Event-related skin conductance in response to immediate monetary gain-loss in the Soochow Gambling Task

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Introduction

Bechara et al. designed the Iowa Gambling Task (IGT, Table 1) to evaluate normal subjects and ventromedial prefrontal patients. Their experimental results indicated that normal subjects can foresee by the favor of intact somatic-markers which can be determined by Skin Conductance Responses (SCRs) (Fig. 1). The somatic-markers cause decision makers to avoid the decks that result in bad final-outcome and approach the good final-outcome decks in IGT. After approximately 30 trials, normal subjects generated larger anticipatory SCRs before choosing bad final-outcome decks and small SCRs before choosing good final-outcome decks. In IGT, for each unit of 10 cards, the bad final-outcome ($ -250) deck A contains 5 gains and 5 losses; deck B contains 9 gains and 1 loss. Conversely, the good final-outcome ($ 250) deck C contains 6.25 gains, 2.5 standoffs and 1.25 losses, and deck D contains 9 gains and 1 loss. However, Tomb et al. and Suzuki et al. noted that the data for SCRs of normal subjects during IGT have divergent results which were inconsistent with Bechara et al. findings. In addition to these SCRs results, Chiu et al. (2005) designed a revised task namely, Soochow Gambling Task (SGT, Table 2) which possesses a clearer and symmetrical gain-loss structure than the IGT. In SGT, deck A in the SGT has 4 gains ($200) and 1 loss ($-650); deck B has 4 gains ($100) and 1 loss ($-650); deck C has 4 losses ($-1050) and 1 gain ($650); and deck D has 4 losses ($-100) and 1 gain ($650). The SGT and IGT have all the same uncertainty and final-outcome structure. Additionally, in the SGT, negative final-outcome decks have high-frequency gain and vice versa. Their result that normal subjects were “insensitive” to final-outcome as well as inconsistent with IGT proposition. Nevertheless, little is known about the link between somatic feedbacks and “myopic” behavior in SGT. This study launched the SGT and event-related SCRs to make the experimental content of the SGT more comparable to the serial studies of IGT. Furthermore, to clarify the argument between Tomb, Suzuki and Bechara et al. results. The SGT has a regular monetary value-structure for an easy evaluation of associated SCRs and event-related SCRs offers additional time-resolution detail for depicting signal changes in sympathetic activity.

Methods

This study recruited 24 college students to perform the SGT. Event-related SCRs recorded sympathetic activation of the anticipatory [-5s to 0s] and responsive [0s to 5s] periods during each trial. The SCRs data was firstly differential to prevent the down-drift in long-term recording. The event-related epochs [-5s to +4s] were averaged by decks (ABCD) and values ($-1050, -650, -200, -100, 1050, 650, 200, 100).

Results and Discussion

Behavioral results replicated in the SGT original finding that normal subjects were “myopic” to the final-outcome (Fig. 2). The signal of event-related SCRs demonstrated that the sympathetic activities were less related to “anticipation” of choices, but roughly responded to monetary “outcome” of various gains and losses (Fig. 3). This result is consistent with that obtained by Tomb and Suzuki et al. and is similar to those obtained by the Iowa group. The SCRs cannot represent the anticipatory somatic signal and guide decisions. These experimental findings for behavior and SCRs implied that under uncertain situations, subjects are occupied by the immediate gain-loss rather than guided by the final-outcome based on somatic feedback.

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