Doubling-Back Aversion

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Abstract

Four studies (N = 2,524) provide support for doubling-back aversion, a reluctance to pursue more efficient means to a goal when they entail undoing progress already made. These effects emerged in diverse contexts, both as participants physically navigated a virtual-reality world and as they completed different performance tasks. Doubling back was decomposed into two components: the deletion of progress already made and the addition to the proportion of a task that is left to complete. Each contributed independently to doubling-back aversion. These effects were robustly explained by shifts in subjective construals of both one's past and future efforts that were associated with doubling back, not by changes in perceptions of the relative length of different routes to an endstate. Participants' aversion to feeling their past efforts were a waste encouraged them to pursue less efficient means. Discussion focuses on how doubling-back aversion is distinct from established phenomena (e.g., sunk-cost fallacy).

Keywords: judgment and decision making, biases, sunk-cost fallacy, subjective construal, goal pursuit

Statement of Relevance

Modern life is busy. Over the course of a day, people must complete a variety of tasks in order to navigate their world and make progress in their work and personal lives. For many such tasks (e.g., running errands, putting belongings away at home), the question is less whether one can complete them, but how efficiently such work can be done. The present research documents a novel phenomenon, doubling-back aversion, that encourages inefficiency in how people pursue achievable tasks. Doubling-back aversion in part stems from a desire to avoid viewing one's previous efforts as a waste, which ironically encourages people to waste time and effort to reach the endstate. Psychologists have long appreciated that people are slow to abandon goals even once they are clearly unachievable. The present work instead examines why people are inclined to sometimes make suboptimal decisions about how to pursue achievable goals.

Research Transparency Statement

General Disclosures

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Open Science Framework Repository

Prior to data collection for every study (Studies 1-4), we preregistered our hypotheses, methods, and analysis plan. These preregistrations, along with our study materials, data, and analysis scripts, are all available on the Open Science Framework: https://osf.io/cpnra/?view_only=a79bbeeb2a774ecaab48d213e693e1a9. Preregistered exploratory analyses that are not included in this manuscript (Studies 3-4) can be found in the Supplementary Online Materials, also available in the OSF repository.

Doubling-Back Aversion

Consider a New Yorker flying home from San Francisco, with a stopover in Los Angeles. Upon landing in L.A., they see their flight to New York is severely delayed. The airline's app gives them the option to switch to an alternate routing through Denver, which would get them to New York three hours earlier. Although several previously identified psychological forces may make one reluctant to switch from the status quo, we suspect many travelers would take this time-saving detour.

Now imagine a twist. Instead of an alternate routing through Denver, the app offers the opportunity to fly back to San Francisco before continuing nonstop to New York. Even if this routing would also save three hours, we suspect that enthusiasm for it would be lower. We propose this is because the option involves *doubling back*: the deletion or undoing of progress already made (flying back to San Francisco) such that one then has more of a journey to complete (the entire trip from San Francisco to New York instead of just the remaining portion of the initial journey). We propose people display *doubling-back aversion,* a preference to avoid doubling back even when doing so is a more efficient means to an end. Beyond documenting doubling-back aversion, we test whether each component of doubling back contributes to this effect.

Previous work has examined a general reluctance to deviate from the path one is on. For instance, people display a status quo bias (Kahneman et al., 1991; Samuelson & Zeckhauser, 1988), sticking with a current option even when alternatives dominate it (Suri et al., 2013). In part, this is because if a decision to change (vs. stay the) course proves unwise, people will especially regret their decision (Zeelenberg et al., 2002). People also unwisely stay the course due to a sunk cost fallacy, continuing to invest resources into a failing proposition in the

(unlikely) hope that they turn their loss around (Arkes & Blumer, 1985; Brockner, 1992; Molden & Hui, 2011; Thaler, 1980; Whyte, 1993). Admitting defeat can threaten one's sense of competence for ever having headed down that road. This prospective threat prompts motivated distortions that downplay one's current (losing) trajectory (Arkes & Blumer, 1985; Festinger, 1962). Decision-makers' fear of taking a wrong turn, or admitting to themselves that they already did, produces a certain passivity and inertia.

These themes lend general plausibility to the doubling-back aversion hypothesis; however, these previously identified phenomena and mechanisms do not directly anticipate our effect. The status quo bias might discourage our New-York-bound flyer from changing their itinerary, but would not differentiate between whether that change involves doubling back or not. As the delays pile on and the risk of cancelation nears certainty, the sunk-cost fallacy might only further encourage the traveler to wait for the flight from Los Angeles to New York. But again, this predicts a counterproductive doubling down on one's previous choices, not a distinct preference for a particular *new* means (i.e., one that avoids doubling back) to an end.

If people display doubling-back aversion, it will be for one of two general reasons. First, the prospect of doubling back may make a route seem objectively daunting. Two means to the same end can be objectively differentiated in terms of cost (for our purposes, the perceived duration of the route, or means to the endstate, being considered; e.g., Vroom, 1964). Forecasts of task duration are malleable and subject to systematic distortion (Buehler et al., 1994, 2010; Halkjelsvik & Jørgensen, 2012; Kruger & Evans, 2004). One possibility is doubling back increases this *perceived route length*, thus explaining the reluctance to double-back.

Second, the prospect of doubling back may change subjective construals of one's previous efforts and/or the efforts one has yet to undertake. The specific nature of these *route*

construals likely vary somewhat depending on the context. Instead of developing a full taxonomy, our goal is to test whether route construals offer incremental validity (beyond perceived route length) in explaining doubling-back aversion. We also test whether it is construals of one's past efforts and/or future efforts that play a mediating role.

One route construal that likely has broad applicability is an aversion to viewing one's efforts as a waste. Reflecting literal waste aversion, people are reluctant to abandon a project if their initial output will become mere scraps instead of input for another task (Arkes, 1996). In another study, interest in a Lego-building task waned once it was clear their creations would be destroyed upon completion (Ariely et al., 2008). Doubling back may thus cheapen one's past efforts by taking a (metaphorical) hammer to that work.

Doubling back may also (or only) contaminate route construals of future efforts. For an achievement goal, doubling back may contaminate one's sense that one can still score a win as opposed to getting mired in a tortured pathway toward an endstate. For instance, as one reaches a dead-end on a challenging hike, we suspect that the looming walk back may seem more like a slog than a glorious path to the mountain's pinnacle. Despite variability in which route construals most logically apply to any specific doubling-back context, the distinction between perceived route length and route construals—as between beliefs about objective costs versus subjective interpretations—has more universal applicability.

This manuscript presents four studies that test for doubling-back aversion. Studies 1 and 2 identify the preference in qualitatively different contexts. In each, participants are provided with a goal and are initially asked or induced to pursue it in a specific way. After some progress, participants then have the choice to switch to an easier means to complete the goal. Only sometimes did that switch require (or seem to require) doubling back. Studies 3 and 4 used

framing manipulations to decompose the influence of each component of doubling back. We also tested to what extent route construals and/or perceived route length explain doubling-back aversion.

Study 1

Participants navigated a virtual-reality world built for this study. Early in traveling from Point A to Point B, participants reached a map. Before this point, participants did not know the available routes. For some participants, it became clear the fastest route required doubling back. We tested for doubling-back aversion by assessing whether this feature discouraged such efficiency.

Method

Participants and Design

Two hundred two undergraduates at an American university took part in exchange for course credit. Participants were randomly assigned to one of two conditions: doubling-back or control. Due to errors with saving the data, five participants' data were missing. This left 197 participants in all analyses reported below. The hypothesis, methods, and analysis plan were preregistered: https://aspredicted.org/DKZ_GXG.

Procedure

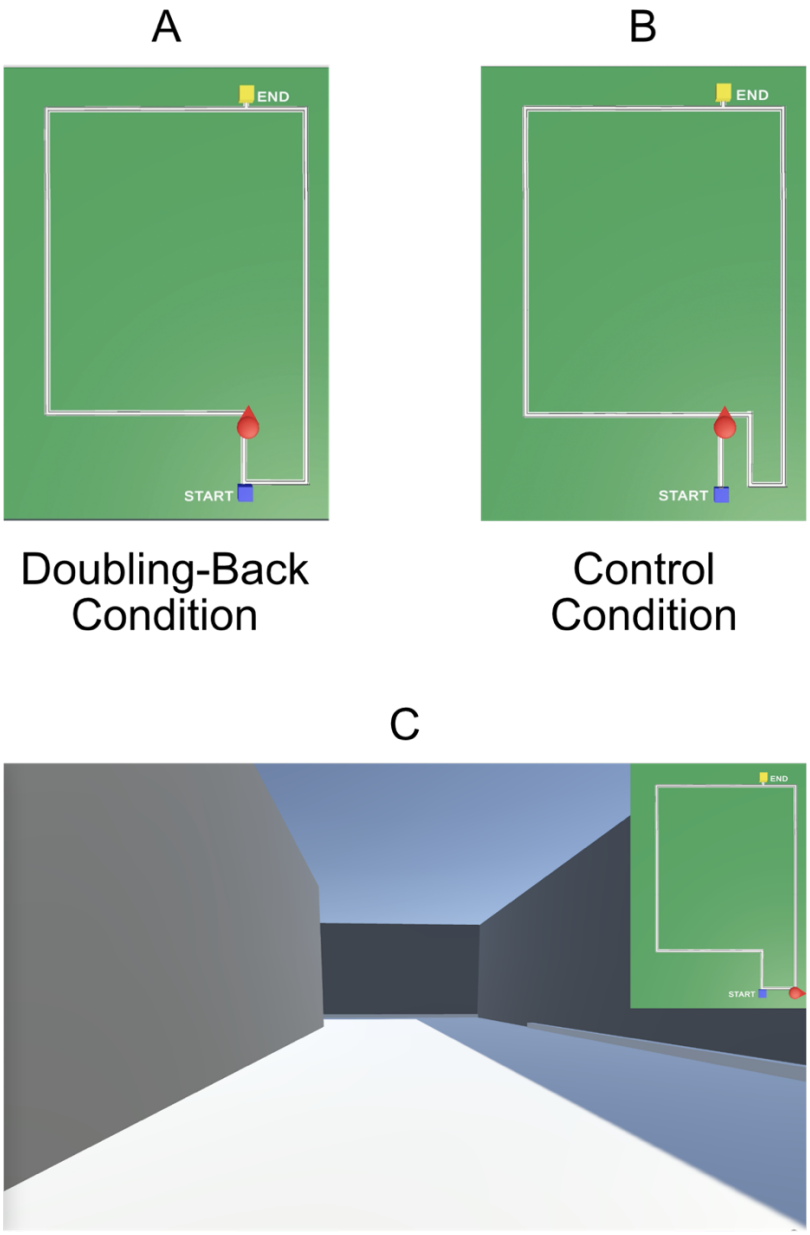
Participants completed the study in the lab, in between two other unrelated studies. In fact, this study was not even presented to participants as a study at all. Instead, after the preceding study (completely administered by computer) had finished, participants learned they would need to walk (in a virtual-reality world) to the next study. More specifically, they needed to traverse a virtual trail to reach an office where they would be supplied with a code, which would allow them to proceed to the next study.

After participants had moved forward a short distance (seemingly the only route participants could go), they reached a map that identified two paths that led to the office. The map remained on screen until participants reached the endpoint and retrieved the code. Unbeknownst to participants, the key dependent variable was the route they took to the office. The nature of one of the two pathways—and thus the maps—differed slightly by condition.

One of the two pathways, which required participants to veer left and then ultimately loop around to the office, was the same in each condition. The other pathway was always identical in length (between the two versions) and approximately 20% shorter than the longer route, but the specific form it took was slightly different by condition. In both conditions, taking this shorter path required participants to temporarily move in the opposite direction of the endstate. But only for those in the *doubling-back* condition did the shorter pathway entail retracting the steps they had already taken. As a result, only in the doubling-back condition did the shorter route require that participants delete the progress they had already made and thus start the journey over from the beginning (see Figure 1). In combination, this allowed us to disentangle an aversion to doubling back from an aversion to moving in the opposite direction from the endpoint (Soman & Shi, 2003).

Figure 1

The Virtual-Reality World Navigated by Participants in Study 1



Note: Panels A and B: These maps were seen once participants reached the point where each red teardrop (indicating the participant's current location and orientation) is positioned. The longer route (the leftward route) is equivalent in both conditions, and the shorter route (the rightward route) is the same length in both conditions. Only in the doubling-back condition does the shorter route entail undoing one's steps and beginning again from the START point. Panel C: A screenshot of the virtual-reality world. Participants navigated through the world using the arrow keys. The route immediately available to them could be seen in the main window, whereas the more general paths were visible in the map insert.

Upon retrieving and entering the code, participants were reminded, “In the virtual world, when the map showed up, you could see where you were and where the office was. You then had to decide how to get to the office. Once you decided on a path to get to where the office was, you went along that path and reached the office.” They were then asked, “Why did you choose that specific path to get to the office? Please explain in two or three sentences.” Per our preregistration, we analyzed these responses to detect potentially artifactual reasons why people would display doubling-back aversion.

Results

Actual Route Length Differences

First, we tested whether participants really did reach the destination more quickly if they took the shorter route on the right. We calculated the time it took participants to get from the map to the destination (once they began moving). In order to reduce positive skew, we log-transformed these times. Although we knew that the right path was 20% shorter, we also found that participants who took that path arrived at the endstate more quickly (back-transformed M = 171.05s) than did those who took the longer route to the left (back-transformed M = 222.38s), $t(195) = 11.72$, $p < .001$, $d = 1.68$.

Doubling-Back Aversion

The shorter route—despite offering a more efficient means to an end—also sometimes required doubling back. First, we followed our preregistered analysis plan by including all participants. A logistic regression showed that more participants chose to take the longer path when the shorter path would require doubling back (56.7%) than when it would not (31.0%), $z = 3.59$, $p < .001$. Next, we proceeded with analyses that we preregistered as exploratory, which involved including increasingly stringent criteria for who was included.

Our second analytic approach was to exclude participants who said they did not double back because that pathway was blocked by a wall. (If participants in the doubling-back condition turned around before reaching the map, they could see only a wall behind them, not the turn that was actually available to them.) Two participants, both in the doubling-back condition, said they thought that path might be blocked off by a wall. Doubling-back aversion held even after excluding these two participants (55.8% vs. 31.0%), $z = 3.45$, $p = .001$. For the final analytic approach, we excluded participants who mistakenly indicated that there was only one path to the office, which means they did not recognize that they were even confronting a choice. There were 5 such participants: four in the doubling-back condition, one in the control condition. Doubling-back aversion held in this further-reduced sample (54.8% vs. 30.3%), $z = 3.40$, $p = .001$. A considerable number of participants in both conditions elected to take the longer path, which may reflect some form of a status-quo bias or sunk-cost fallacy. The robust difference in preferences between the conditions reflects doubling-back aversion.

Study 2

Study 2 tested doubling-back aversion in a qualitatively different context, one requiring cognitive (instead of "physical") effort. Whereas Study 1 presented different participants with different possible pathways, Study 2 actually presented all participants with the same choice. But only for some participants did we frame one route as requiring doubling back.

Method

Participants and Design

Four hundred two CloudResearch-approved Americans were recruited from Amazon Mechanical Turk (AMT). Participants were randomly assigned to one of two *switch-frame* conditions: doubling-back or control. Per our preregistered criterion, we excluded 3 participants

from all analyses reported below who were unable to answer a memory-based attention check at the study's conclusion. These participants were unable to identify what they had been asked to do in the study (correct answer: "write words that begin with a certain letter"). This left 399 participants in all analyses reported below. The hypothesis, methods, and analysis plan were preregistered: https://aspredicted.org/VKX_LL3.

Procedure

Participants learned they would be asked to complete a task: "For instance, you may be asked to solve anagrams (unscramble four or six letters to form a real world), do simple arithmetic problems (addition or multiplication), write words that begin with a certain letter (words that start with G or with T), or identify objects in photographs (monochromatic or full-color pictures)." Note that by describing both general categories of tasks (e.g., generate words…) as well as two specific instantiations of each task (e.g., …that start with 'G' or with 'T'), this offered the flexibility to frame a switch from one specific instantiation of a task to another as continuing with the same task or doubling back and starting over. All participants learned that they would be completing the word-generation task. More specifically, they would have to think of 40 words that start with the letter 'G.' Participants also learned certain constraints: The 40 words would have to be unique, English words, and would need to come from their own memory instead of an external source (e.g., a dictionary, an internet search). Each participant had to actively promise not to cheat in these ways.

Participants began generating words. They were shown a progress bar that updated after the submission of every 5 words to show what percentage of the task they had completed. Once participants had submitted ten words (and thus had completed 25% of the task), participants were offered the key choice. All participants had what were essentially the same two options. One was

to continue with their current task under the same instructions, which would require generating the remaining 30 words that started with ‘G.’ The other option was the same across conditions, but it was framed in one of two ways.

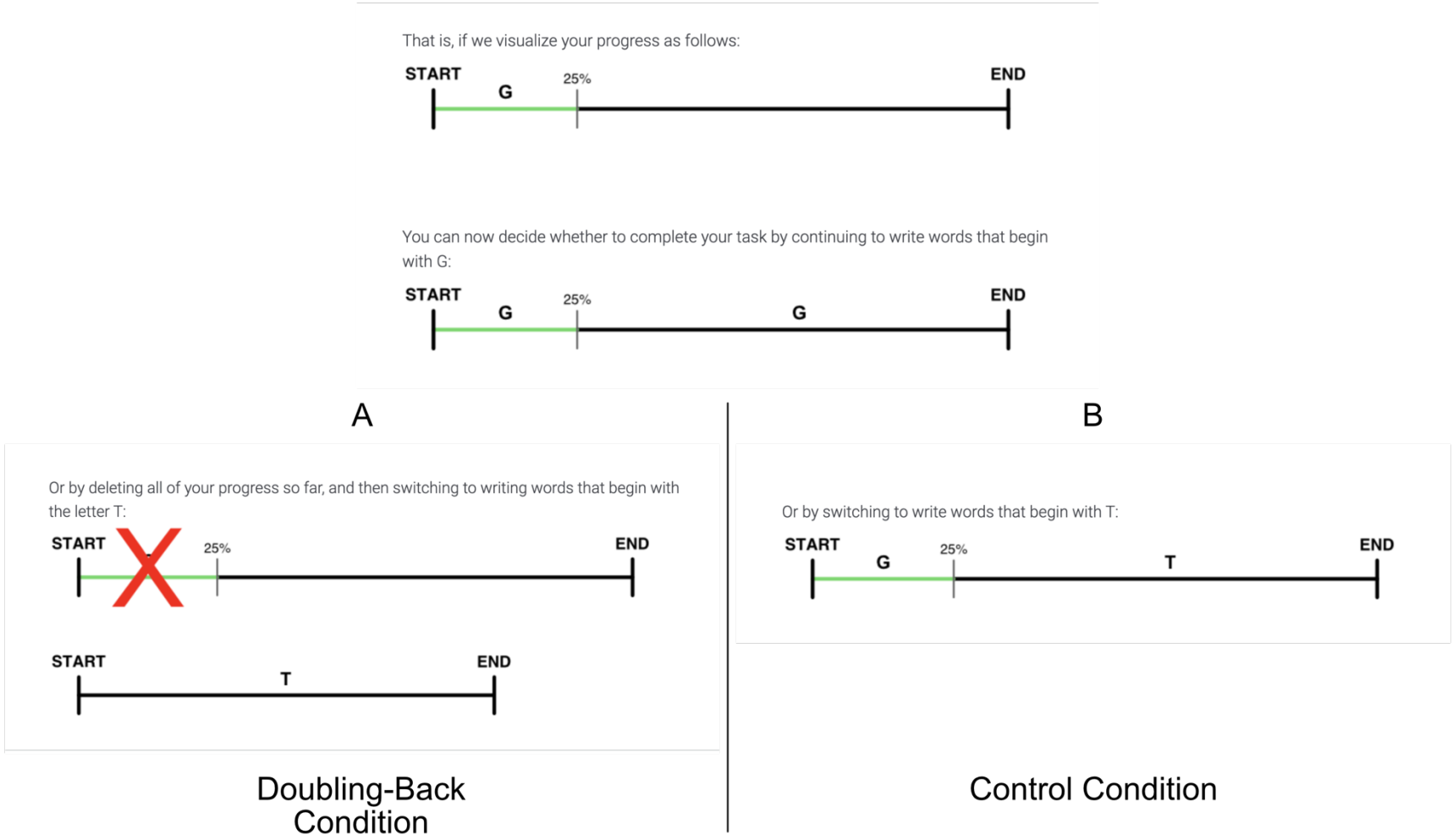
In the *doubling-back* condition, participants were told the other option involved “throwing out the work you have done so far and starting over on a new task.” That new task was to generate 30 words that started with the letter ‘T.’ In the *control* condition, participants were instead told that choosing this alternative option would mean they were “going to continue to work on the same task,” but that “for the final 75%” they would instead generate words that start with the letter ‘T.’ In that way, only in the doubling-back condition was the same option to change course framed as undoing the work that has been done thus far and starting anew. We reinforced these equivalent, but differently framed choices with one of two graphics (see Figure 2).

Note how this manipulation is more conservative than the one used in Study 1. In that study, participants who chose to double-back actually had to spend time and effort trying to re-traverse (in reverse) the route they had already traveled. In Study 2, participants who wished to double back could backtrack with the click of a button. If doubling-back aversion emerges in the present paradigm, it means the aversion is to the *act* of doubling back (even when it can be accomplished immediately) instead of simply to the *process* of doubling back.

There are more words in the English language that start with ‘T’ than that start with ‘G.’ Furthermore, given all participants had already generated 10 words that started with ‘G’ (that they could not reuse), this also made staying the course more challenging. We expected this would make switching to generating ‘T’ words the more efficient way to complete the study. All participants actually completed their selected task. Unbeknownst to participants, we measured

Figure 2

How the Decision to Switch Was Visually Represented in Each Condition (Study 2)



Note: Although participants' past progress and the option to continue on their current path were represented identically in both conditions, only in the doubling-back condition was the decision to switch shown to entail the deletion of their past work and starting anew on the subsequent task (instead of simply completing the remaining 75% under new instructions).

how long participants took to complete the first (generating 10 words that start with ‘G’) and second (generating 30 words that start with ‘G’ or ‘T’, depending on the participant’s choice) parts of the task to determine whether switchers did indeed complete the task more quickly than did those who stayed the course. Per our preregistration, we log-transformed these times (because this transformation was better at reducing positive skew than a square-root transformation) for use in relevant analyses.

Results

Actual Route Length Differences

First, we tested whether those who switched to the ‘T’ task were indeed able to reach the end of the task more quickly than those who continued with the ‘G’ task. And indeed, that was the case. Those who switched tasks were able to complete the second part more quickly (back-transformed $M = 166.64$s) than those who stayed the course (back-transformed $M = 247.36$s), $t(397) = 6.95$, $p < .001$, $d = 0.70$. This supports the assumption that switching routes was indeed a more efficient route to completing the overall task.

Doubling-Back Aversion

We proceeded to the direct test of doubling-back aversion. We conducted a logistic regression in which the switch-frame condition (doubling-back or control) predicted the decision to switch. As predicted, participants were less likely to switch when the new task was framed as requiring doubling back (throwing out one’s work and starting over on a new task; 25.5%) than when it did not (75.4%), $z = 9.48$, $p < .001$. This illustrates doubling-back aversion in a new context.

Recall that each participant made the critical choice (to stay or switch) after completing 25% of the originally assigned task. We proceeded to test whether evidence of doubling-back

aversion would remain even when we controlled for the amount of time participants took to generate those first 10 words that start with a 'G.' That is, perhaps due to a failure of random assignment, those in the doubling-back condition simply happened to be especially quick on the initial task, such that that rapidity—not the aversive prospect of doubling back—was responsible for their greater likelihood of staying the course. We also tested whether this initial task duration predicted the decision to switch differently by condition.

This expanded model included the (standardized) log-transformed initial task time as well as its interaction with the switch-frame condition. Not only was the decision to switch not associated with the initial task completion time, $z < 1$, but this association did not vary by switch-frame condition, $z = 1.09$, $p = .276$. Speaking to doubling-back aversion's robustness, we continued to observe a main effect of condition, $z = 9.48$, $p < .001$. In other words, who did and did not choose to switch tasks was explained only by whether changing course entailed doubling back, not by how much one was able to quickly complete the task under the initial task instructions.

Study 3

Using a new choice context, Study 3 extended on Study 2 by decomposing the two elements of doubling back: undoing or *deleting* one's efforts and having all as opposed to only some of a *task remaining*. Study 3 also tested whether: 1) each element contributes to doubling-back aversion and 2) perceived route length and/or route construals statistically mediated such effects.

Method

Participants and Design

Seven hundred twenty-two Americans who were CloudResearch-approved were recruited from AMT. Participants were randomly assigned to one of four conditions in a 2(deletion: deletion or no-deletion) X 2(task remaining: some or all) full-factorial design. We applied two preregistered exclusion criteria. First, we excluded 7 participants who failed a memory-based attention check that required participants to identify what they had been asked to do during the study. Second, we excluded 9 participants who were identified as outliers because their responses were more than three standard deviations from the mean on a particular composite measure (identified below). The hypotheses, methods, and analysis plan were preregistered: https://aspredicted.org/247_R5Y.

Procedure

The basic two-part structure mirrored that used in Study 2. That is, to begin, participants saw four different tasks they might be asked to do. In actuality, all participants were initially assigned the same task: to write down 40 objects one can find in a doctor's office. This exercise would be subject to certain constraints. Each answer had to be a unique English word and refer to a physical object ("For instance, do not write abstract words like 'happiness.'") We emphasized the importance of not cheating by consulting outside sources to assist with the recall. Each participant was required to affirm that they would not do this.

Choice. After participants had written down 10 objects (such that a progress bar tracking their performance had progressed to 25%), they were offered a choice. They could continue under the original instructions and write an additional 30 objects that could be found in a doctor's office. Or instead, they could switch and complete a variant that we expected would be easier: write down 30 objects that could be found in a school. Like in Study 2, we varied how

this alternative was framed. But instead of simply framing this choice as entailing doubling back or not, we instead varied independently whether each component of doubling back was present:

Deletion. This manipulation was meant to change participants' construal of the work they had done so far should they choose to change course. Those in the *deletion* condition were told that this choice involved "throwing out the work you have done thus far" and that "the objects you already generated will be deleted." Those in the *no-deletion* condition were instead told that this choice entailed "submitting the work you have done thus far" and that "the objects you already generated will be submitted." In this way, we framed participants' initial efforts as either being undone (deletion) or preserved (no deletion). Note that although this frame may change the way that participants construe their past work, it does not alter any objective details of what each choice entails. By analogy, the walker who decides to do an about-face could think of the walk backward as deleting the steps they had taken thus far or (much as one's fitness tracker would see it) as a continuation of one's already-logged journey. Participants' initial efforts still happened regardless of whether they were said to be thrown out or submitted.

Task remaining. This manipulation was meant to change participants' construal of the work that was left to do. More specifically, those in the *some* condition were told they could "continue working on the task" but could choose to change the nature of the objects they were listing "for the remaining 75%." In contrast, those in the *all* condition were told the other option entailed "starting over on a new task." This manipulation was meant to change whether participants would construe their remaining work as the final three-quarters of the task they had been working on all along, or instead as a completely new task. Crucially, this manipulation also had no bearing on what, objectively, participants who chose this option would concretely do. By analogy, the walker who decides to take a U-turn could think of this as choosing a brand new

course or completing the final X% of their journey using a new route. We reinforced these manipulations using visuals that remained on the screen until the time of choice.

Perceived route length. To understand participants' beliefs about the objective challenge posed by each option, we had participants estimate the time it would take to complete each of the two possible tasks. After verifying that these estimates were positively skewed, we followed our preregistered rule and used a (natural-)log transformation instead of a square-root transformation, because the former most reduced skew. We then took the time estimate associated with staying the course and subtracted off the time estimate associated with switching courses to calculate the *perceived relative route length*. Higher numbers thus reflected a perception that staying would prolong the work left to do.

Route construal. For Study 3, we used a route construal measure that would capture the extent to which participants subjectively characterize the choice to switch as doubling back and starting over. More specifically, we asked them, "If you changed to generating objects that are found in schools, how much would that feel like starting over as opposed to simply modifying your approach to the same task?" Participants responded on 7-point scales anchored at 1(*definitely starting over*) and 7(*definitely modifying approach to same task*). The midpoint (4) was labeled "both equally." We reverse-coded this item so that higher numbers would reflect a subjective perception of starting over. We wait until Study 4 to introduce more specific route construal measures that had the potential to offer more color into how switching routes may change one's construal of one's past and future efforts.

Results

Actual Route Length Differences

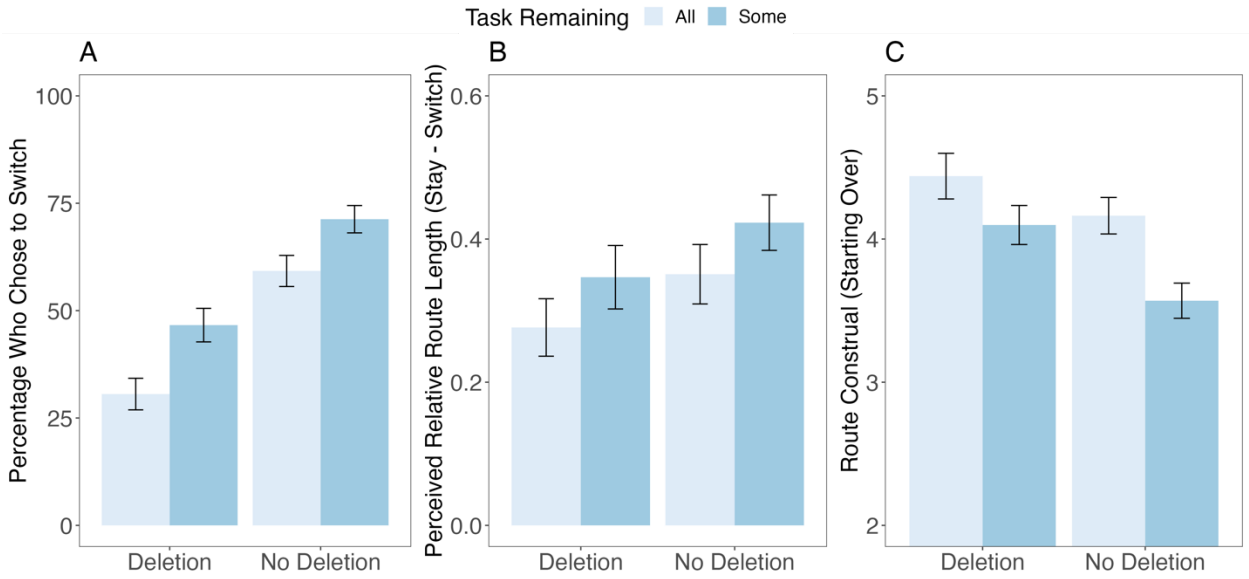
Study 3 used a new decision context, so we first conducted analyses that would speak to the wisdom of switching. That is, we checked whether participants who chose to switch (to generating items found in a school) were able to get through the remaining work more quickly than those who chose to stay the course (by continuing to generate items found in a doctor's office). And indeed, those who chose to switch completed the subsequent recall more quickly (back-transformed M = 195.96s) than those who chose to stay the course (back-transformed M = 285.05s), $t(704) = 7.83$, $p < .001$, $d = 0.59$.

Doubling-Back Aversion

We proceeded to test whether our two manipulations—each reflecting a component of doubling-back—served to discourage switching course. We conducted a logistic regression in which the deletion manipulation (+0.5: deletion, -0.5: no deletion), the task-remaining manipulation (+0.5: all, -0.5: some), as well as their interaction all predicted the decision to switch to the easier route. This analysis revealed a main effect of deletion, $z = -7.03$, $p < .001$, a main effect of task remaining, $z = -3.83$, $p < .001$, and no interaction, $z < 1$. As depicted in Figure 3, those who were led to construe a switch as throwing out their past efforts were less likely to switch (38.8%) than those encouraged to construe the same switch as still preserving their initial work (65.5%). In addition, those encouraged to see the switch as leaving them with a full, complete task ahead of them were less likely to switch (46.0%) than those led to conceive of the switch as still leaving them with only some (three-quarters) of the task to do (60.3%). These results suggest that an aversion to throwing out or deleting one's past efforts, as well as a perception that one would have an entire task ahead of them, contribute to doubling-back aversion. The absence of an interaction effect is consistent with the idea that each component of doubling back independently contributes to doubling-back aversion.

Figure 3

Means and Standard Errors for the Choice Measure and Potential Mediators in Study 3



Note: Error bars reflect ± 1 SE from the mean. For Panel B, the perceived relative route length is the difference score of the two log-transformed estimates.

Perceived Relative Route Length

We then proceeded to determine whether the manipulations affected perceptions of relative route length. We regressed this time-estimate difference score on the deletion manipulation, task remaining manipulation, as well as their interaction. In this case, we observed a marginally significant effect of deletion, ß = -.14, $t(702) = 1.82$, $p = .069$, a marginally significant effect of task remaining, ß = -.13, $t(702) = 1.72$, $p = .086$, but no interaction, $t < 1$ (see Figure 3). These effects offered some evidence that each component of doubling back may increase how objectively daunting the alternative seems compared to sticking with the status quo. Although these effects did not reach the traditional threshold of statistical significance, the fact that there were hints of effects here means both that we will be interested in using the perceived

relative route length as a covariate (to understand the nature of our effects that cannot be attributed to perceptions of route lengths) and in testing these effects again in the next study.

Route Construal

We now turn to whether the manipulations affected the route construals of switching, encouraging it to feel more like starting over (as opposed to continuing with the same task). We used the same regression as that used on the perceived route length measure, but this time we predicted the route construal item. This model returned a main effect of deletion, ß = .22, $t(702) = 2.96$, $p = .003$, a main effect of task remaining, ß = .26, $t(702) = 3.43$, $p = .001$, but no interaction, $t < 1$. As can be seen in Figure 3, those encouraged to see switching as involving the deletion of their previous efforts were more likely to construe switching as involving starting over ($M = 4.27$, $SD = 1.88$) than those led to see switching as still preserving their past work ($M = 3.85$, $SD = 1.76$). Furthermore, those led to see switching as meaning they had an entire task ahead of them were more likely to construe switching as starting anew ($M = 4.29$, $SD = 1.86$) than those encouraged to see the switching as having no implications for how much of the task they had left to complete ($M = 3.81$, $SD = 1.76$).

Statistical Mediation

Next, we examined whether the two manipulations' effects on the choice to switch could be statistically explained by their (sometimes marginal, sometimes significant) effects on perceptions of the relative route length and the route construal of switching. We entered the deletion manipulation, the task-remaining manipulation, their interaction, as well as the perceived route length (time difference score) and the route construal measure in a logistic regression predicting the decision to switch. We observed main effects of both the perceived relative route length (time difference score), $z = 6.87$, $p < .001$, as well as the route construal

measure, $z = -6.69$, $p < .001$. These showed that participants' decision to switch was predicted by their perception that completing the task under the modified instructions would take less time than completing the task under the initial instructions, and *independently* by a perception that such a switch would entail starting over. With these covariates controlled, the effects of the deletion, $z = -6.27$, $p < .001$, and task remaining manipulations, $z = -2.65$, $p = .008$, were reduced but remained significant.

We ran two parallel mediation models (Model 4, PROCESS Version 4.3; Hayes, 2017) to further examine whether the effect of each manipulation on choice was statistically mediated through each candidate mediator: the perceived relative route length of switching and the route construal of switching (perception of starting over). In each model, we alternated which manipulation (deletion or task remaining) was the independent variable and which was a covariate. In both models, we included the interaction between the two manipulations as an additional covariate (to mimic the original model). Note that in a parallel mediation model, each candidate mediator serves as a covariate when assessing an indirect effect through the other candidate mediator.

The indirect effect of deletion on choice through route construal of switching was significant (95% CI [-0.2484, -0.0438]), as was the indirect effect of task remaining on choice through route construal of switching (95% CI [-0.2784, -0.0635]). In contrast, the indirect effect through estimated time difference was nonsignificant for both the deletion model (95% CI [-0.2174, 0.0052]) and the task-remaining model (95% CI [-0.2180, 0.0119]). These effects were anticipated by the earlier reported results that our manipulations reliably influenced route construal, but less robustly affected perceived relative route length. This provides initial evidence that doubling-back aversion results due to shifts in people's subjective understanding of what

changing course would mean, independent of perceptions of how objectively daunting each route is. We now proceed to a more nuanced examination of shifts in such subjective construals.

Study 4

Study 4 builds on Study 3 by assessing whether each component of doubling back contributes to doubling-back aversion due to shifts in how one construes one's *past* efforts and/or shifts in construals of one's *future* work. We also disentangle construals stemming from one's actually switching course (and thus potentially doubling back) as opposed to staying the course. This has the potential of allowing us to localize the mediating effects of subjective route construals on doubling-back aversion to perceptions associated with the specific prospect of doubling back (as opposed to the entire choice context when doubling back is a possibility).

Method

Participants and Design

One thousand one hundred ninety-eight Americans who were CloudResearch-approved were recruited from Amazon Mechanical Turk. Participants were randomly assigned to one of four conditions in a 2(deletion: deletion or no-deletion) X 2(task remaining: some or all) full-factorial design. As per our preregistered criterion, we excluded 11 participants who were unable to answer a memory-based attention check at the end of the study that asked them what they were asked to do in the study (correct answer: "write words that begin with a certain letter"). This left 1,187 participants in all analyses reported below. The hypotheses, methods, and analysis plan were preregistered: https://aspredicted.org/8S5_D74.

Procedure

The study began in much the way that Study 2 did. After seeing a number of tasks that might be assigned, participants learned they would be listing 40 words that start with the letter

'G.' After completing 25% of this task (i.e., listing 10 words), participants received a choice of whether to continue under the original instructions or to switch to a task that Study 2 suggested was objectively shorter: to generate 30 words that start with the letter 'T.' As in Study 3, we decomposed doubling back into two separate components. Depending on participants' deletion condition, they were led to believe that switching would involve throwing out (*deletion*) or preserving (*no-deletion*) the work they had done so far. And depending on participants' task remaining condition, we framed a decision to switch as meaning they would start over on a new task (*all* remaining) or finish the original task (*some* remaining) under modified instructions.

Following these manipulations, participants registered their choice of whether to stay the course or switch. At that point, participants completed a more nuanced set of subjective construal measures (described below) designed to test how the decision to stay or switch would change their feelings about the work they had already completed as well as the work they had yet to do. Then, like in Study 3, participants made time estimates that allowed us to calculate the *perceived relative route length*: participants' estimates of how long it would take them to complete the remaining work if they were to continue under the original instructions or switch to the new instructions. Finally, participants actually completed their chosen course of action.

Route construals of past efforts. Participants indicated how they would feel about the work they had already completed under two conditions: if they decided to stay the course ("Think about if you continued by generating words that start with 'G'…") and if they decided to switch ("Think about if you switched to generating words that start with 'T'…") Under each condition, participants responded to two items preceded by the prompt "I would feel like the work I already did is…": "a waste" and "successful progress." Each item was responded to on a five-point scale (1 = "Strongly disagree", 2 = "Somewhat disagree", 3 = "Neither agree nor

disagree", 4 = "Somewhat agree", 5 = "Strongly agree"). The items were negatively correlated (r = -.74, p < .001). We reverse-scored the first item and averaged it to the second to create two separate composites: one conditional on staying the course, one conditional on switching. For each, higher *past effort construal* scores reflect more positive construals of the work already completed.

Route construals of future efforts. These items complemented the perceptions of work already done by asking how participants would feel about the route they still had to traverse, again conditional on making each choice. For both pairs of items, the two items were preceded by the prompt "I would feel like the work I still have to do is…": "a lot to do" and "an opportunity to succeed." We used the same 5-point Strongly disagree—Strongly agree scale. These items too were negatively correlated (r = -.15, p < .001). We again reverse-scored the first item and averaged it with the second item, so that higher *future work construal* scores (one conditional on staying the course, one conditional on switching routes) reflect more positive construals of the route that lies ahead.

Results

Actual Route Length Differences

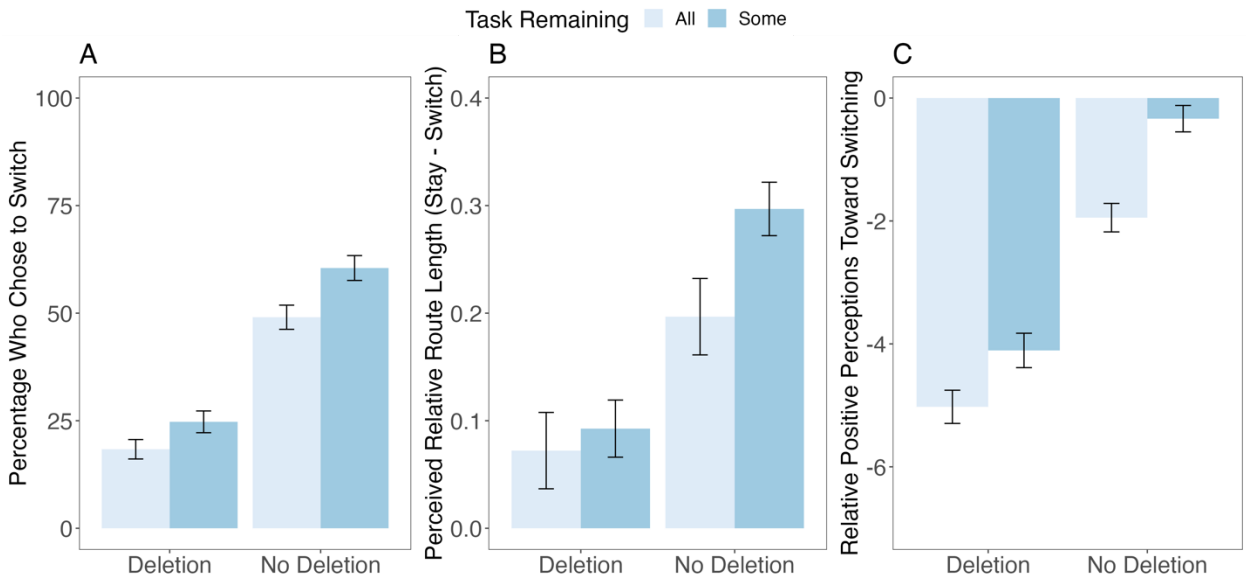
We began by testing whether we would replicate the finding from Study 2 that those who switched were able to complete the second task more quickly than those who stayed the course. Participants who switched to the 'T' task finished that task more quickly (back-transformed M = 165.18s) than participants stayed the course with the 'G' task (back-transformed M = 213.74s), $t(1185) = 8.07$, $p < .001$, $d = 0.48$. This supports the wisdom of switching. With this in mind, we examined the effect of our manipulations on the choice to switch (to the easier option), as well as the role of the potential mediators in explaining this effect.

Doubling-Back Aversion

We next tested whether our manipulations that decomposed the two components of doubling back—deletion and task remaining—affected participants' decision to switch. We conducted a logistic regression in which the deletion manipulation (+0.5: deletion, -0.5: no deletion), the task-remaining manipulation (+0.5: all, -0.5: some), as well as their interaction predicted the decision to switch. We observed a main effect of deletion, $z = -11.44$, $p < .001$, a main effect of task remaining, $z = -3.22$, $p = .001$, but no hint of an interaction, $z < 1$. As depicted in Figure 4, those led to believe that switching would delete the work they had done thus far were less likely to switch (21.6%) than those led to believe that the same switch would lead to their initial work being preserved (54.8%). Similarly, those encouraged to see the switch as requiring completion of a whole new task were less likely to switch (33.7%) than those encouraged to see the switch as leaving only some of the task to do (42.6%). These findings replicate—using a new task—that an aversion to undoing one's initial efforts as well as a perception that one has an entire new task ahead of one independently contribute to

Figure 4

Choice, Perceived Route Length, and Route Construals, by Condition (Study 4)



Note: Error bars reflect ± 1 SE of the mean. For Panel B, the perceived relative route length is the difference score of the two log-transformed estimates.

doubling-back aversion.

Perceived Relative Route Length

We then proceeded to delve more deeply into understanding what contributes to doubling-back aversion. We regressed the time-estimate difference score (estimated time to complete the task under the original instructions minus estimated time to complete the task under the new instructions) on the two manipulations as well as their interaction. We observed a significant effect of deletion, ß = -.30, $t(1183) = 5.25$, $p < .001$, a marginally significant effect of task remaining, ß = -.11, $t(1183) = 1.93$, $p = .054$, but no interaction, ß = .15, $t(1183) = 1.27$, $p = .203$. The direction of these main effects reflected that staying the course (vs. switching) seemed like it would take less time to finish when a switch would involve deletion (vs. the preservation) of one's work and (marginally) less when a decision to switch was framed as requiring the completion of all of a task (vs. the 75% that remained). In combination, this provides middling (but stronger than in Study 3) evidence that shifts in perceptions of the objective time-and-effort costs of traversing each route could contribute to at least one component of doubling-back aversion.

Route Construals

We now turn to our route construal measures. We first created a single composite that reflected the *perceived positivity of switching* by summing the past and future composites under the assumption one switched. We created an analogous *perceived positivity of staying* composite. We created a *relative positivity of switching* by creating a simple difference score: the perceived positivity of switching minus the perceived positivity of staying. Although this combination blurs across positively and negatively tinged construals that possess differences in content, the

construals were all correlated and, perhaps most important, were affected by the doubling-back manipulations in similar ways.

Following our preregistration, we first regressed the relative positivity of switching (vs. staying) on the two manipulations as well as their interaction. We observed a main effect of deletion, ß = -.73, $t(1183) = 13.67$, $p < .001$, a main effect of task remaining, ß = -.27, $t(1183) = 5.04$, $p < .001$, and no interaction, ß = .15, $t(1183) = 1.38$, $p = .167$ (see Table 1). This suggested that both components of doubling-back independently soured participants on their perceptions of switching with reference to staying.

Note that the overall composite does not allow us to see to what extent the manipulations changed how participants would construe their efforts (past and future) as a function of each route—i.e., if they stayed the course as opposed to if they switched. We thus used the same regression model, but this time predicted the switching and staying composites separately (instead of their difference score). Positive construals of switching were eroded by the deletion manipulation, ß = -.86, $t(1183) = 16.48$, $p < .001$, as well as the task remaining manipulation, ß = -.30, $t(1183) = 5.78$, $p < .001$. The interaction was not significant, ß = .12, $t(1183) = 1.15$, $p = .249$.

Crucially, it was only these construals regarding switching that produced the effects on the overall composite. That is, construals about staying the course were not affected by the deletion manipulation, ß = .04, $t < 1$, the task remaining manipulation, ß = .04, $t < 1$, or the interaction, ß = -.09, $t < 1$. As can be seen in Table 1, the manipulations' effects on route construals of switching emerged similarly for perceptions of one's efforts already completed

Table 1

Effects of Doubling Back Manipulations on Route-Construal Composites

Predictor Variables	Overall (switching – staying)	Switching (Positive) Construal			Staying (Positive) Construal		
		Past + future	Past	Future	Past + future	Past	Future
Deletion	-0.73 (.05)***	-0.86 (.05)***	-0.92 (.05)***	-0.49 (.06)***	0.04 (.06)	0.06 (.06)	0.02 (.06)
Task remaining	-0.27 (.05)***	-0.30 (.05)***	-0.28 (.05)***	-0.24 (.06)***	0.04 (.06)	0.04 (.06)	0.03 (.06)
Deletion X Task Remaining	0.15 (.11)	-0.12 (.10)	0.21 (.10)*	-0.05 (.11)	-0.09 (.12)	-0.04 (.12)	-0.10 (.12)

Note: Each cell includes the standardized beta of the row predictor on the column outcome variable from a model that includes deletion (+0.5: deletion, -0.5: no deletion), task remaining (+0.5: all, -0.5: some), and their interaction. Standard errors are in parentheses. *$p < .05$, ***$p < .001$.

(past-efforts construal) and one's work one has yet to complete (future-efforts construal). In other words, seeing switching as undoing one's work and having to complete an entirely new task made people feel that switching would contaminate the work that they had already done *and* feel down about the work they have left to do. Furthermore, and as reported in the Supplemental Materials, the deletion manipulation significantly affected all four construal measures (*p*s $< .001$). The task-remaining manipulations significantly altered three of the four construal measures (*p*s $< .001$) and marginally ($p < .10$) affected the fourth.

Statistical Mediation

Next, we examined whether the manipulations' effects on the choice to switch (i.e., doubling-back aversion) could be statistically explained by the potential mediators. We added three terms to our original logistic regression model predicting the decision to switch: the perceived relative route length (estimated time difference score), the switching (positive) construal composite, and the staying (positive) construal composite. Participants were more likely to switch when they saw staying as taking relatively more time, $z = 3.07$, $p = .002$, when they had a more positive construal of their work if they switched, $z = 13.78$, $p < .001$, and if they had a more negative construal of their work if they stayed the course, $z = -11.32$, $p < .001$. With these potential mediators included, the effect of the deletion manipulation was reduced, $z = -4.68$, $p < .001$, and the effect of the task-remaining manipulation was eliminated, $z < 1$.

We then ran two separate parallel mediation models (Model 4, PROCESS Version 4.3), alternating whether the deletion or task-remaining manipulation was the independent variable or a covariate, to examine whether the effects of our manipulations on choice were statistically mediated by the two mediators that remained plausible: perceived relative route length or the switching (positive) construal composite. Even though it was not affected by our manipulations,

we included the staying (positive) construal composite as a covariate; the interaction term that included the two manipulations was included as well. The models showed that one's positive subjective construal of switching statistically mediated the effects of the deletion manipulation, 95% CI [-2.0000, -1.3434], and the task-remaining manipulation, 95% CI [-0.7988, -0.3788], on the decision to stay the course and thus display doubling-back aversion. The independent indirect effect through the perceived relative route length (i.e., the time difference score) was significant for the deletion model (95% CI [-0.1789, -0.0194]), but not the task-remaining model (95% CI [-0.0844, 0.0019]). To combine across Studies 3 and 4: Although route construals consistently explained doubling-back aversion, perceived route length did in only one of four relevant tests.

For exploratory purposes, we repeated the indirect-effects tests but separated the two components of the route construals if one switched: past and future. The models showed that one's positive subjective construal of past work following switching statistically mediated the effects of the deletion manipulation (95% CI [-1.7249, -1.1482]) and the task-remaining manipulation (95% CI [-0.6066, -0.2709]) on the choice to switch. Similarly, one's positive subjective construal of future work following switching also statistically mediated the effects of both the deletion manipulation (95% CI [-0.4341, -0.1769]) and the task-remaining manipulation (95% CI [-0.2308, -0.0713]) on choice to switch. In summary, this supports that doubling-back aversion is robustly explained by shifts in route construals—whether of one's previous or future efforts—when one considers switching course (and potentially doubling-back), but not when one considers staying the course. This asymmetry supports the idea that it is special subjective fears associated with the choice to double back that discourage uptake of this more efficient means to the end.

General Discussion

Across various contexts, we consistently observed doubling-back aversion: a reluctance to choose more efficient means to an end if they entail undoing one's progress and thus essentially starting over. Each separable component of doubling back—undoing one's work and adding to the proportion of a task remaining—independently contributed to these effects. Doubling-back aversion was little explained by a perception that routes to the endstate would take longer to traverse, but instead through subjective construals specifically associated with doubling back, not staying the course—a perception of starting over that contaminates perceptions of one's past and future efforts.

Doubling-back aversion reinforces the theme that people do not wish to perceive their efforts as having been a waste (Frisch, 1993). For example, people value their work to the extent it can be construed in an abstract, meaningful sense instead of as meaningless drudgery (Hamilton et al., 2019; Martela & Pessi, 2018). Doubling back is one reason past efforts may be subjectively devalued. The irony is that doubling-back aversion can encourage people to waste more time just so as not to have to double-back and view one's previous efforts as pointless.

This newly documented phenomenon shares thematic similarities with but is distinct from work on the sunk-cost fallacy. In one instantiation, the sunk-cost fallacy can dissuade people from completing a goal (e.g., attending a show) if their initial investment failed to yield a return (e.g., a purchased ticket was lost; Kahneman & Tversky, 1982). With doubling-back aversion, the question is not whether people complete a goal, but rather what may discourage them from doing so efficiently. In another example, people display unwarranted escalations of commitment—irrationally persevering on a goal—in the hopes of delaying (and possibly escaping) an admission that their initial investments were actually misguided (Bobocel & Meyer, 1994; Staw, 1976; Whyte, 1993). Losses simply pile up as a result (Dijkstra & Hong, 2019).

Doubling-back aversion discourages people from issuing a course-correction even when doing so would not require them to accept responsibility for choosing that longer course in the first place. After all, our participants had to travel down a pathway to even see that there was another route available (Study 1) or were first *assigned* to complete a task in a particular way (Studies 2-4) before they were offered an alternative. Still, people did not want to take actions that would force themselves to view their previous efforts as a waste, even though it was not a waste that they could have avoided. They willingly sacrificed future efficiency for the sake of preserving their understanding of the significance of what they had already completed. A general desire to finish what one has started may explain why many participants—regardless of their condition—decided to stay the course, but doubling-back aversion—as reflected in the effects of our manipulations—operated on top of any such effects.

By testing whether doubling-back aversion is explained by route construals—independent of perceived relative route length—our primary goal was to emphasize that doubling-back aversion does not simply (or even consistently) stem from a perception that doubling back will simply take longer. This is particularly important in differentiating doubling-back aversion from the goal-gradient hypothesis, the notion that people are more motivated to pursue a goal when they are closer to the endstate (Hull, 1932; Schmid, 2020). That is, some might have suspected that people avoid doubling back when it seemingly entails completing 100% (vs. 75%) of the remaining task simply because the former leads people to assume they are further from the goal. Not only did this manipulation not robustly change how much time participants thought each route would take to complete, but doubling-back aversion held even controlling for such perceptions.

At the same time, we have been careful to avoid claiming that *route construals* is a singular psychological construct. In part, this is because we suspect that which construals doubling back contaminates vary based on details of the goal context. Although doubling back may always entail more of a perception that one's previous efforts were a waste or that one is reintroducing a whole slog to still complete, only in achievement contexts (like Study 4) should doubling back interfere with a sense of success. For example, we doubt Study 1 participants felt that navigating along pathways in a virtual world truly offered an opportunity to succeed. This initial work reinforces the importance of route construals, independent of perceived route length, in producing doubling-back aversion, but future research is necessary to identify which construal-contamination effects are more universal versus context-specific.

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Supplementary Online Materials (SOM) for

Doubling-Back Aversion

Table of Contents

Study 1

We ran an exploratory analysis (not preregistered) in which we regressed the log-transformed time it took participants to traverse the route of their choice on condition, (+0.5; doubling-back, -0.5; control), participants' choice (+0.5: shorter route, -0.5: longer route), as well as all the interaction between condition and choice. In this analysis, there was no longer an effect of condition, ß = .03, $t(193) = 1.41$, $p = .161$, and there was only a main effect of choice to take the shorter route, ß = -.27, $t(193) = 11.79$, $p < .001$. This suggests there was no additional information pertinent to individuals—beyond the choice they made—that would predict how long it would take them to reach the endstate.

Study 3

We preregistered an exploratory analysis in which we would include the (standardized) amount of time participants spent on the initial task (writing 10 objects found in doctors' offices before being interrupted with the choice task) as both a main effect and an interaction with the decomposed factors of condition (i.e., the two components of doubling back) to predict the choice to switch in a logistic regression. We continued to observe a main effect of deletion, $z = -6.95$, $p < .001$, and task-remaining, $z = -3.86$, $p < .001$. There was also a main effect of the initial task completion time, $z = 2.43$, $p = .015$. This association varied by the deletion manipulation, $z = 2.23$, $p = .026$, but not by the task-remaining manipulation, $z < 1$. This suggested some increased sensitivity to just how long participants were taking to complete the original task when participants' previous work would supposedly be undone if they chose to switch. As reported in the main manuscript, the decision to switch in Study 2 was not more a function of the initial task completion time in the doubling-back compared to the control switch-frame condition. Furthermore, and as will be seen below, the decision to switch in Study 4 did not become more (or less) sensitive to the initial task completion time as a function of the deletion or the task-remaining manipulation. It thus seems that this interaction observed in Study 3 is anomalous.

We also preregistered that we would run a linear regression regressing how long participants spent on the second task on choice, the two manipulations, as well as their interactions. We log-transformed the time it took participants to complete the second task of their choice because this transformation was better at reducing positive skew than a square-root transformation. We regressed the log-transformed time it took participants to complete the second task of their choice on the deletion manipulation, (+0.5; deletion, -0.5; no deletion), the remaining task manipulation (+0.5: all, -0.5: some), participants' decision (+0.5: switch, -0.5:

stay the course), as well as all possible interaction terms that can be made with these variables. The choice to switch to the new task (listing items in a school instead of a doctor's office) did predict a time savings, ß = -.73, $t(698) = 9.93$, $p < .001$. We did not observe a main effect of either the deletion manipulation, ß = .09, $t(698) = 1.21$, $p = .225$, or the task-remaining manipulation, ß = -.06, $t < 1$.

Study 4

Exploratory Analysis (Not Preregistered, but Inspired by Surprise Study 3 Finding)

We included the log-transformed amount of time participants spent on the initial task (writing 10 objects starting with the letter 'G' before being interrupted with the choice task) as both a main effect and an interaction with the decomposed factors of condition (i.e., the two components of doubling back) to predict the choice to switch in a logistic regression. We continued to observe a main effect of deletion, $z = -11.35$, $p < .001$, and task-remaining, $z = -3.16$, $p = .002$. There was a marginally significant main effect of the initial task completion time, $z = 1.84$, $p = .066$, which shows that those who struggled for longer with the initial task were more likely to switch away from it when given the chance. However, this association varied by neither the deletion manipulation, $z = -1.38$, $p = .167$ nor the task-remaining manipulation, $z < 1$. Therefore, the decision to switch did not vary in sensitivity to the initial task completion time as a function of the deletion or the task-remaining manipulation.

Preregistered Exploratory Analysis

We first log-transformed the time it took participants to complete the second task of their choice because this transformation was better at reducing positive skew than a square-root transformation. As we preregistered as an exploratory analysis, we then regressed the log-transformed time it took participants to complete the second task of their choice on the deletion manipulation, (+0.5; deletion, -0.5; no deletion), the task-remaining manipulation (+0.5: all, -0.5: some), participants' choice (+0.5: switch, -0.5: stay the course), as well as all possible interaction terms that can be made with these variables. In this analysis, there was no longer an effect of the deletion manipulation, ß = -.00, $t < 1$, nor of the task remaining manipulation, ß = .03, $t < 1$.

There was only a main effect of the choice to switch, ß = -.55, $t(1179) = 8.73$, $p < .001$. Thus, participants who chose to switch did finish the study more quickly.

Additional Analyses of Effect of Manipulations on Route Construal Measures

In Study 4, we created three composite scores for use in our analyses: the *perceived positivity of switching* (switching [positive] construal) composite, the *perceived positivity of staying* composite (staying [positive] construal), and the *relative positivity of switching* composite. Note that each composite combined items that speak to positive construals with items that speak to negative construals. We proceeded to test whether these positive and negative construals were affected by the doubling-back manipulations in parallel ways. We regressed each of the eight construal measures on the deletion manipulation (+0.5: deletion, -0.5: no deletion), the task-remaining manipulation (+0.5: all, -0.5: some), as well as their interaction.

All construal measures that asked how people would feel about their past efforts (2 measures) and their future efforts (2 measures) if they *switched* were significantly affected by the deletion manipulation (ts > 6.55, ps < .001). Three of the four construal measures that asked how people would feel about their past and future efforts if they *switched* were significantly affected by the task-remaining manipulation (ts > 4.49, ps < .001). The only switching construal measure that was not significantly affected by the task-remaining manipulation was the construal of future work measure asking, “I would feel like the work I still have to do is an opportunity to succeed”. That said, the pattern was largely consistent even on this measure alone: The effect was marginally significant, ß = -.10, $t(1183) = -1.66$, $p = .098$.

All construal measures that asked how people would feel about their past efforts (2 measures) and their future efforts (2 measures) if they *stayed* were significantly affected by

neither the deletion manipulation (ts < 1.06, ps > .289) nor the task-remaining manipulation (ts < 0.70, ps > .483).