Cross-modal Time Discounting across Cultures: A Comparison between Japan and the US[a]

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Abstract

This paper explores cross-modal decisions, where options differ across many attributes, and compares them to uni-modal decisions, where options differ on fewer attributes. We examined cultural differences in time preferences between Japan and the United States across both decision types using a within-subjects design, in which participants made both uni-modal and cross-modal decisions. Our series of experiments confirmed significant cross-modal effects, indicating less discounting in cross-modal decisions across different situations. Furthermore, Japanese participants demonstrated greater patience in uni-modal decisions compared to their US counterparts, though no notable differences were observed between the two groups in cross-modal decisions. For the US sample, our findings in uni-modal decisions aligned with previous research, but greater impatience was found in cross-modal decisions, deviating from earlier studies. These results suggest that within-subjects designs may heighten attention toward time delays, thereby weakening cross-modal effects in this context.

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1.   Introduction

Time discounting is the preference for earlier over later outcomes. Traditional studies in time preference have focused on uni-modal decisions, involving choices between outcomes of the same nature (e.g., fewer chocolates now or more chocolates later, or a vacation now or later). However, many real-world decisions are cross-modal, where options differ beyond just quantity. For example, pension decisions might involve weighing current consumption, such as electronics or quality food, against future expenditures on vacations or healthcare.

Under standard assumptions, whether a choice is uni-modal or cross-modal should not affect the decision maker's patience. However, recent evidence (Cubitt et al., 2018; Read et al., 2023) demonstrates a *cross-modal effect*, showing that the effect of the delay on consumer goods is significantly smaller in cross-modal decisions than in uni-modal ones. This behavior can be explained by the attentional dilution effect, which suggests that as the number of differentiating attributes increases, attention to each diminishes, reducing their influence on the decision.

These studies were conducted with American participants. However, recent discourse questions whether findings from "WEIRD" societies (Western, Educated, Industrialized, Rich, Democratic) apply universally, especially in non-WEIRD populations (Henrich et al., 2010), such as Japan. This study compares time discounting in Japanese and American samples, as well as establishing whether and how the cross-modal effect differs between these samples.

Several studies have found that individuals from Japan or Eastern cultures discount future rewards less than their American or Western counterparts (e.g., Du et al., 2002; Ishii et al., 2017), , citing cultural and linguistic factors as potential explanations. Whilst the existing literature has emphasized a discrepancy in time discounting between Japanese and American subjects, we aim to replicate this and extend the analysis to explore whether the cross-modal effect also differs between cultures. To do this, we compare time preferences in uni-modal and cross-modal decisions in the US and in Japan. In contrast with previous studies, we employed a within-participant design, where each participant responded to both uni-modal and cross-modal decision scenarios. This allowed us to analyze the cross-modal effect at the individual level.

2.   Overview

This section describes three experiments that employ closely related procedures. Experiments 1 and 2, which are discussed together, serve as exploratory studies examining the cross-modal effect within a Japanese sample. These experiments employed a within-subjects design, requiring participants to make both uni-modal and cross-modal decisions. The insights gained from comparing Experiments 1 and 2 informed our hypotheses about cultural differences in time preferences between Japan and the United States, leading to Experiment 3.

In all three studies, we implemented a variation of the delayed compensation method, as

described by Read et al. (2023), adapted to allow for a within-participants design.

To align with earlier studies, we used similar materials, involving tradeoffs between a pen and a box of chocolates. Specifically, we used a Parker Pen and a box of luxury Godiva chocolates. The choices were hypothetical.

The studies were all conducted online. Each study began with an introduction where participants were informed about the nature of the tasks, involving choices between two outcomes, one more delayed than the other. We constructed two sets of uni-modal decisions: the Pen-Pen condition (pen sooner or later) and the Chocolate-Chocolate condition (chocolate sooner or later), as well as two sets of cross-modal decisions: the Pen-Chocolate condition (pen sooner or chocolate later) and the Chocolate-Pen condition (chocolate sooner or pen later).

Participants made a series of choices between the options, each accompanied by a delayed monetary payment. An example screenshot from the treatment where the pen is received now and the chocolates later is shown in Figure 1. The choice patterns allowed us to infer participants' indifference point between receiving a specific good at one time, and the alternative good (or the same good in uni-modal decisions) at a different time, along with a later monetary payment. We refer to the monetary payment at the indifference point as the compensation. Each condition consisted of 22 choices, with payments attached to the earlier or later outcomes.
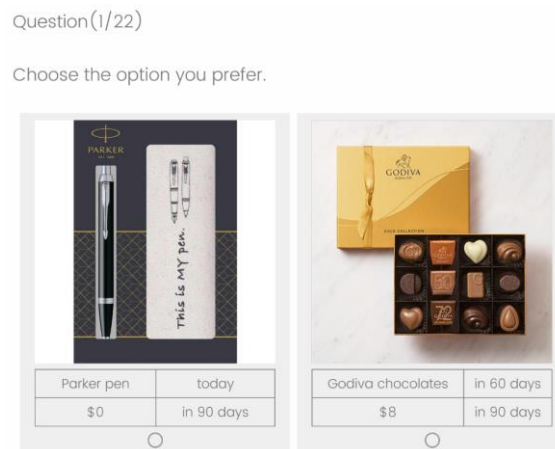

Figure 1. The Screenshot of an Example Question (Pen-Chocolate Condition).

The delay between the sooner and later dates was fixed at 60 days, with the monetary compensation set at 90 days after the sooner date in all experiments. Experiments 1 and 3 used present-day (non-front-end delay) questions, whereas Experiment 2 employed front-end delay questions: the sooner date was set 14 days later, the later date 74 days later, and the monetary compensation date 104 days later. Previous literature indicates smaller discount rates in front-end delay decisions in uni-modal settings (Frederick et al., 2002), hence our interest in exploring the impact of front-end delay on cross-modal decisions as well.

As defined previously, compensation is the amount of money which, if it accompanied the

dispreferred of two options, is just sufficient to induce indifference between them. Signed compensation is equal in magnitude to that compensation, but signed as positive when the sooner option is preferred if neither option is compensated, and signed as negative when the later option is preferred if neither option is compensated. Signed compensation therefore measures preference for the sooner option and we followed the methodology of Read et al. (2023) to estimate it.

3.   Experiments 1 and 2

We outlined how Experiments 1 and 2 served as exploratory studies aimed at establishing the existence of the cross-modal effect in Japan.[1] The results provide a foundation for Experiment 3. In summary, the results from standard discounting tasks (Kirby et al., 1999) and delayed compensation tasks in uni-modal decisions clearly demonstrate that Japanese participants exhibit more patience than those in previous studies (see the first two rows of Table 1). We also found that the cross-modal effect is robust in scenarios where participants repeatedly answer both uni-modal and cross-modal questions, including in front-end delay situations. Interestingly, the average compensation in cross-modal decisions in our sample was higher than in the previous study, resulting in a smaller difference in compensation between uni-modal and cross-modal decisions in our experiments. This discrepancy could potentially be attributed to cultural differences between Japan and the US, although it could be due to procedural differences between our Experiments 1-2 and the previous literature, notably because our study is within-subjects design. As such, a direct comparison between US and Japanese participants is warranted.

4.   Experiment 3

Experiment 3 included both Japanese and U.S. participants and implemented a within-subjects design thereby isolating the effect of the sample difference, specifically the difference between participants in the US and Japan. We recruited 210 American participants from Prolific (https://www.prolific.co/) and 210 Japanese participants from Lancers (https://www.lancers.jp/).

4.1.   Results and Discussions

Our analysis, using pooled data, reveals significant cross-modal effects, consistent with prior studies. When examining the differences between the Japanese and US samples, an interesting pattern emerges. The Japanese participants displayed greater patience in both uni-modal and cross-modal decisions, aligning with previous comparisons of discounting between the two cultures (see the third row of Table 1). However, when it comes to the cross-modal effect, there were no significant differences between the two samples.

In line with previous research, we found that the time preferences of US participants in uni-

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[1] Detailed experimental instructions are available in the online Appendix (https://osf.io/f9b5a/?view_only=a5f83e00444e43ba869c3e28135e2dfd).

modal decisions closely mirror those observed in prior studies (see the fourth row of Table 1). However, a notable deviation occurs in cross-modal decisions, where our US sample demonstrated greater impatience compared to the trends reported in the literature.

Interestingly, our individual analysis revealed that variables such as preference for chocolate over a pen, social status and cognitive ability showed no significant correlation with the cross-modal effect. The lack of a relationship with cognitive ability is particularly noteworthy, as it suggests that even individuals with high cognitive ability may experience a weakening of attention toward time delays in cross-modal decisions. These findings highlight the need for future research to identify factors that could better explain the cross-modal effects.

Table 1: *Summary of the Signed Compensation across Studies*

	Uni-modal Mean±CI	Cross-modal Mean±CI	Difference Mean±CI	Within-subjects
Experiment 1: JP/100	3.42±0.95	2.36±0.83	1.06±0.68	Yes
Experiment 2: JP/100	2.96±0.79	1.65±0.65	1.29±0.60	Yes
Experiment 3: JP/100	3.25±0.99	2.51±0.92	0.60±0.80	Yes
Experiment 3: US	5.87±1.14	4.91±1.16	0.96±0.73	Yes
Read et al. (2023): US	6.07±2.11	0.57±2.73	5.50±3.42	No
Cubitt et al. (2018): US	4.63±1.44	0.46±2.56	4.17±2.92	No

Notes: Japanese yen was converted to USD by dividing by 100. This approach aligns with the 2022 purchasing power parity conversion rate, also used in prior literature (e.g., Ishii et al., 2017).

A key distinction between this study and previous work is our use of a within-subjects design, unlike the between-subjects design in earlier studies. By responding to multiple conditions, participants might become more aware of the time delay. As a result, the time delay may become more salient, which weakened the attentional dilution effect in cross-modal decisions.

5. Conclusion

This paper consistently found robust cross-modal effects across various scenarios using a series of experiments with different designs (ranging from a fully between-subjects approach to a within-subjects one, as well as front-end delay questions) and across countries (from the WEIRD USA to the non-Westernized and therefore slightly less WEIRD Japan).

Japanese participants exhibited greater patience in uni-modal decisions compared to their US counterparts, while no significant differences were observed between the two groups in cross-modal decisions. For the US sample, our findings in uni-modal decisions closely align with prior research, while our US participants displayed greater impatience in cross-modal decisions,

diverging from trends in the literature.

6. Reference

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