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Chronic motivational state interacts with task reward structure in dynamic decision-making

Jessica A. Cooper [a,*], Darrell A. Worthy [b], W. Todd Maddox [a]

[a] The University of Texas at Austin, Department of Psychology, 108 E. Dean Keeton, A8000, Austin, TX 78712, United States
[b] Texas A&M University, Department of Psychology, 4235 TAMU, College Station, TX 77843, United States

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ABSTRACT

Research distinguishes between a habitual, model-free system motivated toward immediately rewarding actions, and a goal-directed, model-based system motivated toward actions that improve future state. We examined the balance of processing in these two systems during state-based decision-making. We tested a regulatory fit hypothesis (Maddox & Markman, 2010) that predicts that global trait motivation affects the balance of habitual- vs. goal-directed processing but only through its interaction with the task framing as gain-maximization or loss-minimization. We found support for the hypothesis that a match between an individual's chronic motivational state and the task framing enhances goal-directed processing, and thus state-based decision-making. Specifically, chronic promotion-focused individuals under gain-maximization and chronic prevention-focused individuals under loss-minimization both showed enhanced state-based decision-making. Computational modeling indicates that individuals in a match between global chronic motivational state and local task reward structure engaged more goal-directed processing, whereas those in a mismatch engaged more habitual processing.

* Corresponding author at: Department of Psychology, The University of Texas, 108 E. Dean Keeton, Stop A8000, Austin, TX 78712, United States. Fax: +1 (512) 471 6175.
E-mail addresses: jessica.cooper@utexas.edu (J.A. Cooper), worthyda@tamu.edu (D.A. Worthy), maddox@psy.utexas.edu (W.T. Maddox).

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1. Introduction

Motivation is a key feature of decision-making that is often studied in terms of approaching positive states and avoiding negative states (e.g. Atkinson, 1964; Bandura, 1986; Roseman, Spindel, & Jose, 1990). We, along with others (e.g., Braver et al., 2014; Maddox & Markman, 2010), argue that the most common definition of motivation as a simple increase in effortful cognitive processing (i.e., trying harder) is outdated, and that a deeper understanding of the complex motivation–cognition interface is crucial to theorizing about motivation as well as cognition (see Braver et al., 2014, for a review).

Under more recent views, motivation is thought to operate at multiple levels, and the effects of motivation on behavior derive from the interactions between these levels. The interactive nature of motivation on behavior is captured by the notion of "regulatory fit" (Higgins, 2000; Maddox & Markman, 2010), which is achieved when the individual's global motivational state (chronic or situational) aligns with the local motivational task framing. Importantly, approach or avoidance motivation at one level can have vastly different effects on behavior depending upon the valence of motivation at another level. To date, little work has explored these multi-level motivational effects on the balance of cognitive processing. This is the focus of the present report.

Regulatory fit effects have been shown in a variety of domains including judgments of morality (Camacho, Higgins, & Luger, 2003), communication effectiveness (Aaker & Lee, 2001; Cesario, Grant, & Higgins, 2004), and generation of anagram solutions (Shah, Higgins, & Friedman, 1998). Unfortunately, no strong mechanistic explanations for these regulatory fit effects have been offered, mainly because these tasks are ones for which no unique optimal strategy can be defined. This shortcoming has been addressed by examining tasks for which the optimal strategy is uniquely identifiable, and importantly is mediated by a specific cognitive process. This work tests the hypothesis that a "fit" between the global and local motivational state enhances effortful cognitive processing at the expense of automatic habitual processing (see Maddox & Markman, 2010, for a review). Critically, whether this enhanced effortful processing leads to better performance depends upon whether optimal task performance is mediated by effortful processing. Thus, this work argues that the motivation–cognition relationship involves a three-way interaction between the global motivational state, the local motivational state, and the cognitive processing system that optimally mediates task performance. When the task is one for which optimal performance requires effortful processing, a regulatory fit is advantageous. However, when the task is one for which optimal performance requires automatic habitual processing, such as implicit category learning (Grimm, Markman, Maddox, & Baldwin, 2008), a regulatory mismatch is advantageous. Tests of this three-way interaction find support in studies that examine category learning (e.g. Grimm et al., 2008; Maddox, Baldwin, & Markman, 2006) and decision-making (Otto, Markman, Gureckis, & Love, 2010; Worthy, Maddox, & Markman, 2007).

Regulatory fit effects in decision-making have shown that decision-makers in a regulatory fit more often choose to systematically explore their environment, while those in a regulatory mismatch more often exploit the highest-valued option (Otto et al., 2010; Worthy et al., 2007). Worthy et al. (2007) and Otto et al. (2010), like much work on regulatory fit, focused on the effect of situational (or induced) regulatory focus. *Situational* or experimentally-induced motivational focus, obtained by making individuals temporarily experience either a subjective history of promotion success or prevention success (Higgins et al., 2001), is extremely helpful in providing methods for boosting overall task performance, but does little to identify performance advantages related to stable traits of the individual. *Chronic* promotion and prevention focus is measured using the Regulatory Focus Questionnaire (RFQ; Higgins et al., 2001), which provides scores for two motivational modes that affect the sensitivity of the motivational system: a promotion focus, in which one becomes more sensitive to potential gains, and a prevention focus, in which one becomes more sensitive to potential losses (Higgins, 1997). Here, we examine whether these chronic (trait-driven) dispositional tendencies lead people to engage in qualitatively different decision-making strategies depending on task framing, whether the goal of the task is to maximize gains or minimize losses. Simply altering the way that decision-making tasks are framed is predicted to drastically alter the types of decision-making strategies that people implement, and could provide a simple mechanism for optimizing performance in decision-making tasks by catering the framing to an individual's chronic motivational mode.