Replication: Unsuccessful replications and extensions of

Temporal Value Asymmetry in monetary valuation and moral judgment[1]

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[1] All data, code, and materials are available at: https://osf.io/xcy9f/.

Abstract

The phenomenon that contemplating future events elicits stronger emotions than contemplating past events has been coined "temporal value asymmetry" (TVA) (Caruso et al. 2008). We conducted very close replications of three experiments derived from two influential TVA papers: Studies 1 and 4 in Caruso et al. (2008), demonstrating TVA in monetary valuation, and Study 1 in Caruso (2010), demonstrating TVA in moral judgment. We also attempted to conceptually replicate whether TVA in monetary valuation would extend to moral judgments. We failed to find support for TVA in monetary valuation (Caruso et al., 2008). We also failed to find support for TVA in moral judgments (Caruso, 2010) and in our conceptual extension. Exploratory analyses excluding potential outliers and z-transforming the dependent variable were consistent with our preregistered analyses. We discuss potential explanations for our results and future directions for research about the effects of time on judgments of value and morality.

Keywords: temporal value asymmetry; judgment; replication; moral judgment; valuation

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1. Introduction

When making judgments, such as determining monetary value or assessing morality, are people influenced by time? Are evaluations about events in the past different than evaluations of events that are to happen in the future? The theory of temporal value asymmetry (TVA) posits an asymmetrical relationship between judgments and their temporal distance from the present, such that when making monetary judgments people would value future events more positively than equivalent past events (Caruso et al., 2008), and when making moral judgments people would evaluate future unethical events more negatively than equivalent past events (Caruso, 2010).

The theoretical underpinnings of TVA can be traced to the experiments conducted by Van Boven and Ashworth (2007), which showed that individuals' emotional states were more intense for future (vs. past) events (but see partially successful replication: Chen, 2020). The findings reported in Van Boven and Ashworth (2007) were influential to the theorizing of TVA effects, which posited that because people often rely on their emotional states to determine the value of events, their valuation of future and past events would be asymmetrical.

In a demonstration of TVA in monetary valuation, Caruso et al. (2008) showed that participants believed that they deserved more money for work they would do in the future than for identical work they had done in the past. The authors also showed that such asymmetrical valuations were driven by emotional intensity: People base their judgments on emotions, and future events evoke more intense emotions than equivalent past events, which subsequently leads to more extreme judgments. In another influential paper, Caruso (2010) found support for TVA

in moral judgments and showed that people judged actions in a more extreme fashion (judging bad deeds more negatively and good deeds more positively) when they were described as future events than when they were described as past events.

In the present investigation, we conducted replications of Studies 1 and 4 in Caruso et al. (2008) and Study 1 in Caruso (2010). We failed to find support for TVA in monetary judgment and moral judgment in both our direct replications and our conceptual replication in an extension.

1.1. Importance and Goals of the Replication

The ability to replicate results is an essential component of the scientific process (Zwaan et al., 2017). Following the ongoing science reform, we embarked on a replication of Studies 1 and 4 in Caruso et al. (2008), as well as Study 1 of Caruso (2010). We believe these articles are ideal targets for replication given the importance of the TVA, the impact of the chosen articles, the absence of direct replications, and the accumulating knowledge with failed replications of other similar temporal asymmetry effects (Žeželj & Jokić, 2014; Brodeur et al., 2016). At the time of writing, there were no published direct replications of these studies (to the best of our knowledge). Several papers have subsequently built on these findings, showing that people experience more collective guilt for future harmful events than identical harmful events that occurred in the past, and that people judge a behavior performed in the future as more intentional than when it was performed in the past (Burns, Caruso & Bartel, 2012; Caouette et al., 2012).

TVA effects have potential consequences on our behavior. When it comes to judging monetary value, TVA can influence us more than we are aware of: How much would a jury compensate the victim of an accident? Would it be more beneficial to frame the accident as an event that has already happened, or as an event that could also take place in the future?

Moreover, when it comes to moral judgment, TVA can have a profound influence on individuals and society. For instance, governments may put forward controversial policies knowing that citizens will eventually come to terms with them after their implementation, that is, when they become past events rather than future ones.

2. Method

2.1. Pre-registration and Open-Science

Before launching data collection, the study design, materials, data analysis plans, and sample size calculations were preregistered on the Open Science Framework (https://osf.io/b936n and https://osf.io/peku4; the second preregistration was conducted to address a minor survey bug identified in a pre-test of 20 participants prior to data collection). All data, analyses, and materials are available at https://osf.io/xcy9f/.

In a single data collection round, we conducted two experiments presented in random order. Our first experiment was as a replication combining Studies 1 and 4 in Caruso et al. (2008) on TVA in monetary valuation and our second experiment was a replication of Study 1 in Caruso (2010) on TVA in moral judgment. We summarize a comparison between the original and replication designs in Table 1 and in the Supplementary Materials (p. 37).

Caruso et al. (2008) used a similar design for Studies 1 and 4: Participants in Study 1 were presented a task that they either completed in the past or that they would complete in the future (a self-relevant task), whereas participants in Study 4 were presented the identical task yet with a 2 (relevance: self-relevant vs. self-irrelevant) x 2 (temporal location: past vs. future) between-subjects design. Participants in Study 4 either read a version about themselves (self-relevant) or about others (self-irrelevant), which either took place in the past or would take place in the future. Thus, the only major difference between Study 1 and Study 4 was the introduction

of an additional independent variable regarding self-relevance in Study 4. We could therefore combine the two experiments as a 2 (relevance: self-relevant vs. self-irrelevant) x 2 (temporal location: past vs. future) between-subjects design. To this point, the replication design matched the original experiments in Caruso et al. (2008). Next, we extended the original studies by introducing to our 2 (relevance: self-relevant vs. self-irrelevant) x 2 (temporal location: past vs. future) between-subjects design an additional scenario regarding unfair treatment inspired by Caruso (2010). The unfair treatment scenario aimed to examine a conceptual replication of whether TVA in monetary valuation would extend to moral judgments.

Our second experiment aimed at replicating Study 1 from Caruso (2010). This experiment was about judging the fairness of a Coke machine that charged different prices and was, therefore, unrelated to the experiments in Caruso et al. (2008). Our replication followed the original study, with a single factor (temporal location: past vs. future) between-subjects design. The original study on TVA in moral judgment in Study 1 of Caruso (2010) presented participants with a scenario regarding an unfair treatment to consumers and asked them to rate how fair the treatment was and how angry they felt. We added a similar scenario about unfair treatment in the workplace, which we felt was more relevant to our target sample, Amazon MTurk online workers.

Table 1

Comparison of the original and replication experimental designs

	Original		Replication	Original	Replication
	Study 1 (Caruso et al., 2008)	Study 4 (Caruso et al., 2008)	Studies 1 and 4 combined (Caruso et al., 2008)	Study 1 (Caruso 2010)	Study 1 (Caruso 2010)
Participants	121	182	423	116	423
Design	2x1 Between-subject	2x2 Between-subject	2x2 Between-subject	2x1 Between-subject	2x1 Between-subject
Independent variables	Temporal location (future, past)	- Temporal location (future, past) - Relevance (self, other)	- Temporal location (future, past) - Relevance (self, other)	- Temporal location (future, past)	- Temporal location (future, past)
Dependent variables	Monetary judgment	- Monetary judgment - Emotional intensity (stress)	- Monetary judgment - Emotional intensity (stress) - Moral judgment (A) - Negative emotional intensity (anger) (A)	- Moral judgment (fairness) - Negative emotional intensity	- Moral judgment (fairness) - Negative emotional intensity

Note. Items marked with (A) are additional variables in the extension.

2.2. Power Analysis and Participants

Among the experiments selected for replication, the smallest effect size for TVA was found in Study 1 from Caruso et al. (2008), which was $d = 0.41$. Based on our calculations, at least 312 observations were necessary to detect this effect size with 95% statistical power at a 5% alpha level (see the power analysis in the pre-registration plan for more detailed analyses). Data were collected from 423 participants ($M_{age} = 39.6$, $SD = 11.9$, 45% females) who were recruited from the Amazon MTurk platform and received $0.50 in remuneration. Because we combined Study 1 and Study 4 from Caruso et al. (2008) in one experiment, to avoid overlapping, about half (n = 213)[2] of the total 423 participants responded to the self-relevant scenario in a future or past setting.

We analyzed the data with the full sample for all experiments, which we report here. Exclusions based on the criteria set out in the pre-registration plan, for example a self-reported low proficiency of English, had little to no effect on our findings (see Supplementary Materials, p. 17).

Participants completed the following two experiments in a randomized order.

2.3. Experiment 1: Replication of Caruso et al. (2008) Studies 1 and 4

We combined the two studies into a single 2 (relevance: self-relevant vs. self-irrelevant) x 2 (temporal location: past vs. future) between-subjects design. We presented the same scenario used in both studies 1 and 4 of Caruso et al. (2008), which prompted participants to imagine a

[2] The pre-registration indicated data collection for 312 participants, yet in a later data analysis we realized the analysis was based on a main effect in Caruso et al. (2008) not taking into account the 2x2 introducing self-other design of Caruso (2010). We therefore proceeded to conduct a sensitivity power analysis, which indicated that we had 99% power to detect the original effect size ($d = 0.41$) with a two-tailed alpha of 5%. Only considering the "self" condition, we had 86% power to detect the original effect size ($d = 0.41$) with a two-tailed alpha of 5%.

task that required data entry. Participants either read a version about themselves (self-relevant) or about others (self-irrelevant), which took place either in the past or in the future (other person and past versions in parentheses):

> "Please imagine that you (another person from the United States) previously agreed to do some extra work on a Saturday to make some extra money. The work will take place one month from today (The work took place one month ago), and it entails (entailed) entering data into a computer for 5 hours. No special skills will be (were) required, you (they) will just need (just needed) to input data from a stack of papers into a computer database."

Following the scenario, participants indicated how much money they or the other person should receive for the data-entry task, how difficult they perceived the work to be for themselves (or for the average American), how qualified they perceived themselves (or the average American) to be for this work, and how stressed they (or the average American) would feel about doing this work.[3] All responses were on a 7-point scale (0 = *Not at all*; 6 = *Extremely*).

2.4. Extension to Experiment 1: Conceptual Replication of Moral Judgments

To this point, the replication design matched the original experiments in Caruso et al. (2008). Next, we extended the original studies by introducing to our 2 (relevance: self-relevant vs. self-irrelevant) x 2 (temporal location: past vs. future) between-subjects design an additional scenario regarding unfair treatment inspired by Caruso (2010). The unfair treatment scenario

[3] We asked how stressed the average American would feel about doing such work instead of asking the participants to indicate how stressed they would feel about the Average American doing such work. The exact question was not indicated in Caruso et al. (2008), and we believed this would serve as the strongest contrast between evaluations of self and others. See the Limitations section in the General Discussion for a discussion of this issue.

aimed to examine participants' moral judgments in addition to monetary judgments (other person and past versions in parentheses):

> "Imagine that after agreeing to this work, you (the person) learn (learned) the work will take (took) 1 hour longer than the initially planned 5 hours. You (the person) cannot (could not) withdraw and there will not be (were not) any adjustments made to the final pay."

After this additional unfair treatment scenario, participants were asked to rate the fairness of this situation and to indicate to what extent they (the person) would feel angry (0 = *Not at all*, to 6 = *Extremely*).[4]

2.5. Experiment 2: Replication of Caruso (2010) Study 1

We presented a scenario similar to the one used in Study 1 from Caruso (2010) where participants read about a Coke vending machine that charged different prices depending on the outside temperature. Participants responded either to the situation in which the machine had already been tested (past condition) or will be tested (future condition). The scenario is presented below (past version in parentheses):

> "Next (last) month, the Coca-Cola Company will test (tested) this new vending machine in which the prices of beverages will be (were) positively correlated with the outside temperature, such that on hotter days the machine will (would) automatically raise the

[4] In this replication, we asked to what extent the person would feel angry instead of asking the participant to indicate how angry they would feel regarding the person's unfair situation. The exact self-relevant question was not indicated in Caruso et al. (2008), and we believe this would serve as the strongest contrast between evaluations of self and others. See the Limitations section in the General Discussion for a discussion of this issue.

> price (from USD 1.00 on relatively cold days to USD 3.50 on relatively hot days). The machine has (had) already been developed but the company has (had) not made a final decision about whether to implement the machine beyond this initial test. The test will take (took) place in England."

Following the scenario, participants rated how fair they thought the machine was (0 = *Not at all fair*, to 6 = *Extremely fair*), how cheated, angry, and outraged they felt about the machine (0 = *Not at all*, to 6 = *Extremely*) and what they thought the company cared more about (0 = *Just making a profit*, to 6 = *Treating its customers fairly*), and how believable the scenario was (0 = *Not at all believable*, to 6 = *Very believable*).

Figure 1 illustrates the procedure in the replication (note that the two experiments were presented in a random order for each participant). After being assigned to these two experiments, the survey concluded with demographics questions and debriefing.

Figure 1. Illustration of a potential experimental procedure for a participant. Participants were randomly assigned to one of several sequences, seeing the experiments in random order.

3. Results

3.1. Order effects

The order in which participants completed the experiments did not have an effect on the overall results. Detailed analyses for the order effects are presented in the Supplementary Materials (pp. 3-15).[5]

3.2. Experiment 1: Replication of Caruso et al. (2008) Study 1

Caruso et al. (2008) found support for the hypothesis that individuals would value a self-relevant event more when the event took place in the future (vs. past) in a single factor (future vs. past) between-subjects experiment. We summarized the original and the current findings in Table 2. We failed to find support for differences between past and future valuations of the task. The effect size reported in the original study (p = .03; d = 0.41) was outside the 95% confidence interval of the effect size observed in our replication study ($t(421)$ = -0.22; p = .82; d = 0.03, 95% CI [-0.24, 0.30]). Similar to the original study, we found no support for differences between the past and future conditions regarding participants' perceived task difficulty ($t(421)$ = 0.03; p = .97) and perceived qualification for the task ($t(421)$ = -1.32; p = .19). We conducted a series of exploratory robustness tests testing different outlier criteria on our data, and we summarized these analyses in the Supplementary Materials.[6]

[5]We performed a series of additional ANOVAs including two different measures of experiment order, using the data without exclusions, excluding participants who indicated a value above $200, and z-transforming the dependent variables. See Supplementary Materials pp. 3 – 15 for the complete analyses.

[6] It is possible that some outliers skewed our results and resulted in our failed replication. We want to note that our preregistered analyses – without excluding participants – followed the procedure described in the original article, which did not report exclusions based on the value they indicated. Nonetheless, we wished to give the original results the best chance to successfully replicate. Therefore, we conducted exploratory analyses both by excluding participants who indicated monetary values equal or above $200 (p. 21-27 in the Supplementary Materials) and by z-transforming monetary values and excluding participants who indicated a monetary value 3 SDs above the mean (p. 28- 34). Overall, results were very similar to the preregistered ones regarding statistical significance, effect sizes, and replication interpretation according to LeBel et al (2019). Non-parametric analyses (p. 16 of the Supplementary Materials) also support the results of our preregistered analyses, finding no effect of temporal location for any replication.

Table 2

Comparison of descriptive statistics and findings: Caruso et al. (2008) Study 1 and the replication

Variables	Temporal location				
	Past	Future			
	M (*SD*)	*M* (*SD*)	*p*-value	Cohen's *d*	95% CI
Monetary valuation					
Original study	$62.20 (N/A)	$125.04 (N/A)	.03	0.41	[0.04, 0.76]
Replication	$146.73 ($581.63)	$168.19 ($768.2)	.82	0.03	[-0.24, 0.30]
Difficulty					
Original study	1.83 (N/A)	1.70 (N/A)	.65	0.08	[-0.27, 0.44]
Replication	1.86 (1.48)	1.85 (1.50)	.97	0.01	[-0.27, 0.26]
Qualification					
Original study	4.18 (N/A)	5.05 (N/A)	.30	0.19	[-0.17, 0.55]
Replication	5.18 (1.43)	5.40 (0.99)	.19	0.18	[-0.09, 0.45]

Note. Standard deviations are in parentheses. $ = USD. N/A = not provided in the original study.

3.3. Experiment 1: Replication of Caruso et al. (2008) Study 4

In Study 4, Caruso et al. (2008) found support for the hypothesis that the TVA effect was stronger when people evaluated a self-relevant (vs. self-irrelevant) event. To test this claim in the replication, we ran a 2 (temporal location: past vs. future) x 2 (relevance: self-relevant vs. self-irrelevant) ANOVA using the full sample in the study (N = 423) with monetary valuation, perceived stress, and perceived difficulty as dependent variables. We summarized the ratings and comparison of analysis of variance (ANOVA) results of the original study and replication in Tables 3 and 4, respectively.

Failing to find support for the original findings, we did not detect any differences due to temporal location, relevance, or the interaction of the two on monetary valuation and perceived stress, with effect sizes much smaller than the original ones. Similar to the original study, participants' perceptions about task difficulty were comparable across experimental conditions.

Table 3

Comparison of descriptive statistics: Caruso et al. (2008) Study 4 and the replication

Variables	Temporal location			
	Past		Future	
	Original	Replication	Original	Replication
Self-relevant condition				
Valuation in USD	49.76 (28.75)	146.73 (581.63)	79.67 (64.12)	168.19 (768.23)
Difficulty	2.53 (1.49)	1.86 (1.48)	2.69 (1.58)	1.85 (1.50)
Stress	1.80 (1.41)	1.68 (1.57)	2.91 (1.79)	1.62 (1.73)
Self-irrelevant condition				
Valuation in USD	47.56 (19.66)	74.41 (43.28)	54.15 (24.44)	133.24 (495.52)
Difficulty	2.62 (1.39)	1.61 (1.22)	2.54 (1.26)	1.99 (1.48)
Stress	1.64 (1.37)	1.94 (1.53)	1.85 (1.28)	2.11 (1.68)

Note. Standard deviations are in parentheses.

Table 4

Comparison of findings: Caruso et al. (2008) Study 4 and the replication

Variables	*N*	*p*-value	η_p^2	95% CI
Monetary value				
Relevance				
Original study	182	.02	.03	[0.00, 0.10]
Replication	423	.311	.00	[0.00, 0.02]
Temporal location				
Original study	182	.002	.05	[0.01, 0.13]
Replication	423	.448	.00	[0.00, 0.02]
Relevance * Temporal location				
Original study	182	.04	.02	[0.00, 0.08]
Replication	423	.724	.00	[0.00, 0.01]
Stress				
Relevance				
Original study	182	N/A	N/A	N/A
Replication	423	.017	.01	[0.00, 0.04]
Temporal location				
Original study	182	N/A	N/A	N/A
Replication	423	.731	<.001	[0.00, 0.01]
Relevance * Temporal location				
Original study	182	.04	.02	[0.01, 0.12]
Replication	423	0.460	.001	[0.00, 0.02]

Note. This table reports the effects of temporal location, relevance, and their interaction on monetary value and feelings of stress. N/A = not reported in the original study.

3.4. Extension to Experiment 1: Conceptual Replication of Moral Judgments

We failed to find support for TVA in moral judgment and in negative emotional intensity (Anger). We only found support for a main effect of relevance on feelings of anger, such that participants indicated stronger feelings of anger for others in the self-irrelevant condition (M = 3.71, SE = 0.12) compared with self-relevant condition (M = 2.91, SE = 0.12; $t(419) = 4.73$, $p < .001$, d = 0.46) which is not what we hypothesized but is likely due to the formulation of the question.[7] We summarized the extension findings in Table 5.

Table 5

Experiment 1 extension findings

Dependent variable	Independent variables	Effect size η_p^2 (95% CI)	Summary
Moral judgment (fairness)	Relevance	0.01 [0.00, 0.03]	Not supported
	Temporal location	0.00 [0.00, 0.02]	Not supported
	Relevance x Temporal location interaction	0.008 [0.00, 0.03]	Not supported
Negative emotional intensity	Relevance	0.05 [0.02, 0.10]	Not supported
	Temporal location	0.003 [0.00, 0.02]	Not supported
	Relevance x Temporal location interaction	0.001 [0.00, 0.02]	Not supported

Note. N = 423; Extension of Studies 1 and 4 of Caruso et al. 2008 using a moral judgment scenario applied in Caruso et al. (2010).

3.5. Experiment 2: Replication of Study 1 from Caruso (2010)

In another experiment on TVA effects, Caruso (2010, Study 1) tested whether judgments of fairness were influenced by temporal asymmetry, and found that, relative to the past

[7] This is due to the formulation of our question, asking them to indicate how the person would feel instead of asking the participant himself to indicate how he feels regarding the unfair situation that happened to that person.

condition, participants reported the Coke machine in the scenario to be less fair in the future condition than in the past one. Similarly, participants reported more negative feelings in the future (vs. past) condition. We created an index of participants' negative emotions using the average score of ratings on anger, cheated, and outraged, as these three ratings were reliable (α = 0.88). We summarized our findings in Table 6.

We failed to find support for temporal location as having an effect on fairness judgments, negative emotional intensity, or attribution of a profit motive to the company in question (Coca-Cola). All effects were much smaller than the original ones.

Table 6

Comparison of descriptive statistics and findings: Caruso (2010) Study 1 and the replication

	Time				
	Past	Future	Total		
Original study N	N/A	N/A	116		
Replication N	211	212	423		
Variables	*M* (*SD*)	*M* (*SD*)	*p*-value	*d*	95% CI
Fairness					
Original study	3.34 (1.76)	2.58 (1.75)	< .03	0.43	[0.06, 0.80]
Replication	1.09 (1.50)	1.30 (1.73)	.180	0.13	[-0.06, 0.32]
Negative emotion					
Original study	1.72 (1.64)	2.33 (1.67)	< .05	0.37	[0.003, 0.74]
Replication	4.01 (1.48)	4.01 (1.65)	.959	0.01	[-0.19, 0.20]
Coke's intentions					
Original study	1.02 (N/A)	0.63 (N/A)	.077	0.33	[-0.03, 0.70]
Replication	0.68 (1.21)	0.57 (1.19)	.340	-0.09	[-0.28, 0.10]

Note. Standard deviations are in parentheses. N/A = not provided in the original studies.

4. General Discussion

We conducted two direct and one conceptual replication of two impactful articles on TVA and failed to find support for the original findings. First, we found no support for TVA in monetary judgment in our replication of Studies 1 and 4 in Caruso et al. (2008). Participants did not believe that they deserved more money for their future work than for the identical work completed in the past. We also failed to find support for TVA in moral judgment in our extension of that replication examining moral judgments. Second, we found no support for TVA in moral judgments in our replication of Study 1 in Caruso (2010). Temporal location had little to no effect on evaluations of fairness or negative feelings.

Caruso et al. (2008) argued that the reason for TVA was the differences in emotions, that contemplating work in the future is more emotionally arousing, that is, more stressful, than contemplating identical work in the past. They further argued for stronger emotions (e.g., stress) when contemplating work done by the self than when contemplating work done by others. We also failed to find support for the emotions account.

Overall, effects were inconsistent with the original studies according to the replication evaluation criteria by LeBel et al. (2019). We summarized the comparison of the findings and the overall replication evaluation in Table 7.

Table 7

Evaluation of replication findings: Comparing original and replication.

Original Study	Dependent Variables	Independent Variables	*N*		Effect Size (95% CI)		Replication Summary*
			Original	Replication	Original	Replication	
Study 1 (Caruso et al., 2008)	Monetary judgment	Temporal location	121	211	d = 0.41 [0.04, 0.76]	0.03 [-0.24, 0.30]	No signal - inconsistent
Study 4 (Caruso et al., 2008)	Monetary judgment	Relevance	182	423	η_p^2 = 0.03 [0.00, 0.010]	0.002 [0.00, 0.02]	No signal - inconsistent
		Temporal location	182	423	η_p^2 = 0.05 [0.01, 0.13]	0.001 [0.00, 0.02]	No signal - inconsistent
		Relevance X Temporal location	182	423	η_p^2 = 0.02 [0.00, 0.08]	0.00 [0.00, 0.01]	No signal - inconsistent
	Stress intensity	Relevance X Temporal location	182	423	η_p^2 = 0.02 [0.01, 0.12]	0.00 [0.00, 0.02]	No signal - inconsistent
Caruso (2010)	Moral judgment	Temporal location	116	423	d = 0.43 [0.06 ,0.80]	0.13 [-0.32, 0.06]	No signal - inconsistent
	Negative emotion intensity	Temporal location	116	423	d = 0.37 [0.00, 0.74]	-0.01 [-0.21, 0.19]	No signal - inconsistent

Notes. *Refers to the replication evaluation summary based on LeBel et al. (2019). Table K (p. 27) and Table Q in the Supplementary Materials (p. 33) contain the same interpretations of results after excluding participants in exploratory analyses in two different ways. Results after and before exclusions are overall very similar (see Supplementary Materials, p. 17).

4.1. Participants' Features

Extensive literature suggests that cultural, personal, and demographic factors may affect how an individual feels about the future (Guo et al., 2012; Hilbert et al, 2022; Innocenti et al. 2019; Zhang and Qin, 2021). For example, initial evidence indicated that the future might elicit more emotions for people from the higher social class than less privileged people, yet there are mixed hypotheses and findings. Cooper (2014) found that those from the upper middle class were among the most worried about their financial prospects, despite their financial means. Binder, Davis, and Bloom (2016) found that students in elite schools felt deep discomfort about their future and carried a profound sense of inadequacy when compared to students from other, less privileged schools. Fear of loss and struggle to maintain the status quo may cause negative emotions to be associated with the future for people in a higher social class (Tevington, 2018). After all, if someone is too busy making ends meet today, they would not have time or energy to contemplate the future. Therefore, it is possible that TVA is less obvious in people from lower social classes. In our replication, about 42% of participants reported that they came from a lower, working, or lower middle class, which may be a very different composition than the participants in the original studies, who were individuals from the campus and dining hall of Harvard University, and a study pool in Boston.

On the same note, it could be argued that our choice of demographics may have potentially driven the differences between the original and replication results. The original experiments were conducted in university campuses with undergraduates whereas we conducted our experiments online with MTurk workers. However, we find this explanation unlikely. MTurk samples have been frequently used and have also been shown to be highly reliable in the domain of judgment and decision making, leading to similar results compared to representative samples

from the US (Coppock, 2017; Coppock, Leeper, & Mullinix, 2018), and in replicating results originally obtained with the US college students, even after a considerable time lag (e.g., Ziano, Mok and Feldman 2020; Ziano et al. 2021a, 2021b).

4.2. Robustness of Temporal Location Effects

Researchers in the field have attempted to replicate similar temporal effects and have yielded mixed results. For example, construal level theory suggests that people feel and act based on the construal of an event instead of the event itself (Trope & Liberman, 2010), and that psychologically close events (e.g. self-relevant events compared to self-irrelevant events; present events compared to future or past events) are evaluated by higher-level construal (e.g. universal moral principles) and are less affected by lower-level construal (e.g. contextual features), leading to more extreme moral judgments (Žeželj & Jokić, 2014). To resolve conflicting evidence, Žeželj and Jokić (2014) conducted a replication experiment, yet they found, among others, no systematic effect of temporal location or relevance on moral judgment. Therefore, the current replications, as well as other replications, suggest either published false-positives or that there may be complicated interactions among temporal location, relevance, and judgment. Until a systematic reassessment of this literature is completed, we suggest greater caution in conducting follow-up studies by accounting for weaker effects. We believe that the best approach would be to advance this literature by conducting replications and extensions that would help revisit and confirm original findings and build on those slowly with extensions of only small incremental steps.

4.3. Limitations

In both Caruso et al. (2008) and Caruso (2010), the past/future asymmetries were strong when a between-subjects was used, but much weaker when studied within-subjects. The authors

explained this by arguing that in within-subjects designs, participants themselves did not think that temporal location should affect their judgments. In our replication, we conducted the experiments as described in the original articles, but participants were assigned to several related experiments in random order (see Figure 1). We conducted analyses testing for and controlling for experiment order and found no support for order effects (Supplementary Materials, pp. 3-15). Future replications can build on ours to test each experiment separately or in a between-subjects design.

In this replication, we asked to what extent the person would feel angry instead of asking the participant to indicate how angry they would feel regarding the person's unfair situation. The exact self-relevant question was not indicated in Caruso et al. (2008), and we believe this would serve as the strongest contrast between evaluations of self and others. Future research may attempt to examine the impact of this adjustment using different question wording.

We also made a small procedural change in Experiment 2, changing the location of the described vending machine from Austin Texas to the UK (without specifying the city). This was meant to address our online sample which did not come from any specific city but rather from the USA broadly. Hence, we chose a location in an Anglophone country with which we surmised that participants had some level of familiarity, to fit with our understanding of the logic used in the original's design. Future replications may further test the implications of such adjustments on the phenomenon, with adjustments to geographical location or scope (city-country contrasts).

5. Declarations of Conflict of Interests, Funding, and Authorship

5.1. Declaration of Conflict of Interest:

The author(s) declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

5.2. Financial disclosure/funding:

The research was supported by the Teaching Development Grant by the University of Hong Kong awarded to the corresponding author.

5.3. Authorship declaration:

Florence conducted this project for her master's thesis. She initiated and designed the studies, wrote the pre-registration, ran the initial analyses, and wrote the initial draft as her master's thesis. Gilad was the advisor, supervised each step in the project, conducted the pre-registrations, and ran data collections. Malak, guided and aided by Ignazio and Burak followed up on initial work by Florence and Gilad to verify analyses and conclusions, add analyses, and jointly prepare journal submission manuscript. Gilad provided feedback, guided the process, and finalized the manuscript for submission. The Supplementary Materials (p. 52) contains a table that details individual contributions following CRediT (Contributor Roles Taxonomy) to identify the contribution and roles played by the contributors in the current replication effort.

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Supplementary Materials

Replication: Unsuccessful replications and extensions of Caruso et al. (2008) and Caruso (2010) Temporal Value Asymmetry in monetary valuation and moral judgment

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Order effects

The first sequence operationalized through the variable *Sequence* is the following:

1= Replication of Caruso et al. (2010) followed by Caruso et al. (2008) Study 4
2= Replication of Caruso et al. (2010) followed by Caruso et al. (2008) Study 1
3= Caruso et al. (2008) Study 4 followed by Caruso et al. (2010)
4= Caruso et al. (2008) Study 1 followed by Caruso et al. (2010)

Variable *Sequence*:

1	2	3	4
2010	2010	2008 Study 4	2008 Study 1
2008 Study 4	2008 Study 1	2010	2010
Other	Self	Other	Self

Table 1
Experiment 1: Replication of Caruso et al. (2008) Study 1

Variables	F	p-value	η2
Monetary value			
Temporal location	.04	.84	.00
Sequence	1.40	.23	.00
Sequence * Temporal location	.09	.75	.00
Difficulty			
Temporal location	.00	.99	.00
Sequence	2.28	.13	.01
Sequence * Temporal location	.00	.93	.00
Qualification			
Temporal location	1.75	.18	.00
Sequence	.02	.87	.00
Sequence * Temporal location	.95	.33	.00

Note. This table reports the effects of temporal location, sequence, and their interaction on monetary value, difficulty and qualification.

Table 2
Experiment 1: Replication of Caruso et al. (2008) Study 4

Variables	F	p-value	η2
Monetary value			
Temporal location	.54	.46	.00
Sequence	1.12	.33	.00
Sequence * Temporal location	.18	.90	.00
Difficulty			
Temporal location	1.89	.16	.00
Sequence	.96	.40	.00
Sequence * Temporal location	1.87	.13	.01
Stress			
Temporal location	.10	.74	.00
Sequence	2.28	.07	.01
Sequence * Temporal location	1.40	.24	.01

Note. This table reports the effects of temporal location, sequence, and their interaction on monetary value, difficulty and stress.

Table 3
Extension

Variables	F	p-value	η2
Fairness			
Temporal location	.60	.43	.00
Sequence	1.76	.15	.01
Sequence * Temporal location	1.30	.27	.00
Negative Emotional Intensity			
Temporal location	1.31	.25	.00
Sequence	10.90	<.001	.07
Sequence * Temporal location	.75	.52	.00

Note. This table reports the effects of temporal location, sequence, and their interaction on fairness and negative emotional intensity.

Table 4
Experiment 1: Replication of Study 1 from Caruso (2010)

Variables	F	p-value	η2
Fairness			
Temporal location	1.76	.18	.00
Sequence	.39	.75	.00
Sequence * Temporal location	.07	.97	.00
Negative Emotion			
Temporal location	.00	.99	.00
Sequence	2.09	.10	.01
Sequence * Temporal location	.65	.58	.00
Coke's intention			
Temporal location	.91	.33	.00
Sequence	.27	.84	.00
Sequence * Temporal location	.32	.80	.00

Note. This table reports the effects of temporal location, sequence, and their interaction on fairness, negative emotion and coke's intention.

Due to the fact that the variable sequence includes the relevance (self-other) fixed factor, it was not possible to include the interaction of temporal location, sequence and relevance without encountering singular fit for both tables 3 and 4. This is why we conducted the same analysis again with another sequence that doesn't include relevance.

The second sequence operationalized through the variable *Sequence2* is the following:
1= Replication of Caruso et al. (2010) followed by either Caruso et al. (2008) Study 4 or Caruso et al. (2008) Study 1

2= Replication of Caruso et al. (2008) Study 1 or 4 followed by Replication of Caruso et al. (201)

Variable *Sequence2*:

1		2	
2010	2010	2008 Study 1	2008 Study 4
2008 Study 1	2008 Study 4	2010	2010
Self	Other	Self	Other

Table 5
Experiment 1: Replication of Caruso et al. (2008) Study 1

Variables	F	p-value	η2
Monetary value			
Temporal location	.04	.84	.00
Sequence2	1.40	.23	.00
Sequence2 * Temporal location	.09	.75	.00
Difficulty			
Temporal location	.00	.99	.00
Sequence	2.28	.13	.01
Sequence * Temporal location	.00	.93	.00
Qualification			
Temporal location	1.75	.18	.00
Sequence	.02	.87	.00
Sequence * Temporal location	.95	.33	.00

Note. This table reports the effects of temporal location, sequence2, and their interaction on monetary value, difficulty and qualification.

Table 6
Experiment 1: Replication of Caruso et al. (2008) Study 4

Variables	F	p-value	η2
Monetary value			
Temporal location	.54	.46	.00
Relevance	.99	.31	.00
Sequence2	.57	.45	.00
Sequence2 * Temporal location* Relevance	.41	.52	.00
Difficulty			
Temporal location	1.89	.16	.00
Relevance	.14	.70	.00
Sequence2	2.16	.14	.00
Sequence2 * Temporal location* Relevance	2.03	.15	.00
Stress			
Temporal location	.10	.74	.00
Relevance	5.93	.01	.01
Sequence2	.87	.35	.00
Sequence2 * Temporal location* Relevance	1.40	.24	.00

Note. This table reports the effects of temporal location, sequence2, relevance and their interaction on monetary value, difficulty and stress.

Table 7
Extension

Variables	F	p-value	η2
Fairness			
Temporal location	.60	.43	.00
Relevance	3.37	.06	.00
Sequence2	1.32	.25	.00
Sequence2 * Temporal location * Relevance	.45	.50	.00
Negative Emotional Intensity			
Temporal location	1.31	.25	.00
Relevance	22.91	<.001	.05
Sequence2	.46	.49	.00
Sequence * Temporal location* Relevance	.85	.35	.00

Note. This table reports the effects of temporal location, relevance, sequence2 and their interaction on fairness and negative emotional intensity.

Table 8
Experiment 1: Replication of Study 1 from Caruso (2010)

Variables	F	p-value	η2
Fairness			
Temporal location	1.78	.18	.00
Sequence2	.03	.85	.00
Sequence2 * Temporal location	.13	.70	.00
Negative Emotion			
Temporal location	.00	.97	.00
Sequence2	1.13	.28	.00
Sequence2 * Temporal location	.01	.91	.00
Coke's intention			
Temporal location	.90	.34	.00
Sequence2	.04	.83	.00
Sequence2 * Temporal location	.12	.72	.00

Note. This table reports the effects of temporal location, sequence2, and their interaction on fairness, negative emotion and coke's intention.

The results obtained show that the order in which participants saw the experiments didn't affect our results. None of the interaction of either the variable sequence or sequence 2 with temporal location (or with temporal location and relevance) on monetary value, difficulty, qualification, fairness, stress, negative emotional intensity or coke's intention was significant. The same analysis conducted for the main dataset was conducted for the dataset excluding participants who indicated a price equal or above $200 and yielded the same results.

Analyzing Order Effects excluding participants who indicated a price equal or above $200

Variable *Sequence*:

Table 9
Experiment 1: Replication of Caruso et al. (2008) Study 1

Variables	F	p-value	η2
Monetary value			
Temporal location	3.05	.08	.01
Sequence	3.27	.07	.01
Sequence * Temporal location	.00	.99	.00
Difficulty			
Temporal location	.10	.75	.00
Sequence	2.85	.09	.01
Sequence * Temporal location	.10	.75	.00
Qualification			
Temporal location	1.61	.20	.00
Sequence	.00	.92	.00
Sequence * Temporal location	.60	.43	.00

Note. This table reports the effects of temporal location, sequence, and their interaction on monetary value, difficulty and qualification.

Table 10
Experiment 1: Replication of Caruso et al. (2008) Study 4

Variables	F	p-value	η2
Monetary value			
Temporal location	1.02	.31	.00
Sequence	2.05	.10	.01
Sequence * Temporal location	.93	.42	.00
Difficulty			
Temporal location	.72	.39	.00
Sequence	1.11	.34	.00
Sequence * Temporal location	2.20	.08	.01
Stress			
Temporal location	.00	.94	.00
Sequence	3.64	.01	.02
Sequence * Temporal location	1.20	.30	.00

Note. This table reports the effects of temporal location, sequence, and their interaction on monetary value, difficulty and stress.

Table 11
Extension

Variables	F	p-value	η2
Fairness			
Temporal location	.51	.47	.00
Sequence	1.81	.14	.01
Sequence * Temporal location	1.12	.34	.00
Negative Emotional Intensity			
Temporal location	.57	.44	.00
Sequence	10.82	<.001	.07
Sequence * Temporal location	.88	.44	.00

Note. This table reports the effects of temporal location, sequence, and their interaction on fairness and negative emotional intensity.

Table 12
Experiment 1: Replication of Study 1 from Caruso (2010)

Variables	F	p-value	η2
Fairness			
Temporal location	1.75	.18	.00
Sequence	.09	.96	.00
Sequence * Temporal location	.25	.85	.00
Negative Emotion			
Temporal location	.00	.96	.00
Sequence	1.28	.27	.00
Sequence * Temporal location	.64	.58	.00
Coke's intention			
Temporal location	.61	.43	.00
Sequence	.11	.95	.00
Sequence * Temporal location	.46	.70	.00

Note. This table reports the effects of temporal location, sequence, and their interaction on fairness, negative emotion and coke's intention.

Variable *Sequence2*:

Table 13
Experiment 1: Replication of Caruso et al. (2008) Study 1

Variables	F	p-value	η2
Monetary value			
Temporal location	3.05	.08	.01
Sequence2	3.27	.07	.01
Sequence2 * Temporal location	.00	.99	.00
Difficulty			
Temporal location	.10	.75	.00
Sequence	2.85	.09	.01
Sequence * Temporal location	.10	.75	.00
Qualification			
Temporal location	1.61	.20	.00
Sequence	.00	.92	.00
Sequence * Temporal location	.60	.43	.00

Note. This table reports the effects of temporal location, sequence2, and their interaction on monetary value, difficulty and qualification.

Table 14
Experiment 1: Replication of Caruso et al. (2008) Study 4

Variables	F	p-value	η2
Monetary value			
Temporal location	1.02	.31	.00
Relevance	3.01	.08	.00
Sequence2	1.96	.16	.00
Sequence2 * Temporal location* Relevance	.40	.52	.00
Difficulty			
Temporal location	.72	.39	.00
Relevance	.02	.87	.00
Sequence2	2.67	.10	.00
Sequence2 * Temporal location* Relevance	1.69	.19	.00
Stress			
Temporal location	.00	.94	.00
Relevance	10.13	.00	.02
Sequence2	.83	.36	.00
Sequence2 * Temporal location* Relevance	2.00	.15	.00

Note. This table reports the effects of temporal location, sequence2, relevance and their interaction on monetary value, difficulty and stress.

Table 15
Extension

Variables	F	p-value	η2
Fairness			
Temporal location	.51	.47	.00
Relevance	3.21	.07	.00
Sequence2	1.24	.26	.00
Sequence2 * Temporal location * Relevance	.82	.36	.00
Negative Emotional Intensity			
Temporal location	.57	.44	.00
Relevance	24.76	<.001	.05
Sequence2	.52	.46	.00
Sequence * Temporal location* Relevance	1.36	.24	.00

Note. This table reports the effects of temporal location, relevance, sequence2 and their interaction on fairness and negative emotional intensity.

Table 16
Experiment 1: Replication of Study 1 from Caruso (2010)

Variables	F	p-value	η2
Fairness			
Temporal location	1.75	.18	.00
Sequence2	.03	.86	.00
Sequence2 * Temporal location	.34	.55	.00
Negative Emotion			
Temporal location	.00	.96	.00
Sequence2	.51	.47	.00
Sequence2 * Temporal location	.17	.67	.00
Coke's intention			
Temporal location	.63	.42	.00
Sequence2	.19	.66	.00
Sequence2 * Temporal location	.06	.80	.00

Note. This table reports the effects of temporal location, sequence2, and their interaction on fairness, negative emotion and coke's intention.

Analyzing Order Effects after z-transforming monetary values and excluding participants who indicated values 3 SDs above the mean

Variable *Sequence*:

Table 17
Experiment 1: Replication of Caruso et al. (2008) Study 1

Variables	F	p-value	η2
Monetary value			
Temporal location	.10	.74	.00
Sequence	2.25	.13	.01
Sequence * Temporal location	1.50	.22	.00
Difficulty			
Temporal location	.00	.95	.00
Sequence	3.65	.05	.01
Sequence * Temporal location	.02	.88	.00
Qualification			
Temporal location	1.88	.17	.00
Sequence	.00	.94	.00
Sequence * Temporal location	.83	.36	.00

Note. This table reports the effects of temporal location, sequence, and their interaction on monetary value, difficulty and qualification.

Table 18
Experiment 1: Replication of Caruso et al. (2008) Study 4

Variables	F	p-value	η2
Monetary value			
Temporal location	.78	.37	.00
Sequence	1.90	.12	.01
Sequence * Temporal location	.70	.54	.00
Difficulty			
Temporal location	1.72	.19	.00
Sequence	1.38	.24	.01
Sequence * Temporal location	1.55	.20	.01
Stress			
Temporal location	.08	.77	.00
Sequence	2.48	.06	.01
Sequence * Temporal location	1.27	.28	.00

Note. This table reports the effects of temporal location, sequence, and their interaction on monetary value, difficulty and stress.

Table 19
Extension

Variables	F	p-value	η2
Fairness			
Temporal location	.62	.43	.00
Sequence	1.74	.15	.01
Sequence * Temporal location	1.47	.22	.00
Negative Emotional Intensity			
Temporal location	1.33	.24	.00
Sequence	10.63	<.001	.07
Sequence * Temporal location	.64	.58	.00

Note. This table reports the effects of temporal location, sequence, and their interaction on fairness and negative emotional intensity.

Table 20
Experiment 1: Replication of Study 1 from Caruso (2010)

Variables	F	p-value	η2
Fairness			
Temporal location	1.62	.20	.00
Sequence	.23	.86	.00
Sequence * Temporal location	.08	.97	.00
Negative Emotion			
Temporal location	.00	.96	.00
Sequence	1.94	.12	.01
Sequence * Temporal location	.67	.56	.00
Coke's intention			
Temporal location	1.10	.29	.00
Sequence	.23	.87	.00
Sequence * Temporal location	.57	.63	.00

Note. This table reports the effects of temporal location, sequence, and their interaction on fairness, negative emotion and coke's intention.

Variable *Sequence2*:

Table 21
Experiment 1: Replication of Caruso et al. (2008) Study 1

Variables	F	p-value	η2
Monetary value			
Temporal location	.10	.74	.00
Sequence2	2.25	.13	.01
Sequence2 * Temporal location	1.50	.22	.00
Difficulty			
Temporal location	.00	.95	.00
Sequence	3.65	.05	.01
Sequence * Temporal location	.02	.88	.00
Qualification			
Temporal location	1.88	.17	.00
Sequence	.00	.94	.00
Sequence * Temporal location	.83	.36	.00

Note. This table reports the effects of temporal location, sequence2, and their interaction on monetary value, difficulty and qualification.

We can see here that the results of Table 5 are the same as the results of Table 1 probably because the analysis for Caruso et al. (2008) is conducted after filtering the relevance to only include the self therefore relevance is not included.

Table 22
Experiment 1: Replication of Caruso et al. (2008) Study 4

Variables	F	p-value	η2
Monetary value			
Temporal location	.78	.37	.00
Relevance	1.89	.17	.00
Sequence2	.00	.93	.00
Sequence2 * Temporal location* Relevance	.09	.75	.00
Difficulty			
Temporal location	1.72	.19	.00
Relevance	.06	.79	.00
Sequence2	2.67	.10	.00
Sequence2 * Temporal location* Relevance	1.85	.17	.00
Stress			
Temporal location	.08	.77	.00
Relevance	6.78	.01	.01
Sequence2	.63	.42	.00
Sequence2 * Temporal location* Relevance	3.22	.07	.00

Note. This table reports the effects of temporal location, sequence2, relevance and their interaction on monetary value, difficulty and stress.

Table 23
Extension

Variables	F	p-value	η2
Fairness			
Temporal location	.62	.43	.00
Relevance	3.08	.08	.00
Sequence2	1.13	.28	.00
Sequence2 * Temporal location * Relevance	.47	.49	.00
Negative Emotional Intensity			
Temporal location	1.33	.24	.00
Relevance	22.74	<.001	.05
Sequence2	.46	.49	.00
Sequence * Temporal location* Relevance	.86	.35	.00

Note. This table reports the effects of temporal location, relevance, sequence2 and their interaction on fairness and negative emotional intensity.

Table 24
Experiment 1: Replication of Study 1 from Caruso (2010)

Variables	F	p-value	η2
Fairness			
Temporal location	1.65	.19	.00
Sequence2	.00	.98	.00
Sequence2 * Temporal location	.08	.77	.00
Negative Emotion			
Temporal location	.00	.95	.00
Sequence2	.96	.32	.00
Sequence2 * Temporal location	.01	.91	.00
Coke's intention			
Temporal location	1.09	.29	.00
Sequence2	.19	.65	.00
Sequence2 * Temporal location	.36	.54	.00

Note. This table reports the effects of temporal location, sequence2, and their interaction on fairness, negative emotion and coke's intention.

Additional analyses

Below we report a series of robustness analyses in which we excluded participants based on preregistered criteria. Further, we conducted additional, exploratory analyses excluding participants that indicated monetary values equal or above $200. Overall, our results are robust to such exclusions, but we encourage the reader to delve into our analyses and draw their own conclusions.

Replication of Study 1 from Caruso et al. (2008)

According to George and Mallery (2010), the values for skewness and kurtosis of all relevant dependent variables were considered acceptable, i.e. between -2 to +2, except for monetary valuation (Skewness = 12.0, kurtosis = 152). However, removal of outliers of three standard deviations above and below the mean, and transforming the variable had no impact on our results. Therefore, analyses after excluding outliers and variable transformation for all experiments are reported in the Supplementary Materials for reference. A Mann–Whitney non parametric test confirmed that this result is not due do parametric assumptions, U- = 4985**;** p = .12**).**

Replication of Study 1 from Caruso (2010).

As in the original experiment, believability of the scenario was not different across conditions (M_{past} = 3.03, SD = 1.95; M_{future} = 3.10, SD = 1.93; $t(421) = 0.35$, p = .727, d = 0.03). However, contrary to the original findings, temporal location did not have an effect on the other focal variables, namely fairness perceptions, negative emotions, and beliefs about the brand's intentions (see Table 7 in the main paper). We created an index of participants' negative emotions using the average score of ratings on anger, cheated, and outraged, as these three ratings were highly reliable ($\alpha = 0.88$).

Additional analysis - exclusion based on pre-registration criteria.

The criteria set out in the pre-registration are as follows:
self-report a low proficiency of English (< 5, on a 1-7 scale); or

1. self-report not being serious about filling in the survey (< 4, on a 1-5 scale); or
2. correctly guessed the hypothesis of this study in the funneling section; or
3. failed to pass the attention check (please refer to the paragraph headed "Methods – Materials and Procedures" for details); or
4. failed to complete the survey.

A total of 425 responses were collected; two individuals did not respond to any questions at all and were considered invalid responses. Therefore, there were a total of 423 participants (M = 39.6 years, SD = 11.9 years; 190 females and 233 males) recruited from Amazon Mechanical Turk with remuneration in the United States. Two participants scored too low on their English capability; two participants scored too low on seriousness; one participant scored too low on both English capability and seriousness. Therefore, a total of five responses were excluded in this additional analysis, and a total of 418 participants were included in this additional analysis.
Table B shows the summary of results and effect sizes of analyses after exclusion.

Table B

Summary and comparison of results – before and after exclusion based on criteria set out in the pre-registration

Hypotheses	Dependent variables	Independent Variables	Effect size unit	Effect sizes of replication	
				With exclusion	Without exclusion
1a	Monetary judgment	Temporal location	*d*	0.03 [-0.30,0.24]	0.03 [-0.24, 0.3]
1b	Monetary judgment	Relevance	η_p^2	0.003 [0,0.02]	0.002 [0,0.02]
		Temporal location	η_p^2	0.001 [0,0.02]	0.001 [0,0.02]
		Relevance X Temporal location interaction	η_p^2	0 [0,0.01]	<0.001 [0,0.01]
	Stress	Relevance X Temporal location interaction	η_p^2	0.003 [0,0.02]	0.001 [0,0.02]
2	Moral judgment	Temporal location	*d*	-0.17 [-0.37,0.02]	-0.13 [-0.06,0.32]
	Negative emotion	Temporal location	*d*	-0.002 [-0.19,0.19]	-0.005 [-0.21, 0.19]
3 (extension)	Moral judgment	Relevance	η_p^2	0.008 [0,0.03]	0.008 [0,0.03]
		Temporal location	η_p^2	0.001 [0,0.02]	0.001 [0,0.02]
		Relevance X Temporal location interaction	η_p^2	0.008 [0,0.03]	0.008 [0,0.03]
	Negative emotion	Relevance	η_p^2	0.048 [0.02,0.09]	0.05 [0.02,0.10]
		Temporal location	η_p^2	0.004 [0,0.03]	0.003 [0,0.02]
		Relevance X Temporal location interaction	η_p^2	0.001 [0,0.02]	0.001 [0,0.02]

Additional analysis – transformed variables.

Upon initial examination, certain dependent variables seem to be skewed and violated the assumption of normality. Table C shows the summary of skewness and kurtosis of dependent variables.

Table C

Summary of initial skewness and kurtosis of dependent variables

Statistics	Monetary value	Stress	Moral judgment	Angri-ness	Fair	Negative emotion	Coke's intention
N	423	423	423	423	423	423	423
Mean	130.855	1.837	2.118	3.310	1.196	4.010	0.622
Skewness	12.012	0.664	0.538	-0.422	1.395	-0.767	2.382
Standard error skewness	0.119	0.119	0.119	0.119	0.119	0.119	0.119
Kurtosis	151.654	-0.436	-0.473	-0.741	1.071	-0.060	5.738
Standard error kurtosis	0.237	0.237	0.237	0.237	0.237	0.237	0.237

Extreme outliers of these dependent variables tend to indicate a lack of seriousness (e.g. a participant reported that he believed he deserved $8000 for 5 hours of simple data-entry work); it seems appropriate to exclude them even though we did not include this step in our pre-registration. After removing extreme outliers of three standard deviations above and below the mean, two dependent variables seem to be skewed to the right and violated the assumption of normality. According to George and Mallery (2010), the values for skewness and kurtosis of all dependent variables were considered acceptable, i.e. between -2 to +2, except for monetary valuation (skewness = 12.0, kurtosis = 152) and Coke's intention (Skewness = 2.38, kurtosis = 5.74). Figure A shows the histograms of these two variables after excluding extreme outliers but before transformation.

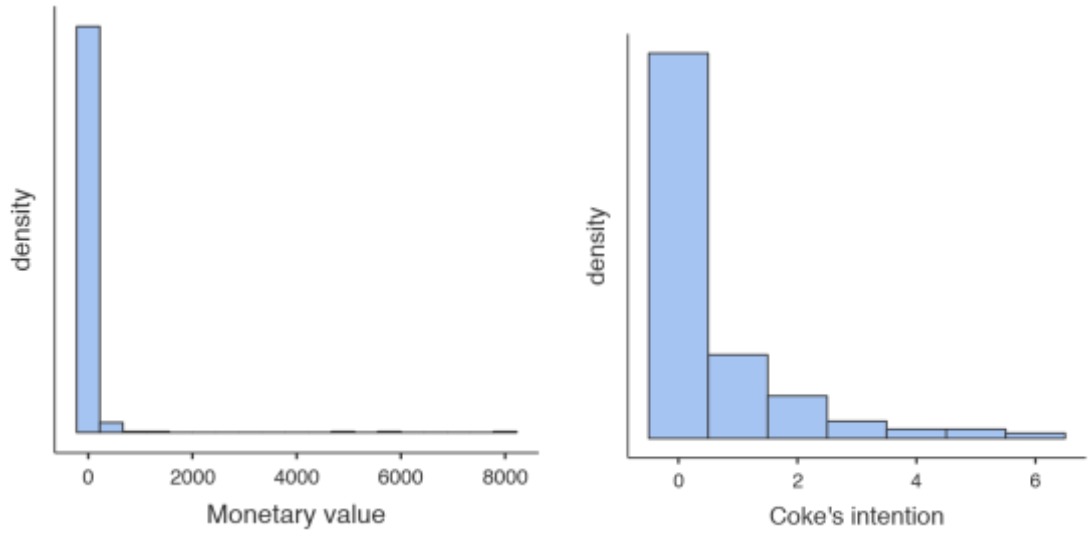


Figure A. Histograms of monetary value and Coke's intention after excluding extreme outliers but before transformation.

Since both variables were still fairly skewed to the right after excluding extreme outliers, we applied the log transformation (i.e. log10(x+1)) consistently on both variables. Table D shows

the summary of skewness and kurtosis of both variables after transformation. Figure B shows the histograms of both variables after excluding extreme outliers and log transformation.

Table D

Summary of skewness and kurtosis of monetary value and Coke's intention after excluding extreme outliers and log transformation

Statistics	Log_Monetary value	Log_Coke's intention
N	410	410
Mean	1.864	0.116
Skewness	-0.158	1.405
Standard error skewness	0.121	0.121
Kurtosis	15.542	0.614
Standard error kurtosis	0.240	0.240

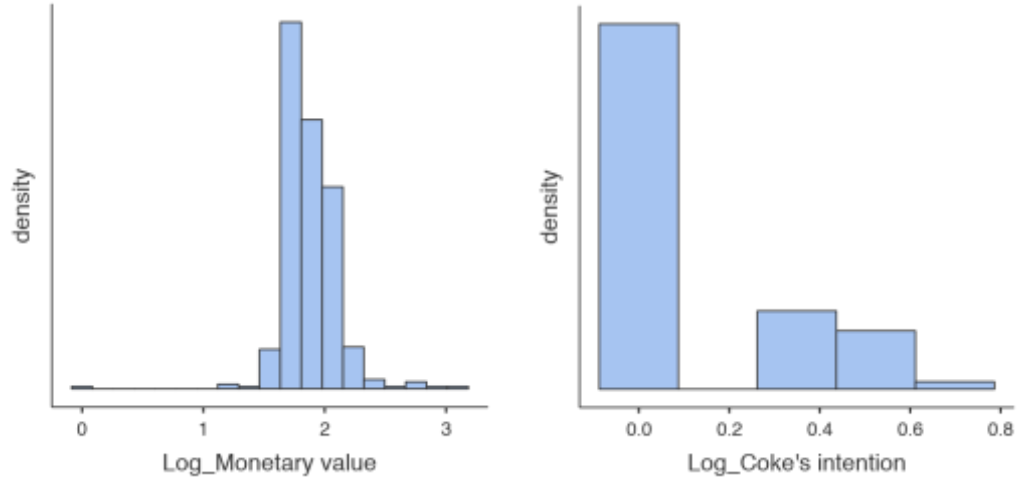


Figure B. Histograms of monetary value and Coke's intention after excluding extreme outliers and log transformation.

As only two dependent variables, namely monetary value and Coke's intention, were involved, we would only conduct analyses relevant to these two variables. Table E shows the summary and comparison of results before and after excluding extreme outliers and log transformation of two dependent variables, i.e. monetary value and Coke's intention.

Table E
Summary and comparison of results – before and after exclusion of extreme outliers and log transformation

Hypotheses	Dependent variables	Independent Variables	Effect size unit	Effect sizes of replication	
				With exclusion	Without exclusion
1a	Monetary judgment	Temporal location	*d*	0.2 [-0.07,0.48]	0.03 [-0.24, 0.3]
1b	Monetary judgment	Relevance	η_p^2	0.01 [0,0.04]	0.002 [0,0.02]
		Temporal location	η_p^2	0.004 [0,0.02]	0.001 [0,0.02]
		Relevance X Temporal location interaction	η_p^2	0.001 [0,0.02]	<0.001 [0,0.01]
	Coke's intention	Temporal location	*d*	0.18 [-0.02,0.37]	0.09 [-0.12,0.34]

Results excluding participants who indicated a price equal or above $200

It is possible that some outliers skewed our results and resulted in our failed replication. We want to note that our preregistered analyses – without excluding participants – followed the procedure described in the original article, which did not report exclusions based on the value they indicated. Nonetheless, we wish to give the original results the best chance, therefore we conducted the following exploratory analyses. The following analyses were performed by excluding participants who indicated a monetary value equal or above $200 in the replication of Study 1 of Caruso et al. (2008). We chose this level as the 25th percentile is $50, the median value is $75, and the 75th percentile is $100. A value of $200 corresponds to the 95th percentile. This allows us to retain most of the data (in fact, about 95%), while excluding values that are prima facie implausible (for instance, the 99th percentile corresponds to $734, which is quite high for such an amount of work). Of course, the decision of designating certain values as "implausible" and to retain a certain percentage of values is arbitrary, but as we did not preregister an exclusion rule, we have to make one of such choices. We encourage the reader to not just consider this analyses, but the other possible specification of this analysis, and to consider the results of this paper in its entirety.

Overall, results are similar to the ones reported in the main manuscript. Compared to the results without excluding participants who indicated a price equal or above $200, there is no change in statistical significance, and effect sizes are quite similar to the analyses without excluding participants. The only change is in the interpretation of the replication, for which the monetary value results from Study 1 from Caruso et al. (2008) go from being "No signal-inconsistent" to "No signal – consistent" according to LeBel et al (2019) interpretation (see Table K below).

Replication of Study 1 from Caruso et al. (2008) excluding participants who indicated a price equal or above $200

In Study 1, Caruso et al. (2008) found support for the hypothesis that individuals would value a self-relevant event more when the event took place in the future (vs. past) in a single factor (future vs. past) between-subjects experiment. Because we combined Study 1 and Study 4 from Caruso et al. (2008) in one experiment to avoid overlapping, about half (*n = 202*) of the total participants after removing those who indicated a valuation higher than 200$ responded to the self-relevant scenario in a future or past setting. As seen in Table 3, we did not observe any differences between past and future valuations of the task. The effect size reported in the original study (p = .03; d = 0.41) was outside the 95% confidence interval of the effect size observed in the replication study ($t(200)$ = -.1.72; p = .09; d = 0.24, 95% CI [-0.04, 0.52]). Similar to the original study, there were no differences between the past and future conditions regarding participants' perceived task difficulty ($t(200)$ = .33; p = .73) and perceived qualification for the task ($t(200)$ = -1.27; p = .20).

The results did not support that participants believed (a) certain work to be more difficult in the future than in the past, or that (b) they were more qualified to do the work in the future than in the past.

Table F

Comparison of original results and replication of Study 1 of Caruso et al. (2008) excluding participants who indicated a price equal or above $200

Variables	Temporal location				
	Past	Future			
	M (*SD*)	*M* (*SD*)	*p*-value	Cohen's *d*	95% CI
Monetary valuation					
Original study	$62.20 (N/A)	$125.04 (N/A)	.03*	0.41	[0.04, 0.76]
Replication	$73.28 ($30.18)	$80.94 ($32.93)	.09	0.24	[-0.04, 0.52]
Difficulty					
Original study	1.83 (N/A)	1.70 (N/A)	.65*	0.08	[-0.27, 0.44]
Replication	1.77 (1.33)	1.71 (1.37)	.74	0.05	[-0.23, 0.32]
Qualification					
Original study	4.18 (N/A)	5.05 (N/A)	.30*	0.19	[-0.17, 0.55]
Replication	5.18 (1.45)	5.40 (1.00)	.21	0.18	[-0.10, 0.46]

Note. Standard deviations are in parentheses. $ = USD. N/A = not provided in the original study. **p* values were rounded to two decimal places in the original study.

Replication of Study 4 from Caruso et al. (2008) excluding participants who indicated a price equal or above $200

In Study 4, Caruso et al. (2008) found support for the hypothesis that temporal value asymmetry effect was stronger when people valuated a self-relevant (vs. self-irrelevant) event. To test this claim in the replication, we ran a 2 (temporal location: past vs. future) x 2 (relevance: self-relevant vs. self-irrelevant) ANOVA using the full sample in the study (N = 406) after removing those who indicated a valuation higher than 200$ with monetary valuation, perceived stress, and perceived difficulty as dependent variables. Tables 4 and 5 summarize the ratings and comparison of analysis of variance (ANOVA) results of the original study and replication, respectively. As seen in Table 5, contrary to the original findings, we did not observe any significant effects of temporal location, relevance, or the interaction of the two on monetary valuation. We did not observe significant effects either of temporal location or the interaction of temporal location and monetary valuation on perceived stress. However, we observed a significant effect or relevance on perceived stress, which is not what we expected in our hypothesis but is due to the formulation of the question itself, asking participants to indicate how stressed the person would feel instead of asking the participant himself to indicate how he feels regarding the situation that happened to that person. Similar to the original study, participants' perceptions about task difficulty were similar across experimental conditions.

Table G

Comparison of ratings - original and replication of Study 4 of Caruso et al. (2008) excluding participants who indicated a price equal or above $200

Variables	Temporal location of work			
	Past		Future	
	Original	Replication	Original	Replication
Self-relevant condition				
Valuation (USD)	49.76 (28.75)	73.3 (3.21)	79.67 (64.12)	80.9 (3.18)
Difficulty	2.53 (1.49)	1.77 (.13)	2.69 (1.58)	1.71 (.13)
Stress	1.80 (1.41)	1.57 (.15)	2.91 (1.79)	1.46 (.15)
Self-irrelevant condition				
Valuation (USD)	47.56 (19.66)	72.2 (3.15)	54.15 (24.44)	71.0 (3.18)
Difficulty	2.62 (1.39)	1.62 (.13)	2.54 (1.26)	1.90 (.13)
Stress	1.64 (1.37)	1.93 (.15)	1.85 (1.28)	2.07 (.15)

Note. Standard errors are in parentheses.

Table H

Comparison of results - original and replication of Study 4 of Caruso et al. (2008) excluding participants who indicated a price equal or above $200

Variables	N	p-value	η_p^2	95% CI
Monetary value				
Relevance				
Original study	182	.02*	.03	[0.00, 0.10]
Replication	404	.09	.00	[0.00, 0.05]
Temporal location				
Original study	182	.002*	.05	[0.01, 0.13]
Replication	404	.32	.00	[0.00, 0.02]
Relevance*Temporal location				
Original study	182	.04*	.02	[0.00, 0.08]
Replication	404	.16	.00	[0.00, 0.04]
Stress				
Relevance				
Original study	182	N/A	N/A	N/A
Replication	404	.00	.02	[0.00, 0.02]
Temporal location				
Original study	404	N/A	N/A	N/A
Replication	404	.93	<.001	[0.00, 0.00]
Relevance*Temporal location				
Original study	182	.04*	.02	[0.01, 0.12]
Replication	404	0.42	.002	[0.00, 0.02]

Note. This table reports the effects of temporal location, relevance, and their interaction on monetary value and feelings of stress. N/A = not reported in the original study. *p values were rounded to two decimal places in the original study.

Extension

We failed to find support for temporal value asymmetry in moral judgment and in negative emotional intensity. As seen in Table 6, the only significant effect was observed for the main effect of relevance on feelings of anger, such that participants indicated stronger feelings of anger for others in the others-relevant condition (M = 3.73, SE = 0.12) compared with self-relevant condition (M = 2.89, SE = 0.12; $t(406) = 4.94$, $p < .001$, $d = 0.49$) which is not what we expected in our hypothesis but is due to the formulation of the question itself.[1]

[1] This is due to the formulation of our question, asking them to indicate how the person would feel instead of asking the participant himself to indicate how he feels regarding the unfair situation that happened to that person.

Table I
Extension results excluding participants who indicated a price equal or above $200

Study	Dependent variable	Independent variables	N	Effect size (95% CI)	Extension summary
Extension of studies 1 and 4 of Caruso et al. 2008 using a moral judgment scenario applied in Caruso et al. (2010)	Moral judgment (fairness)	Relevance	404	η_p^2 0.008 [0.00, 0.05]	Not supported
		Temporal location	404	η_p^2 0.001 [0.00, 0.01]	Not supported
		Relevance X Temporal location interaction	404	η_p^2 0.006 [0.00, 0.05]	Not supported
	Negative emotional intensity	Relevance	404	η_p^2 0.06 [0.09, 0.21]	Supported
		Temporal location	404	η_p^2 0.001 [0.00, 0.02]	Not supported
		Relevance X Temporal location interaction	404	η_p^2 0.002 [0.00, 0.04]	Not supported

Replication of Study 1 from Caruso (2010) excluding participants who indicated a price equal or above $200

In another experiment on temporal value asymmetry effects, Caruso (2010, Study 1) tested whether judgments of fairness were influenced by temporal asymmetry and found that, relative to the past condition, participants reported the Coke machine in the scenario to be less fair in the future condition than in the past one. Similarly, participants reported more negative feelings in the future (vs. past) condition. We created an index of participants' negative emotional intensity using the average score of ratings on anger, cheated, and outraged, which showed high reliability ($\alpha = .88$). We could not replicate any of these results, as reported in Table 7. All the effect sizes we found were much smaller than the original ones and not statistically significant. Temporal location did not seem to have a statistically significant effect on fairness judgments, negative emotional intensity, or attribution of a profit motive to the company in question (Coca-Cola).

Table J
Comparison of results - original and replication of Study 1 of Caruso (2010) excluding participants who indicated a price equal or above $200

	Temporal location					
	Past	Future				
N			Total			
Original study	N/A	N/A	116			
Replication	202	202	404			
Variables	M (SD)	M (SD)		p-value	Cohen's *d*	95% CI
Fairness						
Original study	3.34 (1.76)	2.58 (1.75)		<.03*	0.43	[0.06, .80]
Replication	1.04 (1.43)	1.25 (1.68)		.18	0.13	[-0.06, 0.33]
Negative emotion						
Original study	1.72 (1.64)	2.33 (1.67)		<.05*	0.37	[0.003, 0.74]
Replication	4.01 (1.46)	4.01 (1.63)		.97	0.00	[-0.19, 0.20]
Coke's intentions						
Original study	1.02 (N/A)	0.63 (N/A)		.077	0.33	[-0.03, 0.70]
Replication	0.61 (1.11)	0.52 (1.12)		.42	0.07	[-0.11, 0.27]

Note. Standard deviations are in parentheses. N/A = not provided in the original studies. **p*-values were rounded to two decimal places in the original study. Cohen's d are provided as absolute values.

Table K

Summary and comparison of results – all original and replication studies, excluding participants who indicated a monetary value equal or above $200 in the replication of Caruso et al. 2008

Original study	Dependent variables	Independent Variables	n		Effect size unit	Effect size (95% CI)		Replication summary*
			Original study	Replication		Original study	Replication	
Study 1 (Caruso et. al 2008)	Monetary judgment	Temporal location	121	202	d	0.41 [0.04, 0.76]	0.24 [-0.04, 0.52]	No signal - consistent
Study 4 (Caruso et al. 2008)	Monetary judgment	Relevance	182	404	η_p^2	0.03 [0.00, 0.010]	0.00 [0.00, 0.05]	No signal - consistent
		Temporal location	182	404	η_p^2	0.05 [0.01, 0.13]	0.00 [0.00, 0.02]	No signal - inconsistent
		Relevance X Temporal location Interaction	182	404	η_p^2	0.02 [0.00, 0.08]	0.00 [0.00, 0.04]	No signal - consistent
	Stress intensity	Relevance X Temporal location interaction	182	404	η_p^2	0.02 [0.01, 0.12]	0.00 [0.00, 0.02]	Signal - consistent
Caruso (2010)	Moral judgment	Temporal location	116	404	d	0.43 [0.06 ,0.80]	0.13 [-0.06, 0.33]	No signal - inconsistent
	Negative emotion intensity	Temporal location	116	404	d	0.37 [0.00, 0.74]	0.00 [-0.19, 0.20]	No signal - inconsistent

Notes. *Refers to replication evaluation summary based on LeBel et al. (2019).

Results obtained by z-transforming monetary value

These analyses have the same objectives as the exploratory analyses we conducted excluding participants who indicated monetary values equal or above $200. It is possible that some outliers skewed our results and resulted in our failed replication. We want to note that our preregistered analyses – without excluding participants – followed the procedure described in the original article, which did not report exclusions based on the value they indicated. Nonetheless, we wish to give the original results the best chance, therefore we conducted the following exploratory analyses. The following analyses were performed after z transforming monetary value and excluding participants who reported a monetary value of three standard deviations above the mean. Overall, results are similar to the ones reported in the main manuscript, when looking at effect sizes, statistical significance, and their interpretation as a replication result following LeBel et al (2019).

Replication of Study 1 from Caruso et al. (2008) after z-transforming monetary values and excluding participants who indicated values 3 SDs above the mean

In Study 1, Caruso et al. (2008) found support for the hypothesis that individuals would value a self-relevant event more when the event took place in the future (vs. past) in a single factor (future vs. past) between-subjects experiment. Because we combined Study 1 and Study 4 from Caruso et al. (2008) in one experiment to avoid overlapping, about half (*n = 211*) of the total participants after removing those who reported monetary value of three standard deviations above the mean responded to the self-relevant scenario in a future or past setting. As seen in Table 3, we did not observe any differences between past and future valuations of the task. The effect size reported in the original study (p = .03; d = 0.41) was outside the 95% confidence interval of the effect size observed in the replication study ($t(209)$ = -.27; p = .79; d = 0.04, 95% CI [-0.23, 0.31]). Similar to the original study, there were no differences between the past and future conditions regarding participants' perceived task difficulty ($t(209)$ = -.009; p = .99) and perceived qualification for the task ($t(209)$ = -1.38; p = .17).
The results did not support that participants believed (a) certain work to be more difficult in the future than in the past, or that (b) they were more qualified to do the work in the future than in the past. Additional analyses are available in the Supplementary Materials.

Table M

Comparison of original results and replication of Study 1 of Caruso et al. (2008) after z-transforming monetary values and excluding participants who indicated values 3 SDs above the mean

Variables	Temporal location				
	Past	Future			
	M (*SD*)	*M* (*SD*)	*p*-value	Cohen's *d*	95% CI
Monetary valuation					
Original study	$62.20 (N/A)	$125.04 (N/A)	.03*	0.41	[0.04, 0.76]
Replication	$90.98 ($94.75)	$94.30 ($78.24)	.78	0.04	[-0.23, 0.31]
Difficulty					
Original study	1.83 (N/A)	1.70 (N/A)	.65*	0.08	[-0.27, 0.44]
Replication	1.82 (1.43)	1.82 (1.48)	.99	0.001	[-0.27, 0.27]
Qualification					
Original study	4.18 (N/A)	5.05 (N/A)	.30*	0.19	[-0.17, 0.55]
Replication	5.18 (1.44)	5.42 (0.98)	.17	0.19	[-0.08, 0.46]

Note. Standard deviations are in parentheses. $ = USD. N/A = not provided in the original study. **p* values were rounded to two decimal places in the original study.

Replication of Study 4 from Caruso et al. (2008) after z-transforming monetary values and excluding participants who indicated values 3 SDs above the mean

In Study 4, Caruso et al. (2008) found support for the hypothesis that temporal value asymmetry effect was stronger when people valuated a self-relevant (vs. self-irrelevant) event. To test this claim in the replication, we ran a 2 (temporal location: past vs. future) x 2 (relevance: self-relevant vs. self-irrelevant) ANOVA using the full sample in the study (N = 420) after removing those who reported monetary valuation of three standard deviations above the mean with monetary valuation, perceived stress, and perceived difficulty as dependent variables. Tables 4 and 5 summarize the ratings and comparison of analysis of variance (ANOVA) results of the original study and replication, respectively. As seen in Table 5, contrary to the original findings, we did not observe any significant effects of temporal location, relevance, or the interaction of the two on monetary valuation. We did not observe significant effects either of temporal location or the interaction of temporal location and monetary valuation on perceived stress. However, we observed a significant effect or relevance on perceived stress, which is not what we expected in our hypothesis but is due to the formulation of the question itself, asking participants to indicate how stressed the person would feel instead of asking the participant himself to indicate how he feels regarding the situation that happened to that person. Similar to the original study, participants' perceptions about task difficulty were similar across experimental conditions.

Table N

Comparison of ratings - original and replication of Study 4 of Caruso et al. (2008) after z-transforming monetary values and excluding participants who indicated values 3 SDs above the mean

Variables	Temporal location of work			
	Past		Future	
	Original	Replication	Original	Replication
Self-relevant condition				
Valuation (USD)	49.76 (28.75)	91.0 (8.82)	79.67 (64.12)	94.3 (8.77)
Difficulty	2.53 (1.49)	1.82 (.14)	2.69 (1.58)	1.82 (.14)
Stress	1.80 (1.41)	1.64 (.16)	2.91 (1.79)	1.58 (.16)
Self-irrelevant condition				
Valuation (USD)	47.56 (19.66)	74.4 (8.82)	54.15 (24.44)	86.4 (8.86)
Difficulty	2.62 (1.39)	1.61 (.14)	2.54 (1.26)	1.95 (.14)
Stress	1.64 (1.37)	1.94 (.16)	1.85 (1.28)	2.09 (.16)

Note. Standard errors are in parentheses.

Table O

Comparison of results - original and replication of Study 4 of Caruso et al. (2008) - after z-transforming monetary values and excluding participants who indicated values 3 SDs above the mean

Variables	N	p-value	η_p^2	95% CI
Monetary value				
Relevance				
Original study	182	.02*	.03	[0.00, 0.10]
Replication	420	.17	.00	[0.00, 0.04]
Temporal location				
Original study	182	.002*	.05	[0.01, 0.13]
Replication	420	.38	.00	[0.00, 0.02]
Relevance*Temporal location				
Original study	182	.04*	.02	[0.00, 0.08]
Replication	420	.62	.00	[0.00, 0.00]
Stress				
Relevance				
Original study	182	N/A	N/A	N/A
Replication	420	.01	.01	[0.01, 0.09]
Temporal location				
Original study	404	N/A	N/A	N/A
Replication	420	.77	<.001	[0.00, 0.00]
Relevance*Temporal location				
Original study	182	.04*	.02	[0.01, 0.12]
Replication	420	0.53	.00	[0.00, 0.01]

Note. This table reports the effects of temporal location, relevance, and their interaction on monetary value and feelings of stress. N/A = not reported in the original study. **p* values were rounded to two decimal places in the original study.

Extension

We failed to find support for temporal value asymmetry in moral judgment and in negative emotional intensity. As seen in Table 6, the only significant effect was observed for the main effect of relevance on feelings of anger, such that participants indicated stronger feelings of anger for others in the others-relevant condition (M = 3.70, SE = 0.12) compared with self-relevant condition (M = 2.90, SE = 0.12; $t(418) = -4.71$, $p < .001$, $d = 0.49$) which is not what we expected in our hypothesis but is due to the formulation of the question itself.[2]

Table P

Extension results - after z-transforming monetary values and excluding participants who indicated values 3 SDs above the mean

Study	Dependent variable	Independent variables	N	Effect size (95% CI)		Extension summary
Extension of studies 1 and 4 of Caruso et al. 2008 using a moral judgment scenario applied in Caruso et al. (2010)	Moral judgment (fairness)	Relevance	420	η_p^2	0.007 [0.00, 0.05]	Not supported
		Temporal location	420	η_p^2	0.001 [0.00, 0.01]	Not supported
		Relevance X Temporal location interaction	420	η_p^2	0.009 [0.00, 0.06]	Not supported
	Negative emotional intensity	Relevance	420	η_p^2	0.05 [0.08, 0.20]	Supported
		Temporal location	420	η_p^2	0.003 [0.00, 0.03]	Not supported
		Relevance X Temporal location interaction	420	η_p^2	0.001 [0.00, 0.01]	Not supported

Replication of Study 1 from Caruso (2010) after z-transforming monetary values and excluding participants who indicated values 3 SDs above the mean

In another experiment on temporal value asymmetry effects, Caruso (2010, Study 1) tested whether judgments of fairness were influenced by temporal asymmetry and found that, relative to the past condition, participants reported the Coke machine in the scenario to be less fair in the future condition than in the past one. Similarly, participants reported more negative feelings in the future (vs. past) condition. We created an index of participants' negative

[2] This is due to the formulation of our question, asking them to indicate how the person would feel instead of asking the participant himself to indicate how he feels regarding the unfair situation that happened to that person.

emotional intensity using the average score of ratings on anger, cheated, and outraged, which showed high reliability (α = .88). We could not replicate any of these results, as reported in Table 7. All the effect sizes we found were much smaller than the original ones and not statistically significant. Temporal location did not seem to have a statistically significant effect on fairness judgments, negative emotional intensity, or attribution of a profit motive to the company in question (Coca-Cola).

Table Q

Comparison of results - original and replication of Study 1 of Caruso (2010) - after z-transforming monetary values and excluding participants who indicated values 3 SDs above the mean

	Temporal location				
	Past	Future			
N			Total		
Original study	N/A	N/A	116		
Replication	211	212	420		
Variables	M (SD)	M (SD)	p-value	Cohen's *d*	95% CI
Fairness					
Original study	3.34 (1.76)	2.58 (1.75)	<.03*	0.43	[0.06, .80]
Replication	1.07 (1.47)	1.27 (1.70)	.20	0.13	[-0.07, 0.32]
Negative emotion					
Original study	1.72 (1.64)	2.33 (1.67)	<.05*	0.37	[0.003, 0.74]
Replication	4.00 (1.48)	4.01 (1.65)	.94	0.00	[-0.18, 0.20]
Coke's intentions					
Original study	1.02 (N/A)	0.63 (N/A)	.077	0.33	[-0.03, 0.70]
Replication	0.65 (1.16)	0.53 (1.15)	.29	0.10	[-0.08, 0.29]

Note. Standard deviations are in parentheses. N/A = not provided in the original studies. **p*-values were rounded to two decimal places in the original study

Table R

Summary and comparison of results – all original and replication studies, after z-transforming monetary values and excluding participants who indicated values 3 SDs above the mean

Original study	Dependent variables	Independent Variables	n		Effect size unit	Effect size (95% CI)		Replication summary*
			Original study	Replication		Original study	Replication	
Study 1 (Caruso et. al 2008)	Monetary judgment	Temporal location	121	211	d	0.41 [0.04, 0.76]	0.04 [-0.23, 0.31]	No signal - inconsistent
Study 4 (Caruso et al. 2008)	Monetary judgment	Relevance	182	420	η_p^2	0.03 [0.00, 0.010]	0.00 [0.00, 0.04]	No signal - consistent
		Temporal location	182	420	η_p^2	0.05 [0.01, 0.13]	0.00 [0.00, 0.02]	No signal - inconsistent
		Relevance X Temporal location Interaction	182	420	η_p^2	0.02 [0.00, 0.08]	0.00 [0.00, 0.00]	No signal - consistent
	Stress intensity	Relevance X Temporal location interaction	182	420	η_p^2	0.02 [0.01, 0.12]	0.00 [0.00, 0.01]	Signal - inconsistent
Caruso (2010)	Moral judgment	Temporal location	116	420	d	0.43 [0.06 ,0.80]	0.13 [-0.07, 0.32]	No signal - inconsistent
	Negative emotion intensity	Temporal location	116	420	d	0.37 [0.00, 0.74]	0.00 [-0.18, 0.20]	No signal - inconsistent

Notes. *Refers to replication evaluation summary based on LeBel et al. (2019).

Results of Caruso et al (2008) Experiment 1 replication at different levels of exclusions

Table S

Results of Caruso et al (2008) experiment 1 replication at different levels of exclusion

Variable Values	Temporal Location		t	df	p	Cohen's d	95% CI	skewness	kurtosis
	Past M (SD)	Future *M (SD)*							
≤ $500	84.2 (64.3) (*n* = 104)	94.3 (78.2) (*n* = 106)	1.02	208	.307	0.14	[-0.13, 0.41]	4.05	19.05
≤ $350	80.1 (49.7) (*n* = 103)	82.5 (36.3) (*n* = 103)	0.39	204	.698	0.05	[-0.22, 0.32]	2.73	10.43
≤ $250	73.3 (30.2) (n = 100)	82.5 (36.3) (n = 103)	1.96	201	.051	0.23	[-0.05, 0.51]	1.66	4.22
≤ $150	70.7 (24.3) (n = 98)	78.6 (28.5) (n = 100)	2.09	196	.038	0.30	[0.02, 0.58]	0.73	0.29
≤ $100	68.5 (21.0) (n = 95)	71.6 (21.2) (n = 89)	1.01	182	.315	0.15	[-0.14, 0.44]	0.12	-1.02
≤ $85	59.5 (14.1) (n = 74)	60.5 (13.5) (n = 64)	0.42	136	.677	0.07	[-0.26, 0.40]	-0.31	-0.38

Note: we do not believe that the analysis below is the analysis that produces the best results, but we performed it in order to respond to a reviewer observation . In order to analyze this data, it is better to apply the methods that we detailed above (outlier removal, z-transformation, non-parametric testing), as they have a more solid backing in the literature.
Preregistration

Target articles of replication:

1. Study 1 and 4 from Caruso, Gilbert and Wilson (2008)
2. Study 1 from Caruso (2010)

Caruso, Gilbert and Wilson (2008) proposed that people rate a future event higher in monetary value than the identical event occurred in the past, which is referred to as the **"temporal value asymmetry (TVA)"**. Caruso (2010) further proposed that TVA also extends to moral judgment, which means people may judge a certain moral behavior as being more moral (and an immoral behavior as being more immoral) if it is yet to occur in the future than if it had already occurred in the past.

Caruso (2010) proposed that the reason for such a judgment bias is that people make judgments partly based on emotions, and future events evoke more intense emotions (e.g. stressed, feeling being treated unfairly etc.) than equivalent past events, therefore people make more extreme judgments regarding future events.

The aim of this study is to replicate the effects of three experiments:

- Experiment 1 (future vs past X self vs other) is a replication of Study 1 and Study 4 in Caruso, Gilbert and Wilson (2008).

- Experiment 2 (coke vending machine scenario) is a replication of Study 1 in Caruso (2010).

Hypotheses

Experiment 1

We expect participants to report they a) deserve more money and b) feel more stressed for future work done by themselves than for the identical work done in the past. We also expect participants to report another person a) deserves the same amount of money and b) feel equally stressed for his or her future or past work.

Experiment 2

We expect participants to regard an unethical commercial decision as a) more unfair and b) have more negative emotions (feeling cheated, angry and outraged) if it is described as a future event rather than a past event.

Extension

As experiment 1 (study 1 and 4 in Caruso et. al. 2008) is about TVA in terms of monetary value while experiment 2 is about TVA in moral judgment. We will add two dependent variables (judgment in moral value and negative emotion) in experiment 1 to tie the whole replication. We expect participants to rate a future unfair treatment as more unfair and feel angrier about it than an equivalent unfair treatment in the past.

Methods

Table T
Design in the original articles

	Study 1 from Caruso et. al. 2008	**Study 4 from Caruso et. al. 2008**	**Study 1 from Caruso 2010**
Design	between-subject, 2X1 design	between-subject, 2X2 design	between-subject, 2X1 design
Independent variables (IVs)	future work VS past work	future work VS past work	future unethical decision VS past unethical decision
		work done by self VS work done by other	
Dependent variables (DVs):	judgment in monetary value	judgment in monetary value	moral judgment
		intensity of negative emotion	intensity of negative emotion

Table U
Design in the replication

	Experiment 1 (Study 1 &4 from Caruso et. al. 2008 + extension)	**Experiment 2 (Study 1 from Caruso 2010)**
Design	2X2 design	2X1 design
Ivs	future work VS past work	future unethical decision VS past unethical decision
	work done by self VS work done by other	
DVs	judgment in monetary value	moral judgment
	intensity of negative emotion	intensity of negative emotion
	moral judgment (extension)	

Mixed design in the replication

As each participants will be assigned to either past or future conditions in both experiments, this will be a between-subject (participants assigned to past conditions vs participants assigned to future conditions) and within-subject (each participants will be assigned to do two experiments) design.

Results from the original articles

Study 1 from Caruso et. al. 2008

Sample size	121
Exclusion	Not reported
Age	Not reported
Gender	Not reported
Location	Recruited on the Harvard University campus
Statistical results	Extracted from the original article (p.797), except for the calculated confidence interval (CI): Participants believed that they should receive 101% more money for work they would do one month in the future (M = $125.04) than for the same work they had done one month ago (M = $ 62.20), t (119) = 2.22, p = .03, d = 0.41, 95% CI [0.04, 0.77]
Effect size	d = 0.41, 95% CI [0.04, 0.77]

Study 4 from Caruso et. al. 2008

<table>
<tr><td>Reported statistics</td><td>
TABLE 2
Ratings of Past and Future Events in Study 4
<table>
<tr><th></th><th colspan="2">Temporal location of work</th></tr>
<tr><th>Rating</th><th>Past</th><th>Future</th></tr>
<tr><td>Self-relevant condition</td><td></td><td></td></tr>
<tr><td>Valuation (in U.S. dollars)*</td><td>49.76 (28.75)</td><td>79.67 (64.12)</td></tr>
<tr><td>Difficulty</td><td>2.53 (1.49)</td><td>2.69 (1.58)</td></tr>
<tr><td>Stress*</td><td>1.80 (1.41)</td><td>2.91 (1.79)</td></tr>
<tr><td>Self-irrelevant condition</td><td></td><td></td></tr>
<tr><td>Valuation</td><td>47.56 (19.66)</td><td>54.15 (24.44)</td></tr>
<tr><td>Difficulty</td><td>2.62 (1.39)</td><td>2.54 (1.26)</td></tr>
<tr><td>Stress</td><td>1.64 (1.37)</td><td>1.85 (1.28)</td></tr>
</table>
Note. Standard deviations are in parentheses. Asterisks indicate ratings that differed significantly between the two temporal locations, $p < .05$.
</td></tr>
<tr><td>Sample size</td><td>182</td></tr>
<tr><td>Location</td><td>Recruited from a study pool in Boston</td></tr>
<tr><td>Statistical results</td><td>Extracted from the original article (p.799), except for the calculated Cohen’s d and confidence interval (CI):
Participants believed they deserved 60% more money for their future work than their past work, but that another person deserved the same amount of money for his or her future and past work.
Participants’ valuation of the work were submitted to a 2 (temporal location: past or future) X 2 (relevance: self-relevant or self-irrelevant) analysis of variance (ANOVA), which revealed a main effect of relevance, F (1,178) = 5.86, p = .02, η_p^2 = .03, 95% CI [0.0009, 0.10], d = 0.36*</td></tr>
<tr><td rowspan="2">Effect sizes</td><td>Effect on people’s valuation:main effect of relevance:
η_p^2 = .03, 95% CI [0.001, 0.10], d = 0.36*, 95% CI [0.07, 0.65]*
main effect of temporal location:
η_p^2 = .05, 95% CI [0.008, 0.13], d = 0.47*, 95% CI[0.18, 0.77]*</td></tr>
<tr><td>Effect on feelings of stress:
temporal location for self:
η_p^2 =. 07, 95% CI [0.01, 0.15], d = 0.53*, 95% CI [0.24, 0.83]*

temporal location for other:
η_p^2 = .002, 95% CI [0, 0.04], d = 0.097*, 95%CI[-0.19, 0.39]*</td></tr>
</table>

Study 1 from Caruso 2010

Reported statistics	Table 1 *Mean Ratings of Negative Emotion and Fairness (Experiments 1, 2, and 4)* Negative emotion: Past / Future; Fairness: Past / Future Experiment 1: 1.72 (1.64) / 2.33 (1.67) / 3.34 (1.76) / 2.58 (1.75) Experiment 2 (Near): 2.39 (1.75) / 3.29 (1.89) / 2.56 (1.69) / 1.66 (1.29) Experiment 2 (Far): 2.83 (1.70) / 2.66 (1.77) / 2.16 (1.58) / 2.31 (1.72) Experiment 4: 3.00 (1.99) / 1.93 (2.19) *Note*. For each measure, means for the past and future conditions are different from each other at $p < .05$, except for the Far condition of Experiment 2. Standard deviations are in parentheses.
Sample size	116
Exclusion	Not reported
Age	Not reported
Gender	Not reported
Location	Recruited from undergraduate dining halls at Harvard University
Statistical results	Extracted from the original article (p.612-613) except for the calculated Cohen's d and confidence interval (CI): Participants in the future condition reported that the machine was less fair than participants in the past condition, $t(114) = 2.32$, $p < .03$, $d = 0.43$*, 95%CI [0.06,0.80] Those in the future condition reported that the thought of the machine made them feel more negative emotion than those in the past condition, $t(114) = 1.99$, $p < .05$, $d = 0.37$*, 95%CI [0.002, 0.560]
Effect size	$d = 0.43$*, 95%CI [0.06, 0.80]*

Planned Sample

A total of 312 participants from the United States of America will be recruited online by using Amazon Mechanical Turk. The sample size was determined through a power analysis based on the effect sizes found in Caruso et. al. (2008) and Caruso (2010) with a power of 0.95 and an alpha of .05. Please refer to Appendix A and B for the detailed power analysis and calculation of the minimum sample size.

Exclusion Criteria

We will focus on our analyses on the full sample. However, as a supplementary analysis and to examine any potential issues, we will also determine further findings reports with exclusions. In any case, we will report exclusions in detail with results for full sample and results following exclusions (in either the manuscript or the Supplementary Materials).

- self-report a low proficiency of English (< 5, on a 1-7 scale); or
- self-report not being serious about filling in the survey (< 4, on a 1-5 scale); or
- correctly guessed the hypothesis of this study in the funneling section; or
- failed to complete the survey.

Materials

This replication will use the same materials used in the original articles except for the following items in the below table. It is noted that the dependent variables measured in study 1 and 4 in Caruso et. al. (2008) are combined and will be measured in experiment 1 in this replication.

Analysis plan

Between-subject analysis

Experiment 1 and 2

Statistical tests	two-tailed two-sample independent t-test
Alpha	.05
Statistical information to be reported	mean and standard deviation of valuation of participants assigned to past conditions vs participants assigned to future conditions

Experiment 1

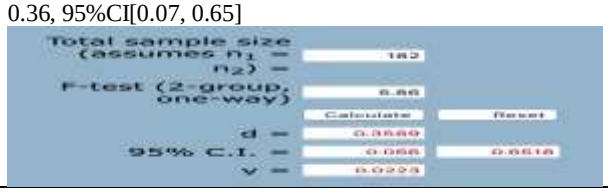
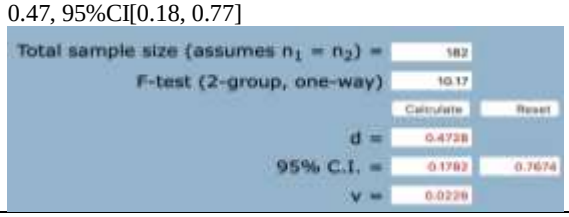
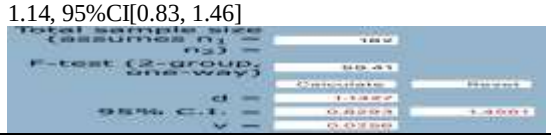
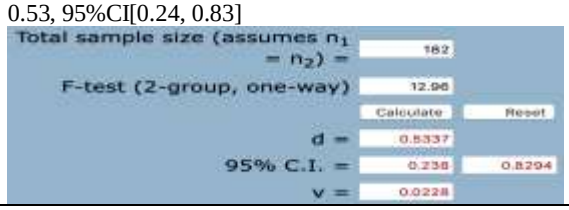
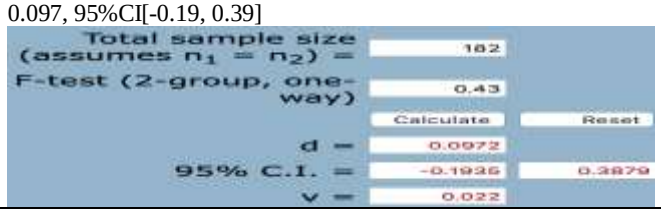
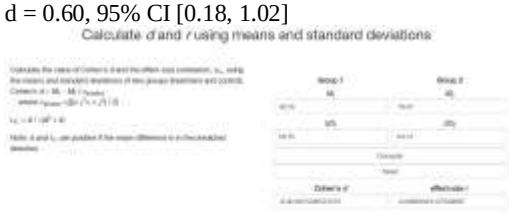
Statistical tests	In relation to valuation of work: 2 (temporal location: past or future) X 2 (relevance: self-relevant or self-irrelevant) analysis of variance (ANOVA) to determine: 1. main effect of relevance 2. main effect of temporal location 3. temporal location X relevance interaction
	In relation to feeling of stressed: 2 (temporal location: past or future) X 2 (relevance: self-relevant or self-irrelevant) analysis of variance (ANOVA) to determine: 1. temporal location X relevance interaction 2. compare feeling of stressed for self: past vs future 3. compare feeling of stressed for other: past vs future
Alpha	.05
Statistical information to be reported	mean and standard deviation of valuation and feeling of stressed of temporal location (past vs future) X relevance (self vs other)

Experiment 1 and 2

Statistical tests	two-tailed two-sample independent t-test
Alpha	.05
Statistical information to be reported	mean and standard deviation of valuation of participants who assigned to conditions in the following sequence: - past conditions in experiment 1 then future conditions in experiment 2 - future conditions in experiment 1 then past conditions in experiment 2

Power Analysis

Study 4 in Caruso et. al. (2008) (Experiment 1 in this replication)
N = 182

	η_p^2 (reported in article)	*d* (calculated by an online calculator*)
main effect of relevance (self vs other) on valuation of work, regardless of temporal location (past vs future)	.03, 95% CI [0.0009, 0.10],	0.36, 95%CI[0.07, 0.65] 
main effect of temporal location (past vs future) on valuation of work, regardless of relevance (self vs other)	. 05, 95% CI [0.008, 0.13]	0.47, 95%CI[0.18, 0.77] 
Temporal Location X Relevance interaction on feeling of stressed	.02, 95% CI [0.15,0.35]	1.14, 95%CI[0.83, 1.46] 
Feeling of stress for self: future vs past	. 07, 95% CI [0.01, 0.15]	0.53, 95%CI[0.24, 0.83] 
Feeling of stressed for other: future vs past	.002, 95% CI [0, 0.04]	0.097, 95%CI[-0.19, 0.39] 
Monetary valuation only considering the self-relevant condition	None	d = 0.60, 95% CI [0.18, 1.02] 
Monetary valuation only considering the self-irrelevant condition	None	d = 0.30, 95% CI [-0.11, 0.71] 

*online calculator: http://www.campbellcollaboration.org/escalc/html/EffectSizeCalculator-SMD5.php; https://lbecker.uccs.edu/

Study 1 in Caruso (2010) (Experiment 2 in this replication)
N = 116

<table>
<tr><th></th><th>t-test
(reported in original article)</th><th>d
(using an excel spreadsheet *)</th></tr>
<tr><td>Effect of more extreme moral judgment for future event than equivalent past event</td><td>t(114) = 2.32, p < .03</td><td>0.43, 95%CI [0.06,0.80]
<table><tr><th colspan="2">d_s from t for independent samples</th></tr><tr><th>Total N</th><th>t-value</th></tr><tr><td>116</td><td>2.32</td></tr><tr><th>Cohen's $d_s \approx$</th><th>p</th></tr><tr><td>0.430813185</td><td>0.02212061</td></tr><tr><th>Hedges $g_s \approx$</th><th>df</th></tr><tr><td>0.427972658</td><td>114</td></tr><tr><th>CL ≈</th><th></th></tr><tr><td>0.619676368</td><td></td></tr></table></td></tr>
<tr><td>Effect of more negative emotion towards future event than equivalent past event</td><td>t(114) = 1.99, p < .05.</td><td>0.37, 95%CI [0.002, 0.560]
<table><tr><th colspan="2">d_s from t for independent samples</th></tr><tr><th>Total N</th><th>t-value</th></tr><tr><td>116</td><td>1.99</td></tr><tr><th>Cohen's $d_s \approx$</th><th>p</th></tr><tr><td>0.369533723</td><td>0.048984557</td></tr><tr><th>Hedges $g_s \approx$</th><th>df</th></tr><tr><td>0.367097237</td><td>114</td></tr><tr><th>CL ≈</th><th></th></tr><tr><td>0.60306934</td><td></td></tr></table></td></tr>
</table>

*excel spreadsheet: https://osf.io/vbdah/

Calculation of the minimum sample size

Since study 1 in Caruso et. al. (2008) has the smallest effect size of the three experiments in relation to effect of temporal location (please refer to Appendix A), it serves as the basis for the required sample size using G* Power Version 3.1.
Power: 1-® = 0.95
Significance: ⟨ = 0.05
Cohen's d (Experiment 3): 0.41
N = 312

Extracted from G* Power Version 3.1:

t tests - Means: Difference between two independent means (two groups)

Analysis:	A priori: Compute required sample size		
Input:	Tail(s)	=	Two
	Effect size d	=	0.41
	α err prob	=	0.05
	Power (1-β err prob)	=	0.95
	Allocation ratio N2/N1	=	1
Output:	Noncentrality parameter δ	=	3.6210220
	Critical t	=	1.9676459
	Df	=	310
	Sample size group 1	=	156
	Sample size group 2	=	156
	Total sample size	=	312
	Actual power	=	0.9505099

Power analysis for monetary valuation in Experiment 4, Caruso 2008 replication, only considering the self-relevant condition

Screenshot from the jpower module in jamovi

Independent Samples T-Test

The purpose of a *power analysis* is to evaluate the sensitivity of a design and test. You have chosen to calculate the sensitivity of the chosen design for detecting the specified effect size.

A Priori Power Analysis

	User Defined			
Power	N_1	N_2	Effect Size	α
0.994	111	111	0.600	0.050

A design with a sample size of 111 in each group can detect effect sizes of $\delta \geq 0.6$ with a probability of at least 0.994, assuming a two-sided criterion for detection that allows for a maximum Type I error rate of $\alpha = 0.05$.

To evaluate the design specified in the table, we can consider how sensitive it is to true effects of increasing sizes; that is, are we likely to correctly conclude that $|\delta| > 0$ when the effect size is large enough to care about?

Contribution

In the table below, we employ CRediT (Contributor Roles Taxonomy) to identify the contribution and roles played by the contributors in the current replication effort. Please refer to the https://www.casrai.org/credit.html for details and definitions of each of the roles listed below.

Role	Chan Wing Yan	Gilad Feldman	Ignazio Ziano	Malak El Halabi	Burak Tunca
Conceptualization	X	X			
Pre-registration	X	X			
Data curation	X	X			
Formal analysis	X		X	X	X
Funding acquisition		X			
Investigation	X	X	X	X	X
Methodology	X	X	X	X	X
Pre-registration peer review/ verification	X	X			
Data analysis peer review/ verification	X		X	X	X
Project administration		X	X		
Resources	X	X			
Software					
Supervision		X	X		X
Validation			X	X	X
Visualization					
Writing-original draft	X				
Writing-review and editing		X	X	X	X