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Program#/Poster#:	401.15/LLL36
Title:	Tougher decisions make rougher moves: The kinematics of reaching to make choices during rewarded learning
Location:	Halls B-H
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Abstract:	Diffuse dopaminergic projections to cortex and basal ganglia mediate a wide variety of functions, including rewarded learning and motor control. However, the interaction of these systems is not well understood. Most studies of human decision making during rewarded learning measure choices executed by saccades or button presses. Yet many of our choices in naturalistic settings

involve finely controlled reaching in 3-D space. We gave 12 healthy young adults a rewarded learning task in which decision trials were intermingled with decision-free reference trials involving the same stimuli, probabilistic reward contingencies, and motor response demands. Subjects made responses by moving a stylus in 3-D space from a "home" position in the lower center of a 19” touch monitor to one of two stimuli in the upper left/right corners. We measured the kinematics of their reaches based on 480 Hz optoelectronic recordings of the position of their index fingertip on the stylus. Compared to non-decisional trials, movements on decision trials were associated with longer reaction times (RT), longer movement times (MT), and higher variability in acceleration profiles (based on normalized integrated jerk, NIJ). An unannounced reversal in the stimulus-reward contingencies also evoked increases in RT, MT, and NIJ in the decision but not the non-decision trials. NIJ was also positively correlated with decision difficulty, as determined by the differential magnitude of subjects' image valuations inferred by using a temporal difference learning model of their trial-by-trial choices. Thus, more difficult decisions were associated with "rougher moves". These results suggest that the movements used to execute choices can provide an index of decision making difficulty. The results also support the likelihood of a strong functional overlap between dopamine's influences in rewarded learning and motor control, and highlight the importance of that interaction in studies of the neural basis of decision making in naturalistic settings.

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