

Two pathways to causal control: Use and availability of information in the environment in people with and without signs of depression



N.C. Byrom^a, R.M. Msetfi^{b,*}, R.A. Murphy^a

^a Department of Experimental Psychology, University of Oxford, UK

^b Centre for Social Issues Research, Department of Psychology, University of Limerick, Republic of Ireland

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ABSTRACT

Perceiving one's causal control is important for adaptive behavior. Studying depression and other individual differences has provided insight into typical as well as pathological causal processing. We set out to study factors that have been shown to distinguish those with and without signs of depression and affect perceptions of causal control: levels of behavior, the availability of outcomes and learning about the environment or context. Two experiments were carried out in which participants, scoring low and high on the Beck Depression Inventory using established cutoffs, completed a causal control task, in which outcomes occurred with a low (.25) or high probability (.75). Behavior levels were either constrained ($N_1 = 73$) or unconstrained ($N_2 = 74$). Overall, findings showed that levels of behavior influenced people's experiences of the context in which events occurred. For all participants, very high behavior levels eliminated sensitivity to levels of outcomes occurring in the environment and lead to judgments that were consistent with conditional probabilities as opposed to the experimenter programmed contingency. Thus increased behavior increased perceived control via influence on context experience. This effect was also evident for those scoring high on the BDI. Overall conclusions are that behavior and context provide two important interlinked psychological pathways to perceived control. However, situations that constrain people's ability to respond freely can prevent people with signs of depression from taking control of a situation that would otherwise be uncontrollable.

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Perception of control over actions and their consequences is a hallmark of adaptive behavior and good mental health (Taylor & Brown, 1988). Studies have shown that people in general can discriminate between experimentally controlled situations in which they do and do not have control over events (Allan & Jenkins, 1983; Dickinson, Shanks, & Evenden, 1984). In addition, comparisons between distinct groups of people based on pre-existing individual differences, such as levels of depression, have been used as a tool to inform our understanding of the psychological processes involved in causal control for people in general (e.g., Msetfi, Murphy, Simpson, & Kornbrot, 2005). This previous work shares the implicit assumption that the participant's causal task is simply to learn the experimenter-presented relation and that they may do so accurately or in a biased fashion (for a detailed background, see Allan, 1993).

However, causal information is dynamic and much as the uncertainty principle (Heisenberg, 1927) states that the mere action of measuring the velocity of quantum particles changes their velocity, human (or animal) action has an impact on the environment in which the action takes place; the explorer not only catalogs and measures the new territory but by her very presence changes the subject of enquiry. In

the case of causal control, the participant can come to define both her experience of and perception of the contingency. Thus causal control judgments do not measure the ability to perceive a particular action–outcome contingency, like one would measure the perception of the weight of a held object, but rather the perception is a reflection of both the action–outcome relation and the environmental impact of actions over time.

Along these lines, behavioral approaches to depression (e.g., Lewinsohn, 1974) and studies looking at causal control in depression (e.g., Blanco, Matute, & Vadillo, 2012) have suggested that the extent to which people 'do' potentially controlling behaviors, in combination with the relative availability of events that they might wish to control, influences the control they experience and the relation between depression and perceptions of control. For example, Alloy and Abramson (1979) showed that people with mild symptoms of depression judged that they had little control over frequently occurring events in contrast to people with no signs of depression who thought that they did have some control. In fact, the experimenters had programmed the experimental task such that neither group had control and suggested that people with depression were more realistic in their perceptions of control. Both groups accurately judged their lack of control when events occurred infrequently suggesting that the availability of events is important. Further, Blanco et al., (2012) showed that the 'depressive

* Corresponding author.

E-mail address: rachel.msetfi@ul.ie (R.M. Msetfi).

realism' effect occurs because people with a higher levels of depression symptoms produce lower levels of behavior which directly predict a low perception of control. Thus sensitivity to outcome availability and levels of behavior would seem to be critical to a healthy assessment of causal control. In order to further our understanding of these behavioral dynamics of causal control, we report two experiments, which test how levels of behavior and the availability of events influence judgments of control in mildly depressed and non-depressed participants. First we provide a brief background to this work.

Systematic efforts to understand the psychological processes underlying perceived causal control were informed by Hume's (1789) key observation that cause cannot be observed directly but must be inferred from information available in the environment, such as the temporal, spatial and statistical relations between actions and outcomes. In particular, measuring sensitivity to causal control has involved manipulating the statistical contingency between an action and outcome and evaluating accuracy and/or bias in judgments (Shanks & Dickinson, 1987; Wasserman, Elek, Chatlosh, & Baker, 1993). One metric termed ΔP , or delta P (Allan, 1980), defines the one-way contingency between actions and outcomes as the difference between the probability of the outcome occurring following the participant's action, $p(O|A)$, and the probability when no action has taken place, $p(O|\sim A)$. When the two probabilities are equal there is no contingency and when the difference $\neq 0$, then a positive or negative contingency is present. Thus the value of ΔP can vary from -1 through 0 to $+1$, like a correlation coefficient, which is consistent with a continuum of preventative control, through no control, to complete generative control over the outcome. As illustrated in the contingency table in Fig. 1, there are four possible action-outcome conjunctions that are all equally relevant to this calculation (described

as cells A, B, C and D). After being exposed to a series of such conjunctions, participants could be asked to rate their own causal control over outcome occurrence using a judgment scale which maps onto the upper and lower bounds of ΔP . Thus the determination of relative and absolute accuracy should be straightforward.

If causal control is conceptualized in terms of this contingency matrix, then key components of the ΔP calculation can change without influencing overall causal control, allowing assessment of systematic bias. For example, levels of behavior are conceptualized as the probability of action, $p(A)$, whereas the availability of events that people might wish to control is measured as the probability of the outcome, $p(O)$. Fig. 1 demonstrates how $p(A)$ and $p(O)$ can vary while ΔP remains constant. The four exemplar conditions shown in Fig. 1 are identical in relation to ΔP , though $p(A)$ and $p(O)$ are varied systematically with low and high levels of both displayed. This suggests that perceived causal control should not vary between these conditions. To the contrary, however, participants appear to be sensitive to these shifts, showing elevated judgments of control with increasing $p(A)$ and $p(O)$ (Blanco, Matute, & Vadillo, 2011; Msetfi et al., 2005; Murphy, Vallee-Tourangeau, Msetfi, & Baker, 2005). These patterns of effects have been interpreted as a systematic and non-normative bias towards illusory control.

However, considering causal control only in relation to the contingency programmed by the experimenter alone may underestimate factors influencing the experience and perception of causal control (Msetfi, Murphy, & Kornbrot, 2012). Firstly, it is possible that the constant contingency assumption is incorrect; changing $p(O)$ or $p(A)$ may produce unintentional changes in the contingency that participants experience ΔP_{EXP} (Msetfi et al., 2012). So, as an example, increasing either $p(A)$ or $p(O)$ over a fixed time frame may restrict participants' experiences to

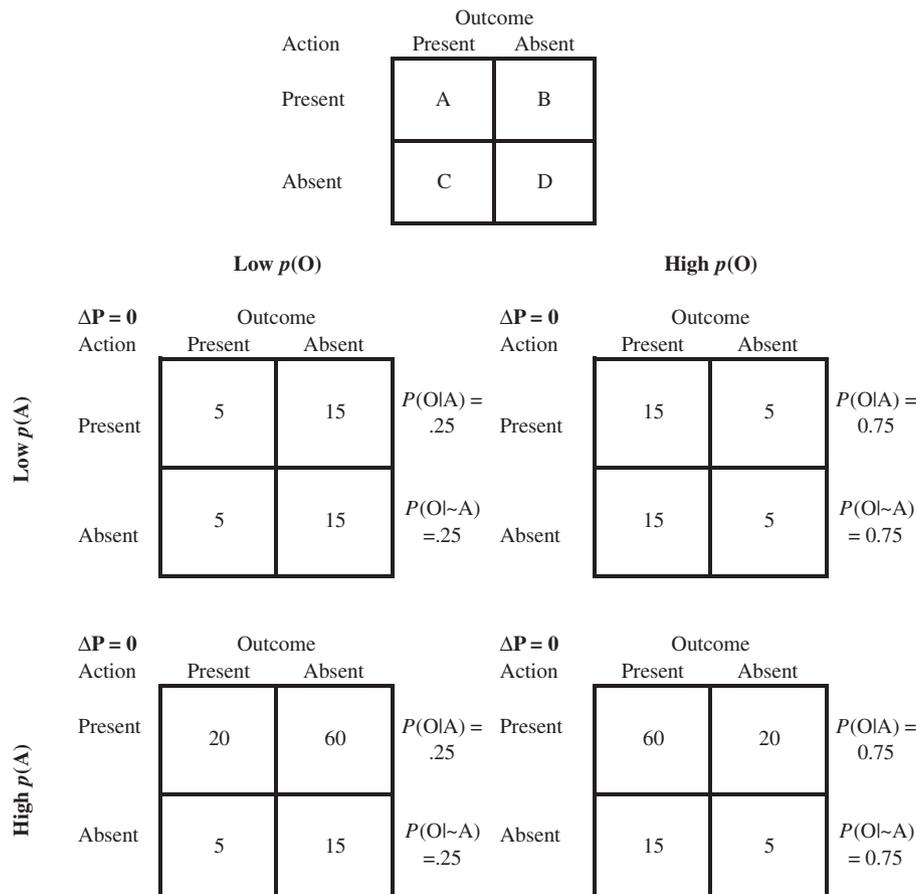


Fig. 1. Contingency tables showing four possible combinations of action-outcome information. The top panel shows generic information from which ΔP is calculated, where A, B, C and D refer to the frequencies of action-outcome conjunctions. $\Delta P = A/(A + B) - C/(C + D)$. All examples involve conditions in which $\Delta P = 0$, yet the $p(O)$ and the $p(A)$ is either low or high.

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