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Bending Arms, Bending Discounting Functions. How Motor Actions Affect Intertemporal Decision-Making.

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We demonstrate that task-irrelevant somatic activity influences intertemporal decision making: Arm movements associated with approach (arm flexion), rather than avoidance (arm extension), instigate present-biased preferences. The effect is moderated by the sensitivity of the general reward system and, owing to learning principles, restricted to arm positions of the dominant hand.

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Bending Arms, Bending Discounting Functions. How Motor Actions Affect Intertemporal Decision-Making

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EXTENDED ABSTRACT

Many consumer decisions involve trading off costs and benefits over time. For example, a consumer may think about replacing a two-year-old car with a shiny new model, rather than driving his old car and saving for retirement. A dieter may find that a fattening chocolate cake is irresistible in the short run, although a fruit salad is more beneficial in the long run. In making such decisions, consumers trade off long run and short run benefits. The factors that influence intertemporal choice receive increasing attention from marketing scholars (e.g., Malkoc and Zauberma 2006; Zauberma et al. 2009) because a better understanding of intertemporal preferences is critical to gain a better understanding of numerous consumption decisions.

Our research examines the effect of bodily feedback from motor actions on intertemporal tradeoffs. We test whether the enactment of basic motor actions, such as extending or flexing one's arm, affects intertemporal decision-making. More specifically, we conjecture that somatic motor actions associated with "approach" lead to present-biased preferences. That is, flexing your elbow may cause you to spend now rather than to save for later or may lead you to prefer chocolate cake over fruit for dessert. Prior research suggests that bodily positions are able to influence attitudes: Simply by pairing stimuli with arm flexion (where the motor action is directed toward the self) or arm extension (where the motor action is directed away from the self), rudimentary attitudes can be established (Cacioppo, Priester, and Berntson 1993). We conjecture that the effects of arm positions extend beyond attitude formation. In this research, we propose that the effects of somatic activity, such as flexing or extending your arm, generalizes beyond attitude formation and affects intertemporal choices between smaller, sooner and larger, delayed monetary rewards (hypothesis 1).

In the *pilot study*, we found that consumers using a shopping basket (i.e., arm flexion) are more likely to purchase vice products (i.e., products providing immediate benefits) at the cash register of a retailer than consumers using a shopping cart (i.e., arm extension). Because of the correlational nature of the pilot study, we designed 4 follow-up experiments to demonstrate the causal path that leads from arm flexion to present-biased preferences. In the experimental studies, participants pressed one of their hands against the table: In the arm flexion (extension) condition, participants put the palm of one of their hands under (on) the table and press upward (downward). In *study 1A*, participants showed a greater preference for vice options relative to virtues (e.g., camping versus studying over the weekend) in the arm flexion condition than in the arm extension condition. In *study 1B*, participants had a greater preference for smaller, earlier rewards (e.g., ?67 tomorrow vs. ?85 in 70 days) in the arm flexion condition than in the arm extension condition. These studies demonstrate that somatic activity associated with approach leads to a preference for immediate over delayed benefits (i.e., present-biased preferences).

Prior research suggests that increasing desire in one domain (e.g., sex, cookies, heroin, cigarettes,...) can affect intertemporal choices in an unrelated domain (e.g., money) (Field et al. 2006; Giordano et al. 2002; Van den Bergh, Dewitte, and Warlop 2008). That is, upon an increase in desire, consumers might want anything

rewarding (Wadhwa, Shiv, and Nowlis 2008). This is consistent with recent neuroscientific evidence demonstrating that many rewards are processed similarly in the brain (Breiter et al. 2001; Montague, King-Casas, and Cohen 2006): Indeed, the same dopaminergic reward circuitry of the brain is activated for a wide variety of different reinforcers (Camerer, Loewenstein, and Prelec 2005). That is, a similar set of brain reward regions responds in common to very distinct categories of reward—for example, beautiful female faces and erotic stimuli activate the classical reward circuitry associated with drug and monetary rewards (Aharon et al. 2001). We propose that somatic activity, through arm flexion contraction, activates this general neurological system processing rewards and affects intertemporal choice as a consequence (hypothesis 2). We demonstrate in *study 2* that the effect of arm flexor contraction on present-biased preferences is moderated by the sensitivity of the brain circuitry processing rewards: Only when the Behavioral Approach System is sensitive enough to be activated by somatic actions, impatience is observed.

In addition, we test whether the effect of arm flexion on present-biased preferences relies on the learned association between arm flexor contraction and the activation of the neurological reward system. A lifetime of experience of motor actions paired with differential evaluative outcomes has established an association between arm flexion and approach orientation (Cacioppo et al. 1993). In the absence of a learning process, the association between arm flexion and approach is most likely not established (hypothesis 3). We hypothesize that actions of the nondominant arm have established fewer higher-order associations between motor actions and evaluative outcomes than actions of the dominant arm. In *study 3*, we are able to confirm that the effect of arm flexion on preference for immediate gratification is restricted to reward system activation by means of the dominant arm.

These studies demonstrate that task-irrelevant somatic activity is able to influence intertemporal decision making: Simply flexing one's arm leads to present-biased preferences. To our knowledge, this is the first research (1) demonstrating effects of somatic activity on economic decision making, (2) that demonstrates that the effect of arm flexor contraction is dependent on the sensitivity of the general reward system, and (3) investigating the role of conditioning as the causal mechanism fostering higher order associations between motor actions of the arm and evaluative outcomes. A limitation of the present research is that we have only focused on the role of arm flexion and the reward system. A complementary set of studies might well be carried out to investigate the consequences of arm extension and the potential role of the punishment system (Carver and White 1994; Gray 1987, 1990; Torrubia et al. 2001). Future research could investigate whether arm extension makes individuals more likely to buy insurances (i.e., avoiding negative outcomes) or affects the choice between a smaller, immediate fine and a larger, delayed fine.

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