

# Heart rate and skin conductance analysis of Iowa gambling performance

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## The Present Study

The somatic marker hypothesis (Damasio, 1994) proposes that choosing the most adaptive behaviour in complex social situations is an informed decision whereby somatic or emotional states mark cognitions and, in turn, guide behaviour.

Empirical support for the somatic marker theory comes from studies using the Iowa Card Gambling Task (Bechara, Damasio, Damasio, & Anderson, 1994). This task is assumed to mimic real-life situations in the way it factors uncertainty, reward and punishment. Participants are presented with four decks of cards and their task is to pick one card at the time. Each choice can result in financial reward or financial cost. Using this laboratory-based Card Gambling Task, Bechara et al. (1994) observed that, initially, individuals sample from all decks but then select from the advantageous decks. Most interestingly, increased levels of electrodermal activity are observed, even before it is explicitly known that it is a risky choice (Bechara, Damasio, Tranel, & Damasio, 1997).

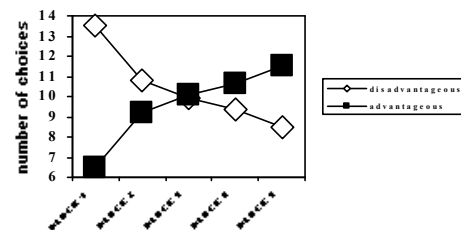
The goal of the current study was to extend the somatic marker hypothesis to the cardiovascular domain. More specifically, it was examined whether heart rate is differentially sensitive to the risk involved in the decision and the significance of its outcome.

## Method

One hundred subjects performed an analogue of the Iowa gambling task (Bechara et al., 1994) requiring a choice between four options; two options were followed by a high reward and, unpredictably, an even higher loss (disadvantageous) and two other options were followed by a small reward but the unpredictable loss was also small (advantageous).

## Results

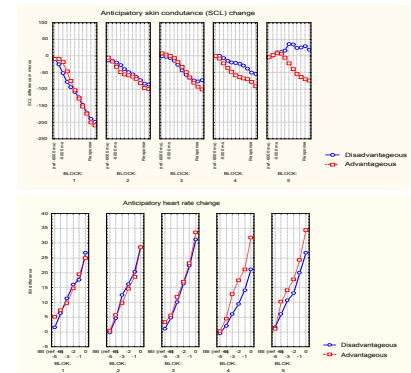
1. Subjects made 100 choices and learned to differentiate between good and bad options by using the outcome of their decisions,  $F(4, 396) = 23.68, p < .001$ .



2. Skin conductance level was higher preceding bad relative to good options during the course of task performance,  $F(10, 670) = 2.40, p < .01$ .

3. Anticipatory heart rate slowing was less pronounced preceding bad options relative to good options,  $F(4, 324) = 3.64, p < .01$ .

4. Heart rate was slower,  $F(15, 3940) = 1.71, p < .05$ , and skin conductance level increased,  $F(21, 5516) = 5.49, p < .001$ , following bad relative to good outcomes. These changes were influenced by both the magnitude and frequency of loss.



## Conclusions

Consistent with previous reports, risky decisions were preceded by increased skin conductance level. In addition, we observed less pronounced heart rate slowing preceding risky decisions, suggesting that anticipatory heart rate provides another value mark for decision-making. Heart rate and skin conductance change following decisions provide a window on cognitive (expectancy) and affective (gain/loss) components of outcome processing (e.g., Crone et al., 2001).

## References

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