individuals (i.e., the group level), choices were highly similar for both types of outcomes in both described and experience-based choices. Thus time *is* like money for consequential choices when decisions are aggregated across individuals. This provides a set of conditions under which temporal and monetary outcomes can be used interchangeably in laboratory experiments when estimating group behavior. However, time is *not* like money in every respect: *Individual* preferences are *not* stable across the domains of time and money for experience-based decisions. This finding is inconsistent with normative economic theory (Becker 1965) which posits similar preferences within an individual because time and money have a direct "exchange rate". Consequently, we are on shaky ground should we regard time and money as inter-changeable

quantities when modeling an individual's risk preferences. In sum, the current study provides much need clarification as to when time is, and is not, money, stressing the importance of examining incentivized non-monetary outcomes in risk research.

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Table 1. Choice sets employed. Outcomes (*O1 - O4*) and probabilities (*P1 - P4*) making up each of the choice sets as well as their respective expected values (EVs): gambles were for monetary (M) or temporal (T) outcomes; were framed as gains (G) or losses (L); and choice sets varied as to whether the riskier option was better (B) or worse (W) than the less risky option.

Type	Choice Set			Riskier Option					Safer Option				
	Frame	EV-dominance (Riskier is ...)		<i>O1</i>	<i>P1</i>	<i>O2</i>	<i>P2</i>	<i>EV</i>	<i>O3</i>	<i>P3</i>	<i>O4</i>	<i>P4</i>	<i>EV</i>
Money	Gain	Better	MGB	£0.10	70%	£0.00	30%	£0.07	£0.05	70%	£0.04	30%	£0.047
Money	Gain	Worse	MGW	£0.10	30%	£0.00	70%	£0.03	£0.05	30%	£0.04	70%	£0.043
Money	Loss	Better	MLB	-£0.10	30%	£0.00	70%	-£0.03	-£0.05	30%	-£0.04	70%	-£0.043
Money	Loss	Worse	MLW	-£0.10	70%	£0.00	30%	-£0.07	-£0.05	70%	-£0.04	30%	-£0.047
Time	Gain*	Better	TGB	60 sec	70%	2 sec	30%	42.6 sec	31 sec	30%	25 sec	70%	29.2 sec
Time	Gain*	Worse	TGW	60 sec	30%	2 sec	70%	19.4 sec	31 sec	30%	25 sec	70%	26.8 sec
Time	Loss*	Better	TLB	-60 sec	30%	-2 sec	70%	-19.4 sec	-31 sec	30%	-25 sec	70%	-26.8 sec
Time	Loss*	Worse	TLW	-60 sec	70%	-2 sec	30%	-42.6 sec	-31 sec	30%	-25 sec	70%	-29.2 sec

Table 2. Described and policy choices. Proportion of choices for the riskier option over choice set for initial described choices, policy choices after experience (subsequent to the 30th experience-based choice in each choice set), and final described choices; robust standard errors in brackets.

Choice Set		Mode and Type of Choice					
Frame	EV-dominance (Riskier is ...)	Initial described choice		Policy choice		Final described choice	
		For money	For time	For money	For time	For money	For time
Gain	Better	.47 (.06)	.35 (.05)	.63 (.05)	.54 (.06)	.57 (.06)	.46 (.05)
Gain	Worse	.34 (.05)	.42 (.06)	.19 (.04)	.24 (.05)	.20 (.05)	.42 (.06)
Loss	Better	.69 (.05)	.53 (.06)	.62 (.05)	.54 (.06)	.68 (.05)	.54 (.06)
Loss	Worse	.41 (.06)	.35 (.05)	.29 (.05)	.19 (.04)	.23 (.05)	.28 (.05)

Table 3. Logistic regression examining predictors of picking the riskier option in descriptive choices. Odd Ratio (OR) and 95% confidence interval (CI_{95%}).

Predictor	OR	z	p	CI_{95%}
Frame (Gain vs. Loss)	1.31	.80	.43	[.67, 2.55]
Riskier Option Better	1.69	1.72	.09	[.93, 3.10]
Frame * Riskier Option Better	1.98	1.40	.16	[.76, 5.19]
Outcome Type (Monetary vs. Time)	1.38	1.02	.31	[.74, 2.56]
Frame * Outcome Type	.58	-1.13	.26	[.23, 1.48]
Riskier Option Better * Outcome Type	.45	-1.70	.09	[.18, 1.13]
Frame * Riskier Option Better * Outcome Type	1.36	.44	.66	[.34, 5.47]
Initial vs. Final	.49	-2.12	.03	[.25, .95]
Frame * Initial vs. Final	.89	-.25	.8	[.34, 2.29]
Riskier Option Better * Initial vs. Final	3.07	2.53	.01	[1.29, 7.32]
Frame * Riskier Option Better * Initial vs. Final	.71	-.51	.61	[.19, 2.69]
Outcome Type * Initial vs. Final	2.04	1.52	.13	[.81, 5.16]
Frame * Outcome Type * Initial vs. Final	.79	-.31	.75	[.19, 3.37]
Riskier Option Better * Outcome Type * Initial vs. Final	.49	-1.09	.28	[.14, 1.75]
Frame * Riskier Option Better * Outcome Type * Initial vs. Final	1.39	.33	.74	[.19, 9.69]
Constant	.52	-2.75	.01	[.33, .83]

Table 4. Logistic regression examining predictors of picking the riskier option in experiential choices. Odd Ratio (OR) and 95% confidence interval (CI_{95%}).

Predictor	OR	z	p	CI_{95%}
Frame (Gain vs. Loss)	1.08	.51	.61	[.80, 1.45]
Riskier Option Better	2.65	6.49	.00	[1.97, 3.55]
Frame * Riskier Option Better	1.17	.78	.44	[.79, 1.72]

Outcome Type (Monetary vs. Time)	1.37	1.95	.05	[.99, .88]
Frame * Outcome Type	.63	-1.91	.06	[.39, 1.01]
Riskier Option Better * Outcome Type	.83	-.92	.36	[.56, 1.23]
Frame * Riskier Option Better * Outcome Type	1.24	.70	.48	[.68, 2.23]
Choice Number	.96	-5.20	.00	[.94,.97]
Frame * Choice Number	1.00	.37	.71	[.98, 1.02]
Riskier Option Better * Choice Number	1.06	4.48	.00	[1.03, 1.08]
Outcome Type * Choice Number	1.01	.50	.62	[.98, 1.03]
Frame * Riskier Option Better * Choice Number	.99	-.82	.41	[.96, 1.02]
Frame * Outcome Type * Choice Number	.99	-.04	.97	[.97, 1.03]
Riskier Option Better * Outcome Type * Choice Number	.99	-.98	.33	[.96, 1.01]
Frame * Riskier Option Better * Outcome Type * Choice Number	.99	-.04	.97	[.96, 1.04]
Constant	.45	-7.60	.00	[.37,.55]

Table 5. Logistic regression examining predictors of picking the riskier option in final and policy choices. Odd Ratio (OR) and 95% confidence interval (CI_{95%}).

Predictor	OR	z	p	CI _{95%}
Frame (Gain vs. Loss)	1.14	0.39	.69	[.58, 2.24]
Riskier Option Better	4.18	4.24	.00	[2.16, 8.09]
Frame * Riskier Option Better	1.14	0.29	.77	[.47, 2.78]
Outcome Type (Monetary vs. Time)	1	-0.00	1	[.47, 2.11]
Frame * Outcome Type	.59	-0.92	.36	[.19, 1.79]
Riskier Option Better * Outcome Type	1.30	0.56	.58	[.51, 3.31]

Frame * Riskier Option Better * Outcome Type	.99	-0.01	.99	[.25, 3.97]
Final Choice vs. Policy Choice	.74	-0.81	.42	[.36, 1.53]
Frame * Final Choice vs. Policy Choice	1.53	0.95	.34	[.63, 3.71]
Riskier Option Better * Final Choice vs. Policy Choice	1.76	1.54	.12	[.86, 3.62]
Outcome Type * Final Choice vs. Policy Choice	1.35	0.59	.55	[.50, 3.64]
Frame * Riskier Option Better * Final Choice vs. Policy	.47	-1.53	.13	[.18, 1.23]
Frame * Outcome Type * Final Choice vs. Policy Choice	.71	-0.52	.61	[.19, 2.61]
Riskier Option Better * Outcome Type * Final Choice vs. Policy Choice	.39	-1.63	.10	[.13, 1.20]
Frame * Riskier Option Better * Outcome Type * Final Choice vs. Policy	2.52	1.18	.24	[.54, 11.79]
Constant	.32	-4.34	.00	[.19, .53]

Figure captions

Figure 1. The proportion of participants selecting the riskier option over choices involving monetary (left panel) and temporal outcomes (right panel) plotted separately by condition: Outcomes involving gains and losses where the riskier option was better or worse than the safer option.

Figure 2. Scatter plots showing the relationships between the averaged rate of selecting the riskier option within, across gains and losses, and between monetary and temporal outcomes.

