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Short Communication

If only I wasn't so impulsive: Counterfactual thinking and delay-discounting

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ABSTRACT

Previous research confirms that people continue to engage in impulsive behavior despite negative consequences. Little is known about what differentiates individuals who learn from past mistakes and those who do not. The theory of functional counterfactual thinking proposes that generating counterfactual ('if only') thoughts after a failure or negative event can facilitate learning from past mistakes. We examined the use of counterfactual thinking, based on an individual's levels of impulsivity. Confirming hypotheses, results suggest that highly impulsive individuals are less likely to engage in functional counterfactual thinking (i.e., upward-additive counterfactuals). Interestingly, these results held only for individuals who were high on behavioral, but not self-reported impulsivity. Implications for the role of counterfactual thinking in impulsive individuals are discussed.

1. Introduction

Impulsivity is a tendency to act with little or no forethought or reflection with no regard for the consequences of those actions (VandenBos, 2009). There are two primary methods to measure impulsivity: behavioral tasks such as the Delay Discounting Questionnaire (DDQ; Richards, Zhang, Mitchell, & de Wit, 1999) and self-report measures such as the Barratt Impulsiveness Scale (BIS; Patton, Stanford, & Barratt, 1995).

Delay discounting describes the extent to which an individual discounts the value of an outcome because of a delay to its occurrence. Specifically, the DDQ is an impulsive decision-making task requiring individuals to decide between smaller immediate or larger delayed outcomes. A choice pattern reflecting comparatively more choices for smaller immediate rewards at the expense of larger but delayed rewards indicates impulsive choice (Richards et al., 1999). The DDQ is thought to measure more specific behavioral processes as opposed to self-report measures, which measure individual perceptions or trait levels of impulsivity.

Research has identified a consistent relationship between delay discounting and risky behaviors (Bickel, Jarmolowicz, Mueller, Koffarnus, & Gatchalian, 2012). Unlike their counterparts, individuals who are highly impulsive continue to engage in risky behaviors despite negative consequences. Little research, however, has examined patterns of thinking that contribute to this absence of behavior change.

When negative outcomes are encountered, one cognitive process that may be activated is counterfactual thinking (Epstude & Roese, 2011; Roese, 1997). Counterfactuals are thoughts about what "might have been" had past events developed differently (Kahneman & Miller, 1986). Counterfactuals contain an antecedent that modifies an element (e.g., "if only I had drank less") and a consequent that imagines a better/worse outcome (e.g., "then I wouldn't have gotten a DUI"). Given that counterfactuals are typically activated following negative events or failures, theorists have suggested that counterfactuals are functional for reasoning and goal pursuit (Epstude & Roese, 2008, 2011). Research supports this idea, showing functional benefits for causal reasoning, motivation, intentions, and behavioral change (Epstude & Roese, 2008; Roese & Epstude, 2017). However, counterfactuals are not all equally functional; certain forms of counterfactual thoughts are more likely to elicit behavior change. Specifically, additive (inserting an element) and upward (imagining a better alternative) counterfactuals are more likely to improve future outcomes, relative to subtractive (removing an element) or downward (imagining a worse alternative) counterfactuals. Thus, individuals who more frequently utilize functional counterfactuals are also more likely to develop corrective behaviors (Page & Colby, 2003; Roese, 1994). Given that highly impulsive individuals fail to implement behavior changes after experiencing negative consequences, it is likely that their functional counterfactual thoughts (specifically upward-additive) differ from their non-impulsive counterparts. Echoing this possibility, recent work on psychopathy (of which impulsivity is a component) and regret (the emotional component of counterfactual thinking) suggests that individuals high on psychopathy are unable to use counterfactual value representation to guide and correct future behavior (akin to counterfactual-based learning; Baskin-Sommers, Stuppy-Sullivan, & Buckholtz, 2016).

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Although research has examined individual differences in counterfactual thinking in general (Bacon, Walsh, & Martin, 2013; Seto, Hicks, Davis, & Smallman, 2015) and functional counterfactuals in particular (Sirois, Monforton, & Simpson, 2010), research on counterfactuals and impulsivity has narrowly focused on the relationship between emotion-based impulsivity (urgency), counterfactual emotions (regret, shame, and guilt) and self-reported counterfactual frequency (Bedtime Counterfactual Processing Questionnaire; Schmidt & Van der Linden, 2009). Although they found a positive relationship between self-reported counterfactual frequency and urgency (an emotion-focused measure of impulsivity), no relationship was found between the impulsive decision-making subscale (premeditation) and frequency of counterfactual thought. Additionally, the counterfactual measure was designed to capture general rates of counterfactual intrusion at bedtime (e.g., "After going to bed, how often do you think: 'If only I made another choice'), as opposed to a traditional counterfactual thought listing task, which measures actual counterfactual generation in response to a particular event, and allows for content analysis. Given these limitations, we examined the relationship between counterfactual thinking (using a counterfactual generation task and focusing on functional content differences) and both self-report and behavioral impulsivity. Drawing from the functional counterfactual literature, we hypothesized that highly impulsive individuals (both self-report and behavioral) would generate fewer counterfactuals overall and fewer functional counterfactuals (upward and additive) in particular.

2. Method

2.1. Participants and procedure

One-hundred undergraduates (M = 18.75 years, SD = 1.16; 53.0% women; 91.0% Caucasian; 17.0% Hispanic) participated for psychology course credit. During the session, participants completed a behavioral impulsive decision-making measure (the DDQ; Richards et al., 1999), a counterfactual thought-listing task, a self-report impulsivity measure (the BIS; Patton et al., 1995), and demographics. Two participants left the counterfactual measure blank and were removed from relevant analyses.

2.2. Measures

2.2.1. Question-based delay discounting task (DDQ; Richards et al., 1999)

The DDQ is an impulsive decision-making measure. Participants were presented choices between $10 available after a specified delay (i.e., 1, 2, 30, 180, or 365 days) and a smaller amount available immediately (e.g., "Would you rather have $10 in 30 days or $2 now?"). This computerized task used an adjusting amount procedure (adjusting the immediate amount in increments of ± $0.50 based on participant choices) to derive indifference points between the delayed standard and immediate adjusting options for each of the five delays assessed. An indifference point reflected the smallest amount of money an individual chose to receive immediately instead of the delayed standard amount ($10) at the specific delay. The order of the choice questions was randomized. The choice questions were presented using a titration procedure that was determined by participant choices, with each participant making a total of approximately 60 choices. DDQ data were analyzed using the area-under-the-curve (AUC) method (Myerson, Green, & Warusawitharana, 2001), with smaller AUC values reflecting greater discounting and greater impulsivity. The AUC data were inspected for normality using Shapiro-Wilk tests, and log-10 transformed to improve normality.

2.2.2. Counterfactual thought-listing task

Following previous counterfactual research, participants completed a vignette-based counterfactual thought-listing task (Roese & Olson, 1993). The vignette describes a car accident (from Wells & Gavanski, 1989; see supplemental materials), and includes features that promote counterfactual thinking (e.g., deviation from a norm; Kahneman & Miller, 1986). After reading the vignette, participants completed the counterfactual thought-listing task, in which they imagine how things might have gone differently. They had 5 min to list things they could think of that, had they been different, would have changed the outcome of the accident. This task cues counterfactual thoughts, without directing participants towards a particular type of counterfactual (i.e., upward/downward; additive/subtractive).

2.2.3. Coding

Two independent judges coded responses for counterfactual content (κ = 0.82). A response was coded as a counterfactual only when there was clear evidence that an alternative to reality had been considered. Judges also coded whether the counterfactual was additive (inserted a new element) or subtractive (removed an existing element) and upward (better alternative) or downward (worse alternative). A third independent judged resolved any discrepancies.

2.2.4. Barratt impulsiveness scale (BIS-11; Patton et al., 1995)

The BIS-11 is a 30-item self-report impulsivity measure. The BIS-11 has three subscales (motor impulsiveness, nonplanning impulsiveness, and attentional impulsiveness) and uses a 4-point scale (1 = rarely/never, 4 = almost always/always). Higher total scores reflect greater impulsivity. Past research has found good internal consistency and test-retest reliability (Stanford et al., 2009). Alpha for the current data was good (α_{total} = 0.86, $\alpha_{attentional}$ = 0.75, α_{motor} = 0.68, $\alpha_{non\text{-}planning}$ = 0.73).

3. Results

Participant's counterfactual thoughts were analyzed using a 2(direction: upward vs. downward) × 2(structure: additive vs. subtractive) within-subjects ANOVA. Results revealed significant main effects of direction ($F(1, 97) = 424.6$, $p < .001$, $\eta_p^2 = 0.81$) and structure ($F(1, 97) = 15.87$, $p < .001$, $\eta_p^2 = 0.14$), and a significant Direction x Structure interaction ($F(1, 97) = 15.09$, $p < .001$, $\eta_p^2 = 0.14$). Accordingly, participants wrote significantly more upward-additive than upward-subtractive counterfactuals (M = 5.40, SD = 3.14 vs. M = 3.98, SD = 2.53), $t(97) = 3.94$, $p < .001$, d = 0.40, but did not differ in their downward-additive and downward-subtractive counterfactuals (M = 0.03, SD = 0.17 and M = 0.01, SD = 0.10), $t(97) = 1.00$, p = .32, d = 0.10. This replicates earlier findings that, following a negative outcome, people are more likely to describe upward compared to downward counterfactuals, and additive compared to subtractive counterfactuals (Roese, 1994; Roese & Olson, 1993).

However, this tendency varied as a result of the participant's behavioral impulsivity, as measured by the DDQ. As mentioned previously, smaller AUC suggests more impulsive decision-making; therefore positive correlations suggest that higher levels of impulsivity are related to generating fewer counterfactuals. The linear regression model examining impulsive decision-making (DDQ) and counterfactual thinking is summarized in Table 1. There was a trend for the DDQ to predict total number of counterfactuals such that higher levels of impulsive decision-making (i.e., smaller AUC) was marginally associated with generating fewer overall counterfactuals. Additionally, there was a significant relationship between the DDQ and the number of upward-additive counterfactuals, such that higher levels of impulsive decision-making (i.e., smaller AUC) were associated with generating fewer upward-additive counterfactuals. The DDQ did not significantly predict upward-subtractive, downward-additive, or downward-subtractive counterfactuals. No significant relationships were found between the BIS-11 (or any of its subscales) and any counterfactual measure.

Table 2 (see supplemental materials) shows the Pearson correlation matrix for the measures of impulsivity and counterfactual thinking. As would be expected, the BIS-total score was significantly correlated with