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PERCEIVED CONTROL IN MULTIPLE OPTION SCENARIOS: CHOICE, CONTROL, AND THE MAKE-A-DIFFERENCE METRIC

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ABSTRACT

To date, no study has compared gradations of make-a-difference metric actual control to perceptions of control. The present study juxtaposed the two, with dependent measures taken before or after participants selected an option to obtain a desired goal (short time period). Almost 500 undergraduates were given one of 10 scenarios, divided by same vs. different options (AA vs. AB, where different letters represent different but unknown time periods), and 2-option vs. 3-, 4-, or 5-option arrangements. Results supported the hypothesis that participants who made a choice between different options (regardless of the number of options) reported higher perceived control than participants who made a choice between identical options (regardless of when they made their choice).

PERCEIVED CONTROL IN MULTIPLE OPTION SCENARIOS: CHOICE, CONTROL, AND THE MAKE-A-DIFFERENCE METRIC

That we can control important outcomes is instrumental in the development of self-esteem, goal fulfillment, and stress reduction (Helzer and Jayawickreme 2015; Nickels et al. 2018). Indeed, an accurate view of both personal agency and others' emotional assessments would aid in interpersonal relations and overall wellbeing (Okeke et al. 2021). Conversely, the absence of control, increases the likelihood of learned helplessness and general physical illness (Peterson et al. 1993; Seligman 1975). Interestingly, many social psychologists have found perceived control (i.e., one's perception of control in any situation) to be more influential than actual control (i.e., when a situation, event, or outcome is actually within one's control); the two are also differentially related in that varying levels of perceived versus actual control has led to differences in one experiencing internalizing problems, such as anxiety, stress, and depression, versus externalizing problems, such as aggressiveness (Scott and Weems 2010). Thus, the present study compares two control metrics (difference and make-a-difference) and evaluates the

latter (controlling the former) with perceived control assessed before or after participants select one option toward a desired goal.

Difference Metric Actual Control

Conceptualizations of actual control vary. Traditionally, researchers believed control exists when an outcome is more likely to occur given one response versus another (Alloy and Abramson 1979; Scott and Weems 2010). One could reduce the likelihood of a car accident by checking the rear-view mirror rather than one's watch; based on the response chosen, they would influence the likelihood of an accident. This *difference metric* is calculated by subtracting the probability of the desired outcome given one response from the probability given a different response. Contingencies like 100-25, 100-50, and 100-75 have difference metrics of 75%, 50%, and 25%. Alloy and Abramson (1979) varied how much control (0%, 25%, 50%, 75%) participants had over the onset of a light by pressing (or not) a button. Participants perceived more control if they actually had more (difference metric) control over light onset. The difference metric was used in clinical studies of depressed persons (Alloy and Abramson 1979; 1988; Moore and Fresco 2012); charges of inadequate control standards beset depressive realism literature (Ackermann and DeRubeis 1991; Alloy and Abramson 1988; Haaga and Beck 1995).

Critics charge the actual control (difference) metric is contaminated with predictability and choice (Nickels et al. 1992). People perceive control not because they *affect* the outcome, but because they can *predict* it (Nickels et al. 1992; Veltman et al. 1998; Vogeltanz and Hecker 1999). Nickels et al. (1992) argue the difference metric measures differential success between available responses, namely a 75-50 contingency (difference metric=25%) denotes a 25% greater likelihood of getting a success given one response versus another. Furthermore, the difference metric requires that participants select an option to learn the probable contingencies in either option. Research shows regardless of actual control, participants given a choice show better coping and personal adjustment (Harchik et al. 1993).

Make-a-Difference Metric Actual Control

Nickels et al. (1992:160) redefined control "as making a difference in outcomes." For example, if a child can choose either of two hands to determine the one concealing a candy, there is control because the child will get a different outcome depending upon the hand chosen. There is no control if both hands conceal a candy or both conceal no candy, because the child will get the same outcome regardless of the hand chosen. Actual control is "better represented by a make-a-difference metric, which is the average difference one makes in deciding outcomes across choice points" or trials (Nickels et al. 1992:161). Investigations by Cramer (Cramer and Gates 2010; Cramer et al. 1997; Gillard and Cramer 2015; Langlois et al. 2002; Nickels et al. 1992) showed with a difference metric at zero, participants with high make-a-difference control reported higher perceived control than participants with low control. Whereas the difference metric involves differential success rates by option selection, the make-a-difference metric involves differential outcomes by option selection. Thus, Nickels' reconceptualization untangles the predictability and choice confounds plaguing the difference metric.

Unlike the difference metric, the make-a-difference metric is calculable in single trials. For the difference metric, a single trial inhibits the organism from learning the contingency. Whereas Nickels' reconceptualization similarly has only tested two-option scenarios, no study to date has assessed perceived control with options above two. Consider that 'A' denotes one particular (unknown) outcome, and 'B' denotes an alternative (unknown) outcome, then the arrangements A-B vs. A-A (or B-B) have been successfully arranged in prior studies (cf. Cramer and Gates 2010; Cramer et al. 1997; Nickels et al. 1992; 2018). Consider further the case that additional (but identical) options were made available; those additional options would result in the same unknown outcome as rendered by another option (e.g., A1-A2-B1; where A1 = A2), then the make-a-difference metric is derived as the number of different pairs divided by the total number of pairs. The arrangement A1-A2-B1 (or AAB) has three possible pairs (A1-A2, A1-B1, and A2-B1), two of which involve different option pairs or 67% make-a-difference metric actual control. The arrangement A1-A2-B1-B2 similarly has 67% make-a-difference metric actual control; and A1-A2-B1-B2-B3 has 60% make-a-difference metric actual control.

Present Study and Hypotheses

Using a motor task performed for a short or long time period, the present study offered participants a choice among 2, 3, 4, or 5 options, each represented by different time periods. For example, a scenario of AA denoted two options with the same (unknown) time period, whereas a scenario of AB also denoted two options but with different (unknown) time periods. When the options available offered the same time period, participants' choice of option made no difference in their time period (i.e., no-control). When available options offered different time periods, participants' choice of option made a difference in their time period. Based on Cramer et al. (1997) and Nickels et al. (1992; 2018), it was hypothesized that without predictability of outcome, participants whose choice made a difference in the time period received would have higher perceived control than participants whose choice made no difference. Some participants completed the dependent measure questionnaire *after* selecting an option, others *before*. Since control represents influence of outcome, the act of choosing options should be immaterial to perceived control. It was hypothesized that even without outcome predictability, there would be no significant difference in perceived control when measures were assessed either before or after selecting their option. Finally, to evaluate the feasibility of the make-a-difference metric, the degree of actual control can be derived and compared to participants' perceptions. Though the difference metric was zero for all groups, it was hypothesized that without predictability of outcome, perceived control would be positively related to the actual control (based on the make-a-difference metric) in each given scenario.

METHOD

Participants and Overview

There were 136 male and 400 female Introductory Psychology students at the University of Manitoba who participated in the study (average age = 20.2 years, *SD* = 4.0). To determine how long they would work in a boring motor task, participants selected one option among two to five possible options. The options, labelled as A or B, denoted short or long time periods, and participants were not told which letter represented which time period. Some participants selected

among similar options (all As), some selected among different options. Some participants completed the dependent measures after making their selection, some before selection.

Design

The study utilized a 2 x 10 factorial design, with TIME OF CHOICE (before or after assessing dependent measures) and SCENARIO (number and arrangement of OPTIONS) as the independent variables. Each scenario consisted of letters A and B. There were two 2-option (AA, AB), two 3-option (AAA, ABB), three 4-option (AAAA, AAAB, AABB), and three 5-option scenarios (AAAAA, AAAAB, AAABB). Different arrangements within a scenario were counterbalanced to remove order effects and letter preferences (e.g., the scenario 'AAAB' could be represented as AAAB, ABBB, AABB, BBBA, BBAA, and BAAA). The 6 ACTUAL CONTROL scenarios included AB, AAB, AAAB, AAAAB, AABB, and AABBB; the 4 without included AA, AAA, AAAA, and AAAAA.

Booklet. Each participant received a covered 8½" x 11" booklet, containing these pages: (1) a sample motor task page of 25 rows of 34 columns of small empty boxes; (2) a demonstration page outlining how the manipulations checks would be completed for (a) a scenario with different options and (b) a scenario with identical options; and (3) a scenario (tailored to one combination of the independent variable), and (4) the dependent measures questionnaire.

Questionnaire. Before or after choosing an option, participants completed the dependent measures questionnaire, consisting of the following items: (1) How much CONTROL do you have over what time period you get: 0% = "No Control" to 100% = "Complete Control"; (2) To what extent do you want the short period: 1 = "not at all" to 7 = "to a great extent"; (3) Which time period they thought they would get (short or long), and how confident are you in this answer: 1 = "not at all" to 7 = "to a great extent"; (4) What are your chances of getting the short period: 0% = "No Chance" to 100% = "Complete Certainty."

Procedure

Seated in a large classroom, participants were told they would provide a measure of hand-eye coordination on a repetitive and timed task; specifically, the study investigated the degree to which coordination depends on the length of time working on the task and whether one made a difference in how long one worked on the task. As a sample, participants used the boxed sheet to understand how they would fill in empty boxes; at the experimenter's signal, they filled in subsequent boxes with an 'X.' The experimenter timed participants at this task for one minute.

Upon completion, participants were told this sample motor task lasted one minute; some students would later perform the same motor task for a short period (viz. 2 minutes) and other students for a long period (viz. 20 minutes). Their particular time period would be determined by their selection of one of a set of letters (As and Bs), each denoting different time periods -- one short, the other long, and they were not told which.

At the top of the next page, participants viewed their scenario: two to five options, or one of ten combinations of As and Bs. They counted and reported the number of As and Bs, and the total number of options. Half the participants selected one of the available options *before* completing the dependent measures; the other half selected an option *after* completing the measures. When

all participants had completed the dependent measures, the experimenter indicated the study was complete; there would be no motor task. Participants were debriefed.

RESULTS

Using SPSS (v.28), we set alpha = .05. There were 28 female and 10 male participants -- reasonably well distributed among both TIME OF CHOICE and SCENARIO -- who incorrectly answered the manipulation checks; also, two cases with missing data were excluded (final $N = 496$). Ratings of perceived control were not significantly related to the number of As, the number of Bs, the total number of options, or which letter they selected among those available (ps > .05). However, ratings of perceived control were higher when participants believed they had a better chance of getting the short period, $r(493) = .28$, $p < .001$; when they believed they would get the short period, $r(494) = -.09$, $p = .037$; and when they wanted the short period, $r(494) = -.11$, $p = .018$. Table 1 shows the means and standard deviations in perceived control by TIME OF CHOICE and OPTIONS/SCENARIO.

Table 1
Perceived Control Means and Standard Deviations by Options/Scenario and Time of Choice

	Time of Choice					
Options	Measures Before Choice			Measures After Choice		
Scenario	M	(SD)	n	M	(SD)	n
2-Options						
AA	3.23	(12.49)	31	12.55	(22.30)	20
AB	26.03	(27.37)	30	26.96	(26.70)	23
3-Options						
AAA	17.83	(26.49)	23	22.26	(31.24)	23
AAB	19.00	(24.92)	27	24.96	(24.74)	23
4-Options						
AAAA	22.29	(35.51)	24	26.19	(30.08)	21
AAAB	30.84	(30.73)	25	25.04	(29.50)	26
AABB	25.33	(28.12)	24	30.00	(28.92)	23
5-Options						
AAAAA	15.38	(30.88)	26	20.00	(28.45)	22
AAAAB	12.22	(21.00)	27	15.89	(22.81)	28
AAABB	24.38	(27.00)	24	21.54	(28.38)	26
TOTAL	19.28	(27.46)	261	22.52	(27.36)	235

For the first hypothesis, perceived control constituted the dependent measure in a factorial analysis of variance, with ACTUAL CONTROL, TIME OF CHOICE, and OPTIONS as the independent variables. Results showed no significant effect for TIME OF CHOICE, $F(1,476) = 1.70$, $p = .193$; but a significant main effect for ACTUAL CONTROL, $F(1,476) = 5.78$, $p = .0017$, omega squared = .05; whereby those whose choice among options made a difference in the time period felt more control than those whose choice among options made no difference. This effect was qualified by a significant interaction between OPTIONS and ACTUAL

CONTROL, $F(3,476) = 2.89$, $p = .035$, omega squared = .05. Simple effects tests showed with just two options that there was a significant difference in perceived control between those with actual control and those without, $t(87) = 4.51$, $p < .001$.

For the second hypothesis, results showed neither a main effect for TIME OF CHOICE nor an interaction between TIME OF CHOICE and each of OPTIONS or ACTUAL CONTROL, ps > .05. Given that the absence of a difference is inconclusive, and given this hypothesis advocated *no difference* between control ratings either before or after option choice (proving the null), we conducted an equivalency statistic (Rogers, Howard, and Vessey 1993), which tests whether mean group differences are trivial. Results uncovered such a trivial difference between the perceived control ratings of participants who completed the questionnaire *before* choosing a letter, and those completing it *after* ($z = 2.88$, $p = .0063$).

The third hypothesis compared participants' perceived control to make-a-difference actual control (based on number of different options). The correlation between perceived and actual make-a-difference control was weak but significant, $r(494) = .143$, $p = .0014$. That is, groups with actual control generally underestimated their perceived control, whereas groups without generally overestimated their perceived control.

DISCUSSION

The present study tested the utility of make-a-difference actual control by varying the execution of choice and the number and arrangement of options. Participants were not told which option led to which outcome (unpredict) until after their choice was made and their dependent measures assessed. Random assignment to the 20 experimental groups distributed various organismic and confounding variables.

Our data supported the first hypothesis that even without predictability of outcome, participants whose choice among options made a difference had greater perceived control than participants whose choice among options made no difference. This parallels the findings of Cramer et al. (1997) and Nickels et al. (1992; 2018), who reported higher ratings of control, influence, and responsibility; and lower ratings of helplessness among participants who knew their choices among options resulted in different outcomes. Of interest presently is how the effect was significant with only two options present as three or more yielded no such difference. Perhaps additional though identical options dilute the effect by leading participants to doubt their own assumptions with additional thinking and consideration. Future research would do well to explore this possibility.

Ratings of perceived control did not vary as a function of the number of different options (As or Bs), the total number of options, or the option selected. However, perceived control was higher among participants who both wanted the desired outcome and felt more confident they would get it. Thus, even after withholding the actual outcome from participants, it could not prevent them from forming their own hypotheses and wishes about the anticipated time period.

Our data supported the second hypothesis that, even without predictability of outcome, participants' perceptions of control would not differ whether made before or after their choice.

This result has several interesting ramifications. Although traditionalists believe prediction and control to be intertwined, these data show that individuals can perceive control without prediction, and even without choice. It further invites consideration of control without choice, a notion that even Nickels et al. (1992) found difficult to conceptualize.

Finally, our data supported the third hypothesis that, even without predictability of outcome, perceptions of control correlated to the actual control in a given scenario. With the difference metric held at zero for all conditions, we could manipulate the make-a-difference metric by varying number and configuration of options, and track participants' control ratings, revealing underestimates among those with any actual control, and overestimates among those without (viz. illusory control; see Langer 1975). Future research should identify additional variables to predict participants' personal control.

Several limitations warrant mention. We employed a single dependent variable, which while valid in prior studies (Nickels et al. 2018) forbids reliability assessment; alternatively, we included multiple control-related measures for replication. Secondly, whereas cell sizes were adequate, additional data collection would reduce the variance around estimated means. Finally, we would encourage researchers to explore additional scenario configurations, such as three different options (e.g., ABC), options that repeat (e.g., ABCC).

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