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**It's No Longer "Me":**

**Low Past-Self-Continuity Reduces the Sunk-Cost Bias**

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**Abstract**

The sunk-cost bias describes the tendency to continue an inferior course of action because one has invested significant, irrecoverable resources in it in the past. It can lead individuals to make decisions that are suboptimal for their welfare. Across five experiments ( $N = 3,197$ ), we investigate whether the tendency of individuals to display sunk-cost bias is influenced by their sense of psychological connectedness to their past self that incurred the initial cost, or past-self-continuity. Studies 1-3 show evidence that individuals with low (versus high) past-self-continuity are less likely to display sunk-cost bias because they anticipate less negative feelings associated with abandoning substantial investments. Study 4, which was conducted under Registered Report format, provides partial support for this theory. We discuss potential complementary mechanisms, as well as implications of our findings for negative self-focused emotions and for decision biases rooted in overweighting of or overcommitment to past actions.

*Keywords:* sunk-cost bias, self-continuity, decision making, emotions, intervention

## Introduction

The sunk-cost effect describes the increased tendency to continue with an inferior course of action because one has invested significant, irrecoverable resources in it in the past (e.g., money, time, or effort; Arkes & Blumer, 1985; Thaler, 1980). A substantial body of research has found that the sunk-cost effect (also referred to as sunk-cost bias or sunk-cost fallacy) can lead individuals to make normatively suboptimal decisions that fail to maximize their welfare (Arkes & Blumer, 1985; Brockner & Rubin, 1985; Garland, 1990). For example, a person may attend a sports event because she has paid for the ticket even though she would prefer to be elsewhere on the day of the event. Similarly, a person may continue taking music lessons because he has spent money on the musical instrument even though he may no longer enjoy the lessons.<sup>1</sup>

Prior literature has emphasized the role of personal responsibility in incurring the initial costs as an important determinant of sunk-cost effects. Abandoning an investment triggers greater feelings of guilt, regret, and wastefulness when this decision needs to be taken by the same person that made the initial investment rather than someone else; thus personal responsibility, as has been repeatedly documented, makes people more likely to continue a suboptimal course of action (Arkes & Blumer, 1985; Staw, 1976; Staw & Fox, 1977; Wong & Kwong, 2007). In this paper, we focus on psychological instead of physical sameness, and propose that even when the decision-maker is physically the same person who is responsible for the initial decision, she can feel psychologically disconnected from the past self that undertook the investment, and as a result will be more likely to change her course of action.

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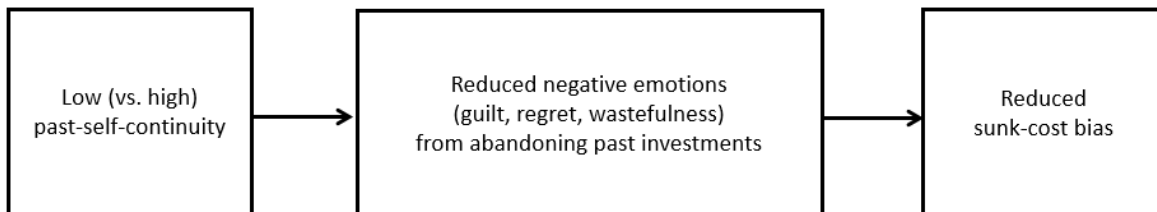
<sup>1</sup> Sunk cost situations are defined by the existence of a prior investment that is substantial and irrecoverable. A certain subset of sunk cost situations, known as escalation of commitment or entrapment, additionally involve receiving negative feedback about the chosen course of action and incurring continued losses for the chance of eventually fulfilling a goal (Arkes & Blumer, 1985). For example, a manager may continue to invest resources into an unsuccessful R&D project in the hope of eventually leading it to success. Our theory and studies focus on sunk cost situations in general.

The two decisions involved in illustrations of sunk-cost bias—investing in a course of action, and deciding whether to continue the previously chosen course or to abandon it in favor of a different course—are typically separated in time. An emerging body of research on self-continuity indicates that people can perceive different degrees of connectedness between temporally distant selves. This sense of connectedness is based on the perceived degree of stability or change in the self on important dimensions, such as personality, morals and values. Self-continuity varies across individuals and can also be manipulated externally (Bartels & Urminsky, 2011; 2015; Ersner-Hershfield, Garton, Ballard, Samanez-Larkin, & Knutson, 2009). Higher self-continuity has been linked to older age (Rutt & Löckenhoff, 2016). Self-continuity tends to be reduced by experiencing identity-disrupting life events such as religious conversion or war (Bartels & Rips, 2010). It can be increased by triggering nostalgic thoughts (Sedikides, Wildschut, Routledge, & Arndt, 2015), by making the temporally removed self more vivid (Hershfield et al., 2011), and by making stability in the self salient (Bartels & Urminsky, 2011; Sedikides et al., 2015; Sedikides et al., 2016).

A person's sense of self-continuity can influence their choices and decisions (Bartels & Urminsky, 2011; Iyer & Jetten, 2011). Most prior work on this topic has focused on the relationship between the present and future self and showed that feeling low connectedness to one's future self can lead to myopic behavior. Thus, heightening the connectedness, for instance by emphasizing the overlap in personality traits, morals, and values between the present and future self, has emerged as a way to reduce myopia, leading to decreased spending (Bartels & Urminsky, 2011; Ersner-Hershfield et al., 2009) and diminished delinquent or unethical behavior (Van Gelder, Hershfield, & Nordgren, 2013).

People may, however, also differ in how connected they feel to their *past* self (Sedikides et al., 2016; Sedikides et al., 2015). We propose that, in contrast to the research on future-self-

continuity, feeling high connectedness to one's temporally removed self—in this case past self—can lead to nonnormative behavior. People show sunk-cost effects because they place *too much* weight on costs they have incurred in the past. Consequently, making them feel *less* connected to the past self and hence place *less* weight on past actions may lead to more normative behavior. Specifically, when people feel less connected to their past self that invested in a course of action, they may be less likely to display sunk-cost bias. This is because the emotions underlying the sunk-cost effect—guilt, regret, and wastefulness from abandoning the prior investment—require a sense of personal responsibility for the past action; they typically arise from actions committed by the self but not by others (Arkes & Blumer, 1985; Smith & Ellsworth, 1985; Tangney, Miller, Flicker, & Barlow, 1996). To the extent that individuals feeling low past-self-continuity view their past self as a different person, they should be less likely to anticipate these negative feelings from abandoning past investments, and hence should be less likely to stick to a previously chosen course simply because of past investments (see *Figure 1*).



*Figure 1.* Proposed theoretical model.

Recent work on “interpersonal sunk-cost bias” is in line with our theorizing that psychological rather than physical sameness may drive the sunk cost effect. This work shows that an initial irrecoverable cost can make people more likely to stick to a course of action even when

this cost was incurred by a different individual rather than by the decision-maker (Gunia, Sivanathan, & Galinsky, 2009; Olivola, 2018). Importantly, this effect was more likely when the decision-maker perceived high psychological connectedness between himself and the other person who incurred the initial cost (Gunia et al., 2009; cf. Olivola, 2018). Hence, this prior work suggests that sunk-cost bias can occur in the absence of personal responsibility when the decision-maker feels high connectedness with the individual who is responsible for incurring the cost. Conversely, our work posits that sunk-cost bias may be mitigated even in the presence of personal responsibility, when the decision-maker feels low connectedness with the past self that was responsible for incurring the cost.

Measuring and manipulating past-self-continuity, we investigate whether people who experience lower connectedness are less likely to display sunk-cost bias. Across all studies (1-4) we found that individuals with low past-self-continuity were less likely to stick to a previously chosen inferior course of action after making substantial investments. In Study 2a we more directly tested whether this was due to reduced weight given to the past investment, which has been proposed as a more stringent test of the sunk-cost bias (Olivola, 2018). We therefore varied the size of sunk cost and found that low past-self-continuity reduced the tendency to stick to a previously chosen course of action to a greater extent when sunk cost was high (vs. low). This is consistent with our theorizing that low past-self-continuity can attenuate the sunk-cost bias by reducing anticipated negative feelings from abandoning large investments. Study 3 provided mediation evidence for the role of anticipated negative feelings. However, the findings of Study 4, which was conducted under the Registered Report format, are not fully consistent with this theorizing. In this study, while individuals with low past-self-continuity were less likely to stick to a previously chosen inferior course of action, this occurred both when sunk cost was higher and lower. We discuss potential causes for this finding and directions for future research.

## Study 1

Study 1 aimed to gain initial evidence for the hypothesized relationship between past-self-continuity and sunk-cost bias. Past-self-continuity varies by individual, with some naturally experiencing lower connectedness than others (Sedikides et al., 2015). Using a correlational design, we assessed sunk-cost bias and measured individual differences in past-self-continuity. We predicted that individuals who tend to experience lower past-self-continuity would be less likely to exhibit sunk-cost bias.

## Method

Based on a pilot test<sup>2</sup> showing a correlation coefficient of  $r = .21$ , and the aim of at least 80% test power, we determined our target sample size to be 200. No data analysis was performed before the target sample size was reached.

We recruited 200 participants from Amazon's Mechanical Turk (Mean age = 35.22,  $SD = 10.66$ ; 59.5% male, 40.5% female), which allows detecting an effect as small as  $r = .20$  ( $\alpha = 0.05$ ,  $1 - \beta = 0.80$ ). At the beginning of the survey, we asked participants to type a specific phrase. Participants who failed this task were screened out from the survey and no data was collected from them, hence they did not count towards the target sample size. We did not exclude any participants who completed the study. We applied the same procedure in all studies unless otherwise noted. All manipulations are reported. Any measures not reported in the main text can be found in the Supplemental Materials.

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<sup>2</sup> The method and materials of the pilot test were the same as those of study 1; hence study 1 is an exact replication of the pilot test. The pilot test results were substantially the same and are reported in the Supplementary Materials. We consider it a pilot test because it was our first test of the predicted correlation between past-self-continuity and sunk-cost effect, and the main purpose was to obtain an effect size estimate as a basis for calculating the required sample size for the main study.



Participants read a variation of the wallpaper scenario that was previously used to illustrate the sunk-cost effect (Bruine de Bruin, Parker, & Fischhoff, 2007). They imagined that three years ago they had decorated their bedroom and had decided to put up wallpaper instead of painting the walls. They were further told that putting up the wallpaper had cost them \$400 and an entire day of work.

The scenario continued to state that today, three years after purchasing the wallpaper, they were no longer sure whether they would choose the same wallpaper or may now prefer painted walls. Further, the wallpaper had recently been stained by accident, so they would need to either fix the wallpaper or remove it and have the wall painted instead. Either of these options would cost them \$90 and an afternoon of work.

As the main dependent measure, participants completed a seven-item measure assessing their tendency to fix the wallpaper versus removing it and painting the walls (example items were “I would keep the wallpaper after replacing the strip with the mark” and “I would try out painting my walls” [reverse coded]; all items used 7-point scales from “1 = does not describe me at all” to “7 = describes me extremely well”;  $\alpha = .97$ ). The likelihood of fixing the wallpaper, and thus further pursuing the alternative in which they had invested irrecoverable resources, constituted our measure of sunk-cost bias.

Finally, we measured past-self-continuity using a three-item measure similar to those used in prior research (Bartels & Urminsky, 2011; Ersner-Hershfield et al., 2009;  $\alpha = .84$ ; example item: Participants saw seven images of pairs of circles with varying degrees of overlap, which represented their past and present selves, and were asked to select “the one picture that best describes how similar you feel now to your past self three years ago, in terms of personality, temperament, beliefs, values, ambitions, life goals, ideals, etc.”; the items used different scales

and were z-transformed before being combined). The full scenarios and measures are reported in the Supplementary Materials.

## Results

**Sunk-cost bias.** We investigated whether individual differences in past-self-continuity predicted sunk-cost bias by conducting a linear regression with the past-self-continuity measure as the independent variable and individuals' tendency to fix the wallpaper as the dependent variable. The results show a significant positive relationship between past-self-continuity and tendency to fix the wallpaper ( $r = .20$ ,  $n = 200$ ,  $95\% \text{ CI} = [0.07, 0.34]$ ,  $p = .005$ ), such that individuals who had a lower sense of connectedness with their past selves also reported a lower tendency to pursue the alternative in which they had previously invested.

**Robustness check.** Because prior work found that higher age predicts greater resistance to the sunk-cost bias, and that age is positively correlated with self-continuity, we ran another regression in which we included age as a covariate (Rutt & Löckenhoff, 2016; Strough, Mehta, McFall, & Schuller, 2008). The positive relationship between past-self-continuity and sunk-cost bias, such that lower past-self-continuity was associated with reduced tendency to fix the wallpaper, held when controlling for age ( $\beta_{\text{past-self-continuity}} = 0.20$ ,  $SE = 0.07$ ,  $95\% \text{ CI} = [0.06, 0.34]$ ,  $p = .006$ ).

## Discussion

Study 1 provides initial correlational evidence that lower past-self-continuity is associated with reduced sunk-cost bias.

### Study 2a

Study 2a aimed to show that manipulating low (vs. high) past-self-continuity attenuates the sunk-cost bias. Additionally, this study included a low-cost condition in which the size of the sunk cost was substantially reduced. This provided a more rigorous measure of sunk-cost bias (Olivola, 2018). Specifically, we tested whether high-past-self-continuity participants would be more likely to stick to the previously chosen course after incurring higher (versus lower) costs, but this tendency would be attenuated for low-past-self-continuity participants.

Including a low-cost condition also allowed us to test our theory against an alternative account. We theorized that low (vs. high) self-continuity increases the tendency to change course because it reduces the negative affect associated with abandoning substantial past investments. This predicts that low (vs. high) past-self-continuity increases the tendency to change course to a greater extent when sunk cost is large than when it is small. However, a potential alternative interpretation of the results of Study 1 is that individuals who perceived their core identity as less stable may have believed that their preferences were more likely to have changed since the initial investment, and this may have boosted their tendency to change course. If true, inducing low (vs. high) past-self-continuity should increase the tendency to change course equally, independent of the size of the cost.

### Method

Study 2a, as well as the following studies (Studies 2b and 3) manipulated past-self-continuity. A pilot test<sup>3</sup> yielded an effect size estimate of  $d = 0.35$  for the effect of low compared

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<sup>3</sup> The method and results of this pilot test are reported in the Supplementary Materials. We consider it a pilot test because it was our first test of our past-self-continuity manipulation on the sunk-cost effect, and the main purpose was to obtain an effect size estimate as a basis for calculating the required sample size for the main studies that manipulate past-self-continuity.

to high past-self-continuity on the sunk cost bias. Our aim in determining the sample sizes was to achieve at least 80% test power to detect this effect. In Study 2a, we additionally predicted an interaction pattern and hence would have required a larger sample to achieve the same test power for the interaction effect; however, sample size was constrained by availability of funds. No data analysis was performed before the target sample size was reached.

We recruited 501 participants from Mechanical Turk (Mean age = 37.84,  $SD = 12.78$ ; 41.7% male, 57.9% female, 0.4% other), which allows detecting effects as small as  $d = 0.25$  ( $\alpha = 0.05$ ,  $1 - \beta = 0.80$ ). Participants were randomly assigned to one of the four conditions created by a 2 (past-self-continuity: low vs. high) by 2 (size of sunk cost: low vs. high) between-subjects design.

We used the same wallpaper scenario as in Study 1. Participants in the high-sunk-cost condition were told that they paid the regular price of \$400 for the wallpaper and spent an entire day putting it on the wall, as in Study 1. Participants in the low-sunk-cost condition also read that the regular price of the wallpaper was \$400; however, they were told that at the checkout they discovered that the wallpaper was on sale and therefore paid only \$80 and the wallpaper was put on the wall for them for free.

Next, we manipulated psychological connectedness to the past self via a trait-stability task (adapted from Bartels & Urminsky, 2015). Specifically, participants in the high-past-self-continuity condition (low-past-self-continuity condition) read a paragraph stating that research shows that a person's core identity, such as personality traits, beliefs and values, stays the same (changes significantly) throughout adult life and then were asked to indicate one or two aspects of their own core identity that they thought were the same (different) three years ago compared to now.

Participants then continued with the second part of the scenario in which the wallpaper had been stained and, using the same seven items from Study 1, indicated their tendency to fix the wallpaper versus painting the walls, our measure of sunk-cost bias ( $\alpha = .97$ ).

Finally, as a manipulation check, participants completed the same three-item measure of past-self-continuity from Study 1 ( $\alpha = .90$ ).

## Results

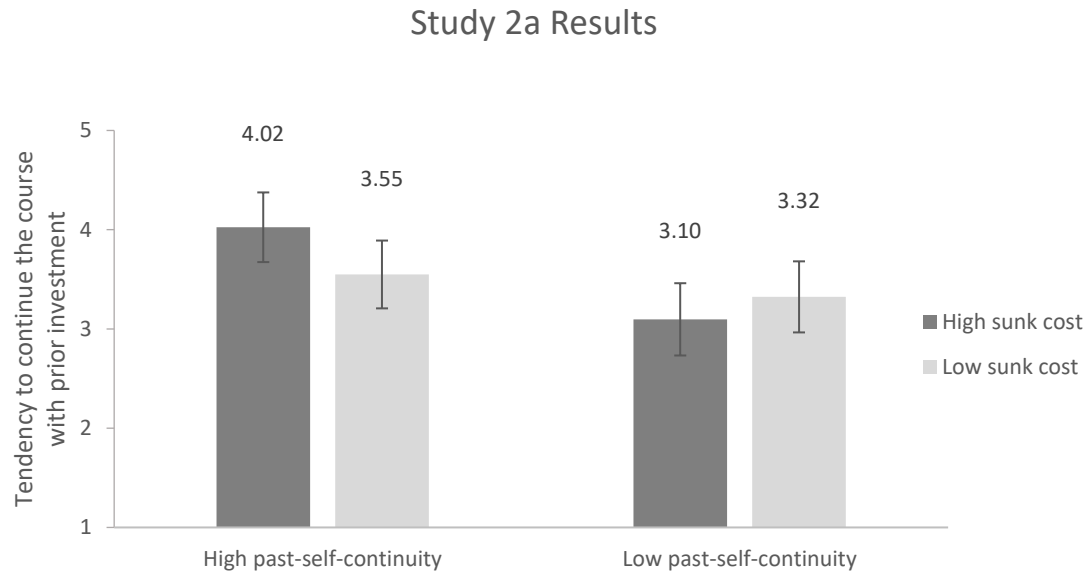
**Manipulation check.** A two-way analysis of variance (ANOVA) on the past-self-continuity measure revealed a significant main effect of past-self-continuity condition,  $F(1, 497) = 36.10, p < .001, \eta^2 = 0.068, 95\% \text{ CI} = [0.031, 0.114]$ . As intended, participants in the high-past-self-continuity condition felt more connected to their past self ( $M = 0.23, SD = 0.84, 95\% \text{ CI} = [0.13, 0.33]$ ) than those in the low-past-self-continuity condition ( $M = -0.25, SD = 0.92, 95\% \text{ CI} = [-0.36, -0.13]$ ). Further, as expected, neither the main effect of size of sunk cost nor the interaction were significant,  $F < 1$ .

**Sunk-cost bias.** A two-way ANOVA with past-self-continuity and size of sunk cost as independent variables and tendency to fix the wallpaper as the dependent variable showed a significant main effect of past-self-continuity, such that participants in the low-past-self-continuity condition were less likely to fix the wallpaper ( $M = 3.21, SD = 1.96, 95\% \text{ CI} = [2.96, 3.46]$ ) than those in the high-past-self-continuity condition ( $M = 3.78, SD = 2.07, 95\% \text{ CI} = [3.53, 4.03], F(1, 497) = 10.26, p = .001, \eta^2 = 0.020, 95\% \text{ CI} = [0.003, 0.051]$ ). The main effect of size of sunk cost was not significant,  $F(1, 497) = 0.48, p = .489$ . Importantly, the predicted interaction was marginally significant,  $F(1, 497) = 3.80, p = .052, \eta^2 = 0.008, 95\% \text{ CI} = [0.000, 0.030]$ .

We conducted planned contrasts to test our prediction that the sunk-cost effect is stronger in the high- than in the low-past-self-continuity condition. The analyses showed that in the high-

past-self-continuity condition, participants were marginally more likely to fix the wallpaper when sunk cost was high ( $M = 4.02$ ,  $SD = 2.11$ , 95% CI = [3.65, 4.40]) than when sunk cost was low ( $M = 3.55$ ,  $SD = 2.01$ , 95% CI = [3.21, 3.89]; Mean difference = 0.48,  $SE = 0.25$ ,  $F(1, 497) = 3.64$ ,  $p = .057$ ,  $d = 0.17$ , 95% CI = [0.00, 0.35]). Hence, we replicated the classic sunk-cost effect in the high-past-self-continuity condition. In contrast, in the low-past-self-continuity condition participants were no more likely to fix the wallpaper when sunk cost was high ( $M = 3.10$ ,  $SD = 1.93$ , 95% CI = [2.74, 3.45]) than when sunk cost was low ( $M = 3.32$ ,  $SD = 1.99$ , 95% CI = [2.97, 3.68]; Mean difference = -0.23,  $SE = 0.26$ ,  $F(1, 497) = 0.76$ ,  $p = .384$ ). Thus, as predicted, the sunk-cost effect was mitigated in the low-past-self-continuity condition.

An additional set of planned contrasts tested our prediction that low (compared with high) past-self-continuity reduced the tendency to further invest in the wallpaper to a greater extent when sunk cost was high compared with when it was low. Among high-sunk-cost participants, low-past-self-continuity reduced the tendency to fix the wallpaper ( $M = 3.10$ ,  $SD = 1.93$ , 95% CI = [2.74, 3.45]) relative to high-past-self-continuity ( $M = 4.02$ ,  $SD = 2.11$ , 95% CI = [3.65, 4.40]; Mean difference = 0.93,  $SE = 0.26$ ,  $F(1, 497) = 13.00$ ,  $p < .001$ ,  $d = 0.32$ , 95% CI = [0.15, 0.50]). In contrast, among low-sunk-cost participants, those in the low-past-self-continuity condition were similarly likely to fix the wallpaper ( $M = 3.32$ ,  $SD = 1.99$ , 95% CI = [2.97, 3.68]) as those in the high-past-self-continuity condition ( $M = 3.55$ ,  $SD = 2.01$ , 95% CI = [3.21, 3.89]; Mean difference = 0.23,  $SE = 0.25$ ,  $F(1, 497) = 0.80$ ,  $p = .370$ ). Hence, the alternative explanation implicating a perceived change in preferences was not supported.



*Figure 2.* Results from Study 2a: Tendency to continue with the course of action in which participants had made a prior investment (i.e., tendency to fix the wallpaper) as a function of past-self-continuity and size of sunk cost. Error bars represent 95% confidence intervals.

## Discussion

Study 2a provided causal evidence that low past-self-continuity reduces sunk-cost bias. Specifically, after we induced high past-self-continuity, we replicated the classic sunk-cost effect: individuals were more likely to continue a previously chosen course after investing more versus less resources. In contrast, after we induced low past-self-continuity, this effect was mitigated: individuals were equally likely to continue the course regardless of the size of the investment.

We have argued that low past-self-continuity can reduce the tendency to continue the previously chosen course because it makes abandoning substantial sunk costs less emotionally aversive. In line with this theoretical account, in the presence of substantial sunk costs, lower (vs.

higher) past-self-continuity reduced the tendency to continue the prior course; but when sunk cost was small, so that abandoning it was unlikely to evoke negative emotions, lower past-self-continuity did not influence this tendency. Hence, an alternative account according to which the low-self-continuity manipulation primed participants to think that their preferences had changed was not supported.

The replication of the widely demonstrated sunk-cost bias after a high but not after a low past-self-continuity intervention suggests that individuals naturally experience high connectedness to the past self when contemplating sunk costs. If true, the effect we document should be driven by inducing low rather than high past-self-continuity. This means that a low past-self-continuity intervention should make individuals more likely to abandon substantial sunk costs than they are in the absence of an intervention. After a high past-self-continuity intervention, however, individuals may behave similarly as in the absence of an intervention. To tests these predictions directly, we conducted a follow-up study which replicated the two central conditions and added a control condition.

### **Study 2b**

Study 2b aimed to test whether a low-past-self-continuity intervention can increase the tendency to change course after incurring substantial sunk costs compared with a control condition. We do not have a formal hypothesis for the high-past-self-continuity condition compared to the baseline; however, the replication of prior demonstrations of sunk-cost bias in the high-past-self-continuity condition (Study 2a) suggests a smaller effect of inducing high past-self-continuity.



## Method

Based on the effect size estimate of  $d = 0.35$  for the effect of high versus low past-self continuity on sunk-cost bias obtained in the pilot test, and the aim of at least 80% test power, we determined our target sample size to be 400. No data analysis was performed before the target sample size was reached.

We recruited 402 subjects from Mechanical Turk (Mean age = 35.59,  $SD = 11.42$ ; 54.0% male, 45.5% female, 0.5% other) which allows detecting an effect as small as  $d = 0.31$  ( $\alpha = 0.05$ ,  $1 - \beta = 0.80$ ).

Participants were randomly assigned to one of the three conditions created by a one-factor design with three levels: high past-self-continuity, low past-self-continuity, and control.

Participants completed the high-cost version of the wallpaper scenario used in Studies 1 and 2a. We induced high and low past-self-continuity using the same trait-stability task as in Study 2a; participants in the control condition instead completed an unrelated writing task (they described the process of doing laundry). As before, the tendency to fix the wallpaper constituted our measure of sunk-cost bias ( $\alpha = .97$ ).

## Results

**Sunk-cost bias.** A one-way ANOVA with past-self-continuity as independent variable and tendency to fix the wallpaper as dependent variable showed a significant main effect of past-self-continuity,  $F(2, 399) = 7.29$ ,  $p = .001$ ,  $\eta^2 = 0.035$ , 95% CI = [0.007, 0.074]. Replicating our prior findings, contrasts revealed that the tendency to fix the wallpaper was significantly lower in the low-past-self-continuity condition ( $M = 3.43$ ,  $SD = 1.81$ , 95% CI = [3.11, 3.74]) than in the high-past-self-continuity condition ( $M = 3.98$ ,  $SD = 1.97$ , 95% CI = [3.63, 4.32]; Mean difference = 0.55,  $SE = 0.24$ ,  $F(1, 399) = 5.13$ ,  $p = .024$ ,  $d = 0.23$ , 95% CI = [0.01, 0.42]).

Importantly, the tendency to fix the wallpaper was also lower in the low-past-self-continuity condition than in the control condition ( $M = 4.33$ ,  $SD = 2.05$ , 95% CI = [3.99, 4.66]; Mean difference = 0.90,  $SE = 0.24$ ,  $F(1, 399) = 14.46$ ,  $p < .001$ ,  $d = 0.38$ , 95% CI = [0.18, 0.58]). Last, as expected, the high-past-self-continuity condition did not significantly differ from the control condition (Mean difference = 0.35,  $SE = 0.24$ ,  $F(1, 399) = 2.18$ ,  $p = .141$ ).

## Discussion

After inducing low past-self-continuity, participants were more likely to change course than the baseline. After inducing high past-self-continuity, participants were equally likely to change course as the baseline. This suggests that individuals naturally experience relatively high past-self-continuity, and that interventions inducing low past-self-continuity can improve decision-making by reducing the sunk-cost effect.

## Study 3

Study 3 aimed to further test our proposed mechanism. Specifically, we hypothesized that individuals who feel less (vs. more) connected to their past self are more likely to abandon a course of action after a substantial investment because they anticipate lower feelings of guilt, regret, and wastefulness. We therefore measured anticipated negative affect from abandoning sunk costs and tested whether this mediated the relationship between low past-self-continuity and a decreased tendency to continue the course with substantial past investments. Finally, Study 3 tested the effect of past-self-continuity on sunk-cost bias in a different context: choice of a hobby.

## Method

We determined our sample size based on the effect size estimate of  $d = 0.35$  obtained in the pilot test and the aim of at least 80% test power. Because Study 3 used a new scenario, we conducted preliminary analyses when half of the determined sample size was reached and decided to complete data collection based on the preliminary pattern.

We recruited 290 participants from Mechanical Turk (Mean age = 36.52,  $SD = 12.18$ ; 51.4% male, 48.3% female, 0.3% other) which allows detecting an effect as small as  $d = 0.33$  ( $\alpha = 0.05$ ,  $1 - \beta = 0.80$ ).

Participants were randomly assigned to either a low-past-self-continuity condition or a high-past-self-continuity condition. This study did not include an attention screening and no observations were excluded from the analyses.

Participants imagined that one year ago, they had considered whether to enroll in a summer course of either photography or singing. They were told that they had chosen the photography course and had bought expensive professional photography equipment. Participants then completed the same past-self-continuity manipulation as in Study 2a, with respect to their past self one year ago.

Next, participants continued with the second part of the scenario. They imagined that one year later, they wanted to enroll in a summer course again and were facing the same choice between singing and photography. The scenario further indicated that they now felt they may enjoy singing more than photography; however, this would mean they would no longer be using their expensive photography equipment. Participants completed a seven-item measure assessing their tendency to continue with photography rather than switching to singing (example items were “I would give photography another try” and “I would try singing this summer” [reverse

coded];  $\alpha = .95$ ). The tendency to continue photography rather than switching to singing, thus further pursuing the alternative in which they had invested substantial resources, constituted our measure of sunk-cost bias.

Then, as our measure of anticipated negative affect, participants rated the extent to which they would feel regretful, guilty, and wasteful ( $\alpha = .90$ ) if they signed up for the singing rather than the photography class. We also measured anticipated positive affect (happy, enthusiastic;  $r = .84$ ,  $n = 290$ ,  $p < .001$ ). This additional measure allowed for a more rigorous test of our proposed mechanism: we predicted that the effect of past-self-continuity on changing course would be uniquely driven by a decrease in the negative emotions that have been shown to be associated with abandoning sunk costs (Arkes & Blumer, 1985; Staw, 1976) but not by an increase in positive emotions associated with the alternative option.

Finally, as a manipulation check, participants completed the same three-item measure of past-self-continuity as in Studies 1 and 2a ( $\alpha = .86$ ).

## Results

**Manipulation check.** A  $t$  test on the past-self-continuity measure revealed a significant main effect of past-self-continuity condition,  $t(288) = 6.09$ ,  $p < .001$ ,  $d = 0.71$ , 95% CI = [0.48, 0.95], such that those in the high-past-self-continuity condition felt more connected to their past self ( $M = 0.30$ ,  $SD = 0.78$ , 95% CI = [0.17, 0.43]) than those in the low-past-self-continuity condition ( $M = -0.30$ ,  $SD = 0.88$ , 95% CI = [-0.44, -0.15]).

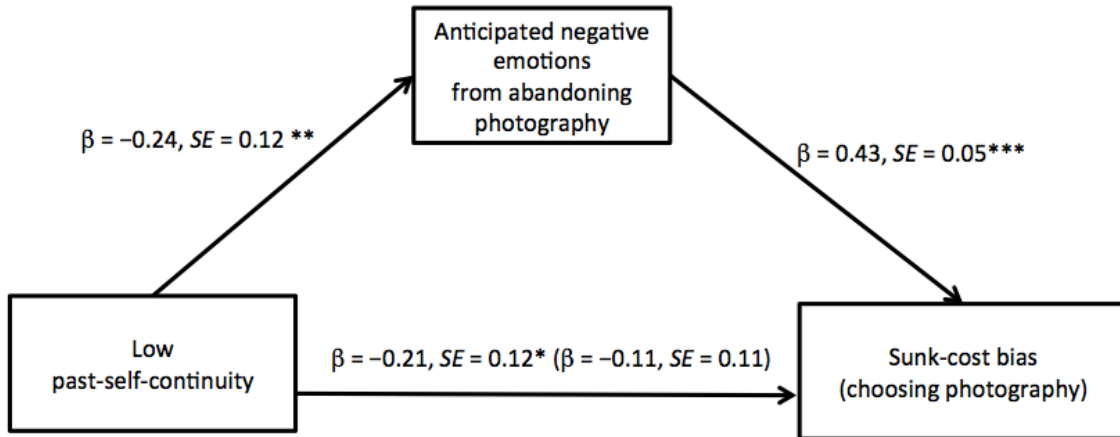
**Sunk-cost bias.** A  $t$  test comparing the tendency to enroll in the photography (vs. singing) class between the low- and high-past-self-continuity conditions revealed that, as predicted, participants were marginally less likely to continue photography in the low-past-self-continuity condition ( $M = 4.45$ ,  $SD = 1.83$ , 95% CI = [4.15, 4.75]) than in the high-past-self-continuity

condition ( $M = 4.81$ ,  $SD = 1.60$ , 95% CI = [4.55, 5.08],  $t(288) = 1.80$ ,  $p = .073$ ,  $d = 0.21$ , 95% CI = [-0.02, 0.44]). Further in line with our hypotheses, when thinking about abandoning photography, participants in the low-past-self-continuity condition anticipated lower negative affect ( $M = 3.32$ ,  $SD = 1.82$ , 95% CI = [3.03, 3.62]) than those in the high-past-self-continuity condition ( $M = 3.76$ ,  $SD = 1.90$ , 95% CI = [3.45, 4.08],  $t(288) = 2.02$ ,  $p = .045$ ,  $d = 0.24$ , 95% CI = [0.01, 0.47]). As predicted, low past-self-continuity did not influence anticipated positive affect ( $M_{low-past-self-continuity} = 4.56$ ,  $SD = 1.78$ , 95% CI = [4.27, 4.85];  $M_{high-past-self-continuity} = 4.34$ ,  $SD = 1.68$ , 95% CI = [4.06, 4.61];  $t(288) = -1.11$ ,  $p = .268$ ).

Next, we ran a mediation analysis to test whether the effect of low past-self-continuity in mitigating the sunk-cost bias could be explained, wholly or in part, by the decrease in anticipated negative affect when abandoning photography.<sup>4</sup> Results indicated that low-past-self-continuity was a significant predictor of anticipated negative affect ( $\beta = -0.24$ ,  $SE = 0.12$ , 95% CI = [-0.47, -0.01],  $p = .045$ ), and anticipated negative affect was a significant predictor of likelihood of choosing photography ( $\beta = 0.43$ ,  $SE = 0.05$ , 95% CI = [0.33, 0.54],  $p < .001$ ). Low-past-self-continuity was no longer a significant predictor of tendency to choose photography after controlling for the mediator, anticipated negative affect ( $\beta = -0.11$ ,  $SE = 0.11$ , 95% CI = [-0.32, 0.10],  $p = .308$ ). The indirect effect was tested using a bootstrap estimation with 5,000 samples. The results indicated that the indirect effect was significant ( $\beta = -0.10$ ,  $SE = 0.05$ , 95% CI = [-0.2036, -0.0017]).

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<sup>4</sup> This mediation model was deemed appropriate because we manipulated past-self-continuity, and prior work has shown that feeling guilty, regretful and wasteful predicts sunk-cost bias (Arkes & Blumer, 1985; Hafenbrack et al., 2014; Staw, 1976; Wong & Kwong, 2007).



*Figure 3.* Study 3: Mediation model with low past-self-continuity as the independent variable, anticipated negative emotions from abandoning photography as the mediator, and sunk-cost bias (the tendency to continue photography) as the dependent variable. The statistics shown in parentheses represent the direct effect when the mediator is included in the model.

\*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .001$ ; Indirect effect =  $-0.10$ ,  $SE = 0.05$ ,  $95\% CI = [-0.2036, -0.0017]$ .

## Discussion

Study 3 provided additional evidence of the mechanism by which low past-self-continuity can reduce sunk-cost bias: when individuals felt less connected to their past self who invested substantial resources in a course of action, they anticipated lower negative affect from abandoning this course, and were therefore more likely to do so. Notably, the past-self-continuity intervention only influenced negative emotions related to abandoning the initial investment, but not positive emotions associated with switching to the alternative option, which provides evidence for discriminant validity of our mechanism measure.

### Study 4: Registered Report

The main goal of Study 4 was to further test the robustness of our main finding that inducing low (vs. high) past-self-continuity attenuates the sunk-cost effect. For this purpose, we took several measures. First, we pre-determined a large sample size that will allow for 95% test power. Second, we recruited participants from Prolific, thereby using a different subject pool than the previous studies. Third, we used a different scenario, a classic sunk-cost scenario that involves the choice between two trips scheduled for the same weekend (Arkes & Blumer, 1985; Olivola, 2018). Finally, this study was conducted under the Registered Report format: the proposed method, analysis and predicted results were formally reviewed and approved by the review team and pre-registered on Aspredicted.org before the data collection began (<https://aspredicted.org/blind.php?x=zK4fn8>).

As in Study 2a, we included a low-cost condition and predicted that the effect of low (vs. high) past-self-continuity on the likelihood of changing course would be attenuated when sunk cost was low. In doing so, we tested for further evidence of our proposed mechanism. Our theory, which is based on negative affect arising from forgoing sunk costs, predicts that low (vs. high) past-self-continuity increases the tendency to change course to a greater extent when sunk cost is large than when it is small. As in Study 3, we measured anticipated negative affect from abandoning sunk costs and tested whether the predicted attenuation of the effect of past-self-continuity when sunk cost is small would be mediated by negative affect. Specifically, we expected that when sunk cost is small, negative affect would be low independent of the level of past-self-continuity.

## Method

Our aim in determining the sample size was to achieve 95% test power to detect the interaction between low (vs. high) past-self-continuity and low (vs. high) sunk cost, as it is the smallest of the predicted effects. Using the sample means from Study 2a and Shiny app we determined the required sample size to be 1800, which allows detecting effects as small as  $d = 0.17$  ( $\alpha = 0.05$ ,  $1 - \beta = 0.95$ ).

We aimed to recruit a total of 1800 participants on Prolific and obtained a final sample of 1804 participants (Mean age = 32.90,  $SD = 11.61$ ; 51.5% male, 47.5% female, 1.1% other). The prerequisites for participation were that they indicated USA as their current country of residence, have completed at least 5 studies, and have an approval rate of at least 90%. As in our previous studies, an attention check question at the beginning of the survey asked participants to type a specific phrase. Participants who failed this task were screened out from the survey and no data was collected from them, hence they did not count towards the target sample size. We did not exclude any other participants who complete the study. No data analysis was performed before reaching the predetermined sample size.

Participants were randomly assigned to one of four conditions created by a 2 (past-self-continuity: low vs. high) by 2 (size of sunk cost: low vs. high) between-subjects design. Participants read a variation of the weekend trip scenario used in previous literature to demonstrate the sunk-cost effect (Arkes & Blumer, 1985; Olivola, 2018). They imagined that two years ago, they had booked a hotel in Cancun, Mexico, for a weekend two years from that time. Participants in the high-cost condition further imagined that they had paid \$500 for the booking and that it had taken them an entire day to reach an agent to make the booking. Participants in the



low-cost condition imagined that they had paid \$200 and that they had been able to reach an agent quickly.

Next, we manipulated past-self-continuity to be either high or low, using the trait stability task from Studies 2a-3.

Participants then continued with the second part of the scenario. It stated that now, two years later, they had made a last-minute booking for a hotel in San Juan, Puerto Rico, a place they really wanted to visit. They paid \$200 for the booking. Participants further imagined that after making the booking they realized that both Cancun and San Juan hotel bookings were accidentally for the same weekend. Since neither booking could be cancelled or rescheduled, they now had to decide whether to take the trip to Cancun or to San Juan. Either trip would require them to buy a plane ticket for \$200.

As the main dependent measure of sunk-cost bias, participants completed a two-item measure assessing their tendency to go on the trip to Cancun rather than San Juan (the items were “Which weekend trip would you be more likely to go on?” [reverse-coded] and “Would you be more likely to buy a plane ticket to Cancun or San Juan?” [reverse-coded]; both items used 7-point scales, from “1 = definitely to Cancun, Mexico” to “7 = definitely to San Juan, Puerto Rico”;  $r = .94, p < .001$ ). The likelihood of travelling to Cancun, and thus further pursuing the inferior alternative, constituted our measure of sunk-cost bias.

Then, as our measure of anticipated negative affect, participants rated the extent to which they would feel regretful, guilty, and wasteful if they went on the weekend trip to San Juan rather than Cancun on a 7-point scale (“1 = not at all”, “7 = very much”;  $\alpha = .84$ ).

Finally, as a manipulation check, we assessed past-self-continuity using the same three-item measure as in the previous studies ( $\alpha = .84$ ).

## Results

**Manipulation check.** A two-way analysis of variance (ANOVA) with past-self-continuity condition and size of sunk cost as independent variables and the past-self-continuity measure as the dependent variable was conducted to test whether the past-self-continuity manipulation had the intended effect. As expected, there was a main effect of the past-self-continuity manipulation, such that participants in the high-past-self-continuity condition reported higher past-self-continuity ( $M = 0.16$ ,  $SD = 0.85$ , 95% CI = [0.10, 0.21]) than those in the low-past-self-continuity condition ( $M = -0.16$ ,  $SD = 0.86$ , 95% CI = [-0.22, -0.10]), indicating that our manipulation was successful,  $F(1, 1800) = 62.99$ ,  $p < .001$ ,  $\eta^2 = 0.034$ , 95% CI = [0.019, 0.052]. Neither the main effect of size of sunk cost nor the interaction were significant,  $F < 1$ .

**Sunk-cost bias.** To test our main predictions, we conducted a two-way ANOVA with past-self-continuity and size of sunk cost as independent variables and tendency to go to Cancun as the dependent variable. We predicted that low (vs. high) past-self-continuity would decrease the tendency to stick to the previously chosen course of action when sunk cost is high, but this effect would be attenuated when sunk cost is low. Further, we predicted that high (vs. low) sunk cost would increase the tendency to stick to the previously chosen course of action when past-self-continuity is high, but this effect would be attenuated when past-self-continuity is low. Our theory did not make a prediction as to whether the main effect of past-self-continuity or the main effect of size of sunk cost on tendency to travel to Cancun would be significant because this depends on the degree of attenuation. Central to our theory, we expected a significant interaction between past-self-continuity and size of sunk cost. Contrary to our prediction, however, the interaction term was not significant,  $F(1, 1800) = 0.08$ ,  $p = .779$ . Rather the results showed two significant main effects: Participants in the high-cost condition were more likely to go on the previously booked trip to Cancun ( $M = 3.91$ ,  $SD = 2.21$ , 95% CI = [3.77, 4.06]) than those in the

low-cost condition ( $M = 3.04$ ,  $SD = 1.97$ , 95% CI = [2.92, 3.17]), replicating the classic sunk-cost effect,  $F(1, 1800) = 77.87$ ,  $p < .001$ ,  $\eta^2 = 0.041$ , 95% CI = [0.025, 0.061]. Additionally, participants in the low-past-self-continuity condition were less likely to go on the trip to Cancun ( $M = 3.33$ ,  $SD = 2.14$ , 95% CI = [3.19, 3.47]) than those in the high-past-self-continuity condition ( $M = 3.63$ ,  $SD = 2.13$ , 95% CI = [3.49, 3.76],  $F(1, 1800) = 9.59$ ,  $p = .002$ ,  $\eta^2 = 0.005$ , 95% CI = [0.001, 0.014]). Hence, as in our previous studies, low (compared to high) past-self-continuity decreased the tendency to continue with a previously chosen course of action after making a substantial irrecoverable investment. However, in contrast to Study 2a, this was also the case when the amount of investment was low.

Since we did not find the predicted interaction, meaning that the effect of past-self-continuity was not qualified by the size of the sunk cost, we did not conduct the planned follow-up contrast analyses. We discuss potential alternative mechanisms underlying the pattern of results in this study in the discussion section.

Finally, to test the effect of past-self-continuity on anticipated negative emotions associated with abandoning the low and high past investments, we conducted a two-way ANOVA with past-self-continuity and size of sunk cost as independent variables, and anticipated negative affect as the dependent variable. The results only revealed a main effect of size of sunk cost, such that participants in the high-cost condition anticipated greater negative affect ( $M = 4.44$ ,  $SD = 1.71$ , 95% CI = [4.33, 4.55]) than those in the low-cost condition ( $M = 4.21$ ,  $SD = 1.66$ , 95% CI = [4.11, 4.32]),  $F(1, 1800) = 8.12$ ,  $p = .004$ ,  $\eta^2 = 0.004$ , 95% CI = [0.0004, 0.013]. Neither the main effect of past-self-continuity ( $M_{high-past-self-continuity} = 4.38$ ,  $SD = 1.70$ ;  $M_{low-past-self-continuity} = 4.27$ ,  $SD = 1.67$ ;  $F(1, 1800) = 1.88$ ,  $p = .171$ ) nor the interaction ( $F < 1$ ) were significant. Hence, the conditions to run the planned mediation analysis were not met.

## **Discussion**

We hypothesized that low past-self-continuity would reduce the sunk-cost bias. Specifically, we predicted that low past-self-continuity would reduce individuals' tendency to stick with a previously chosen course of action after making a substantial investment. Our theorizing, based on negative emotions such as guilt, regret, and wastefulness associated with abandoning substantial past investments, had further predicted that this effect would be attenuated when the sunk cost is smaller and therefore less likely to trigger such negative emotions in the first place.

As predicted, we found that low past-self-continuity reduced individuals' tendency to stick to their past action after making a larger investment. In contrast to our prediction, however, this effect was not attenuated when the investment was smaller. Hence, the sunk-cost bias, when defined as the increased tendency to continue a course of action after making greater versus smaller investments (Olivola, 2018), was not reduced. This is in contrast to the results of Study 2a. Further, the effect on our proposed mechanism measure, anticipated negative affect from abandoning past investment, was not significant. Together this suggests that in this study, the effect of past-self-continuity on tendency to continue the course of action may at least in part have worked through a different mechanism than the negative emotions account we proposed, and of which we found evidence in Studies 2a and 3.

One explanation noted previously is that individuals who perceived their core identity as less stable due to the manipulation of low past-self-continuity may have also believed that their preferences have changed since the initial investment. As a result, they may have been more inclined to change their course of action regardless of the size of sunk cost. The results from Study 2a, where participants were more prone to change course of action under low-past-self-continuity only when the sunk cost was larger, make this a less compelling account for our

overall set of results. It is possible, however, that the low past-self-continuity manipulation may have triggered perceived change in preferences in this study because it was conducted during the Covid-19 pandemic. Participants in the low past-self-continuity condition, who thought about changes in their core identity, may have additionally thought of changes in their consumption habits that were caused by the pandemic. As a result, they may have believed to a greater extent that their preferences had changed since the initial investment, making them more willing to switch their course of action independent of the size of the sunk cost. We tried to pre-empt this potential issue by instructing participants to assume a world without the pandemic for the purpose of the study. The contents of the participants' responses to the manipulation task suggest that they largely followed these instructions.<sup>5</sup> However, we cannot completely rule out the possibility that pandemic may have affected participants' thoughts during the self-continuity manipulation task.

While all the scenarios we used have been adapted from past research on sunk-cost bias, Study 4 differed from Studies 1-3 in one potentially important respect which may suggest another reason for the observed results. Studies 1-3 involved two distinct and separate choices each of which could be completed and experienced on its own. For instance, in Study 2a participants had purchased wallpaper and had benefitted from the wallpaper during past years, and then needed to decide whether to invest in renewing the wallpaper to continue benefitting from it in the coming years. In contrast, in Study 4 participants first made a decision which was not experienced as of yet, and was thus incomplete. They then needed to decide whether to complete that decision, or decide to take a different path, thus leaving the first decision unexercised. Specifically, they needed to decide whether to go to Cancun, having booked that trip two years before, or leave the Cancun trip unfulfilled and go to San Juan instead. The results of Study 4 may therefore be

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<sup>5</sup> Among the 1804 participant responses, only 14 included one or more of the words “corona”, “covid”, “pandemic”, or “virus”.

explained by the concept of completion (Gourville & Soman, 1998; Van Putten, Zeelenberg, & Van Dijk, 2007; Soman & Cheema, 2001). This theory states that the unwillingness to abandon a previously chosen course observed in sunk cost studies is caused by a desire to complete an unfinished cost-consumption episode. People are assumed to open a “mental account” for a transaction after incurring a cost, and are motivated to consume as planned in order to close the account in a satisfactory way (Soman & Cheema, 2001). In our study, participants had paid for the Cancun trip but had not taken it, and hence may have been motivated to complete the transaction episode by traveling to Cancun. This motivation may operate independent of the size of the cost. Low past-self-continuity may have thus resulted in “psychological decoupling” of the payment and the consumption of the transaction episode (Prelec & Loewenstein, 1998). Participants in that condition may have assigned the payment they made two years ago for the Cancun trip to their past self, viewing the mental account as “closed” even when it was not completed through consumption. This may explain why low past-self-continuity reduced the tendency to stick to the chosen course not only when sunk cost was large, but also when it was small.

### **General Discussion**

Five studies examined whether individuals who feel less connected to their past-self are less likely to exhibit sunk-cost bias. Past work posited that people feel high responsibility for investments they have personally made, and they consequently anticipate negative emotions when contemplating abandoning these investments (Arkes & Blumer, 1985; Hafenbrack et al., 2014; Staw, 1976). The present research investigated this assumption by focusing on the temporal separation between the initial investment and the subsequent decision to continue the course of action. We hypothesized that individuals would be less likely to anticipate negative

emotions and hence to exhibit sunk-cost bias when they have a weak sense of connectedness to their past self who made the initial investment. Across five studies we found evidence that reducing psychological connectedness to the past self, or past-self-continuity, reduced people's tendency to stick to a previous chosen course of action after making an investment in it despite the presence of a better alternative. However, we found mixed evidence as to whether this was due to reduced weight given to sunk costs. Specifically, Study 2a has found that low (compared to high) past-self-continuity reduced individuals' tendency to stick to a previously chosen course of action when sunk cost was large, but this effect was not found when sunk cost was small. This provided evidence that inducing low past-self-continuity reduced the sunk-cost bias. However, Study 4, conducted under Registered Report (pre-registered and highly powered), failed to replicate evidence for the role of the sunk cost: individuals who felt less (versus more) connected to their past self were less likely to stick to their previously chosen course of action both when the investment in that option was large and when it was small. We want to note that the tendency to stick to a previously chosen course of action, which was reduced by the low past-self-continuity intervention in all of our studies, is an essential part of the sunk-cost bias, and has by itself been commonly used as the definition of sunk-cost bias by prior literature (Gunia et al., 2009; Hafenbrack et al., 2014; Soman & Gourville, 2001). In the present research we adopted a more stringent definition of the bias which involves the relative tendency to stick to past actions depending on the amount invested in that option (Olivola, 2018) and found only partial evidence that this relative tendency may be reduced by low past-self-continuity.

Our findings contribute to the line of research which has studied moderators of sunk-cost bias, such as ambiguity of information (Van Dijk & Zeelenberg, 2003) and mindfulness meditation (Hafenbrack, Kinias, & Barsade, 2014). We present evidence that sunk-cost bias can be influenced by perceptions of self-continuity. More specifically, our research contributes to our

understanding of the role of psychological connectedness between the person incurring the sunk cost and the person making the focal decision. Work by Gunia et al. (2009) and Olivola (2018) focused on settings in which sunk costs were incurred by someone other than the decision-maker, and found that decision-makers may still show an increased tendency to continue with the prior course of action. Both papers also discuss the role of psychological connectedness between the individual who incurred the sunk cost and the focal decision-maker. Gunia et al. (2009) show that such interpersonal sunk-cost effects are more likely when the decision-maker feels stronger psychological connectedness to the person who incurred the initial cost. In contrast, Olivola (2018) argues that the effect was independent of the psychological connectedness with the initial investor. Notably, however, Olivola (2018) does not directly manipulate psychological connectedness but instead social closeness. Our work complements this literature by returning to intra-personal sunk-cost settings, in which the initial investor and the decision-maker are physically one and the same, and showing that psychological connectedness matters.

We found evidence that low psychological connectedness to the past self can reduce sunk-cost bias in part because individuals are less likely to anticipate negative emotions, specifically guilt, regret, and wastefulness, from abandoning past investments. Study 2a found that the effect of past-self-continuity was attenuated when the size of sunk cost was smaller and therefore less likely to trigger negative emotions in the first place. Furthermore, Study 3 measured negative emotions and found the theorized reduction under low past-self-continuity. The finding that low past-self-continuity can reduce negative self-conscious emotions may have in itself broader implications. For example, feelings of shame, guilt, and regret are associated with symptoms of depression and anxiety (Kim, Thibodeau, & Jorgensen, 2011; Roese et al., 2009). Might such symptoms be reduced by making patients feel disconnected from the past self whose actions or



characteristics give rise to these feelings? Future research may further study these effects and their potential downstream consequences for mental health, well-being and life satisfaction.

The results of Study 4, where low past-self-continuity reduced the tendency to change one's course of action independent of the size of sunk cost, suggest that in certain settings psychological mechanisms other than reduced negative affect on which we focused may contribute to this effect. Specifically, when the decision-maker has not yet received any consumption benefit for the payment they made, low past-self-continuity may lead to psychological disassociation or "decoupling" of the payment from the consumption, thereby reducing the need to realize the consumption associated with the past payment. Future work may systematically examine the effect of self-continuity on decoupling.

Our findings also have implications for a population that may naturally feel less connected to a past self that may have made an investment, the growing segment of aging individuals, who may be more likely to experience impaired memory (Yoon & Cole, 2008). If consumers do not remember as clearly the time in which they made an investment, they may naturally feel less connected to that past self and may therefore be less likely to commit sunk-cost bias. This is consistent with prior findings that older adults are less likely than younger adults to commit the sunk-cost fallacy (Strough, Mehta, McFall, & Schuller, 2008). Interestingly, and seemingly contradicting this notion, prior work reported a positive relationship between older age and self-continuity (Rutt & Löckenhoff, 2016). This points to the need to study self-continuity in a more nuanced way. For example, one may feel a general sense of identity stability but not feel connected to a specific episode from the past; or one may feel a strong sense of connection to a specific past experience despite perceiving changes in the self (see also Prebble, Addis, & Tippett 2013). Future research can study these specific aspects of self-continuity and their unique consequences.

Finally, our research adds to the literature examining consequences of self-continuity. This line of work has primarily focused on negative consequences of low self-continuity for psychological functioning and decision-making. It identified low future-self-continuity as a cause of short-sighted behaviors, and proposed interventions that enhance future-self-continuity as a means to reduce myopia (Bartels & Urminsky, 2011, 2015; Chandler, Lalonde, Sokol, Hallett, & Marcia, 2003; Hershfield et al., 2011; Van Gelder et al., 2013). So far, however, the potential positive consequences of low self-continuity have largely been unexamined (an exception is Kim and Wohl (2015)'s and Wohl et al. (2018)'s research examining addictive behaviors). To our knowledge, our research is the first to suggest that feeling disconnected from a temporally removed self can reduce decision biases. We focused on reducing sunk-cost bias; however, our findings may bear relevance to other phenomena characterized by overweighting of or overcommitment to past decisions, including inaction inertia and endowment effects. For example, research on the endowment effect has shown that people assign higher value to an item when they own it, relative to the same item when another individual owns it (Kahneman, Knetsch, & Thaler, 1991), and such valuation differences between buyers and sellers can cause market inefficiencies. Would feeling less connected to the past self who took ownership of the item lead people to assign lower value to the item? Examining this and related questions offers interesting avenues for future work.

### **Author contributions**

The first and second authors contributed equally. The first and second authors developed the study idea and concept. The first and second authors developed the study design, with critical input by the third author. The first and second authors supervised data collection and performed data analysis and interpretation, under supervision of the third author. The first and

second authors drafted the initial manuscript, with critical revisions by the third author. All the authors worked on various aspects of the final version and approved the final manuscript for submission.

### **Open Practices Statement**

Studies 1-3 were not formally preregistered. Study 4 was conducted under Registered Report format and was formally pre-registered before data collection. All materials are available in the Supplementary Materials. All materials, data and code are made available on the Open Science Framework at [https://osf.io/6zvg9/?view\\_only=cd5660b6ae7947daa79a6509727ff160](https://osf.io/6zvg9/?view_only=cd5660b6ae7947daa79a6509727ff160).

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