Emotional Awareness and Psychophysiological Markers of Performance on the Iowa Gambling Task

Cory Inman, B.A., Matthew Mumaw, M.A., & Tricia King, Ph.D.

Introduction

The Somatic Marker Hypothesis (SMH)

➢Proposes that in complex decision-making situations that entail reward, punishment, and uncertainty, physiological emotional processes act as biasing markers that influence decisions to an appropriate action.

➢Antonio Damasio (1994) has shown that patients with lesions in the ventro-medial prefrontal cortex (VMPFC) have particular issues in day-to-day decision-making.

➢Support for the SMH through two main findings:

❖Typical participants:

▪Preferred good choices before they had conceptual knowledge of advantageous decisions in the IGT

▪Produced somatic markers before bad choices

❖VMPFC Lesion Patients:

▪No definitive preference of good choices over bad choices through out IGT

▪Lack of somatic markers before any choices

➢Neuropsychological mechanisms involved:

❖In typicals, after experience with the task, re-activation of specific somatosensory patterns occurs when participants encounter certain previously encoded situations (Bechara et al., 2000).

▪Two proposed pathways:

•*Body-Loop*- The body physically changes in reaction to activation of the VMPFC. These changes are sent to the somatosensory cortices producing a physiological response.

•*As-if Body Loop* - Re-activation signals bypass the body and are sent directly to the somatosensory cortices, which produce the appropriate pattern marking a situation good or bad.

Somatic Markers

➢Skin Conductance Responses

❖Biasing response to a given emotional, decision making situation

❖Occurs within the 4 seconds preceding a card choice after experience in the task

➢Reward or Punishment SCR

❖Response to the outcome of a given trial

❖Occurs within the 4 seconds after a card choice

➢Heart Rate

❖Crone et al. (2004) have found evidence for the slowing of interbeat intervals (IBIs) as a somatic warning signal in good performers.

Emotional Awareness

➢According to the SMH, these psychophysiological responses may function at two different visceral levels:

❖Conscious aware level

❖Unconscious unaware level

➢The participant's ability to distinguish between the two is dependent on the individual's level of emotional awareness.

➢Emotional awareness is a continuous personality trait that may have an influence on the participant's ability to distinguish promising options throughout the IGT.

Methods

Hypotheses

➢ On the IGT, those with High levels of Emotional Awareness will:

1) Make more advantageous decisions
2) Exhibit greater change from baseline of anticipatory skin conductance level before risky decisions.
3) Exhibit a slower heart rate before making good decisions.

Participants

➢Thirty-seven participants were recruited at Georgia State University from undergraduate psychology classes in partial fulfillment of course requirements.

➢13 Males, 24 Females, ages ranged from 18 to 50 years (*M*=21.32, *SD*=5.97)

➢15 Caucasian, 14 African American, 3 Asian, 1 Cape Verdean, 1 East African, 1 Pacific Islander, and 2 unknown participants.

The Iowa Gambling Task

➢Designed to imitate real life decision-making through reward, punishment, and uncertainty of outcomes in a laboratory setting (Bechara et al., 1994).

➢Includes:

❖4 Decks of Cards; A, B, C, D

❖100 Trials

❖$2000 of Credit

➢Participants must determine:

❖Good Decks

▪Yield a lower immediate gain but a smaller future loss; long term net gain

❖Bad Decks

▪Yield a high immediate gain but larger future loss; a long term net loss

Figure1. Describes the reward and punishment contingencies per deck of the IGT

Toronto Alexithymia Scale-20

➢A 20 item self-report scale aimed at measuring deficits in identifying and describing emotions. (Bagby et al., 1994)

➢1 (strongly disagree) to 5 (strongly agree) scale

❖↓ TAS score = ↑ Emotional awareness and vice versa

❖This samples TAS-20 scores ranged from 25 to 74 (*M*=44.83, *SD*=12.53).

➢The Difficulty Identifying Feelings factor

❖*Ex.:* "I am often puzzled by sensations in my body."

Results

➢*Hypothesis 1*

❖ Correlations were run between:

▪ TAS-DIF factor and TAS-20 total score

▪Good minus bad choices per 20 card block

❖Our main result is that block 3 (trials 41-60) shows significant positive correlations with the DIF factor and total scores for the TAS-20 for the whole group and females, as seen in Table 1.

➢*Hypothesis 2*

❖Correlations were run between:

▪ Z-score of the TAS-20

▪Mean baseline SCL (from 4 seconds immediately before anticipatory period) minus mean anticipatory SCL (4 seconds before choice) for bad choices per 20 card block.

❖Most of correlation coefficients were not significantly related, as seen in Table 2.

➢*Hypothesis 3*

❖Correlations were run between:

▪Z-scores of the TAS-20

▪Anticipatory inter-beat interval (IBI) for good choices

❖The correlations were not significant, as seen in Table 3.

Table 1
Correlations between Z-Score of the Toronto Alexithymia Scale (TAS-20) and card choices (good minus bad) per 20 card block

TAS-20	Block 1	Block 2	Block 3	Block 4	Block 5	Total
DIF Factor	.12	.15	**.40***	.31	.00	.29
Male	-.10	-.03	.41	.28	-.29	.03
Female	.20	.32	**.41***	.39*	.19	**.47***
Total TAS-20	.11	.16	**.35***	.24	-.06	.17
Male	-.28	-.19	.16	.10	-.22	-.12
Female	-.08	**.40***	**.42***	.35	.02	.34

*p<.05

Table 2
Correlations between Z-Scores of the Toronto Alexithymia Scale (TAS-20) and the difference in averaged skin conductance level (SCL) between the baseline and anticipatory periods for bad choices per 20 card block

TAS-20	Block 1	Block 2	Block 3	Block 4	Block 5
DIF Factor	-.29	-.06	.21	.16	-.03
Male	.18	-.40	-.41	.02	-.004
Female	**-.43***	-.02	.10	.21	-.04
Total TAS-20	**-.33***	-.03	.12	.23	.03
Male	-.05	-.41	.24	.09	.006
Female	**-.41***	.009	.008	.26	.04

*p<.05

Table 3
Correlations between Z-scores of the Toronto Alexithymia Scale (TAS-20) and the anticipatory inter-beat interval (IBI) for good choices per 20 card block

TAS-20	Block 1	Block 2	Block 3	Block 4	Block 5
DIF Factor	-.007	-.10	-.17	-.12	-.07
Male	-.19	-.48	-.51	-.46	-.36
Female	.25	.23	.18	.22	.18
Total TAS-20	.02	-.10	-.15	-.11	-.08
Male	-.06	-.37	-.38	-.38	-.34
Female	.35	.23	.18	.21	.19

*p<.05

Discussion

➢Hypothesis 1

➢Lower emotional awareness is associated with more advantageous decisions during the 'hunch' period (Bechara et al., 2005)

❖Block three of this study is considered to be part of the 'hunch' period in which participants begin to distinguish the good from the bad decks.

❖Those who were *less emotionally aware* may have taken a more rational and cognitive approach to the task through following the instructions rather than their emotional responses.

▪Yechiam et al. (2005) proposed the expectancy-valence model to elucidate the cognitive strategies used in the IGT.

➢Those who were *more emotionally aware* may have been more impulsive.

➢The initial emotionally encoded somatic patterns may have been encoded for the wrong decks.

➢Hypothesis 2 and 3

➢The psychophysiological hypotheses were not supported by this study's findings.

➢Limitations

❖No defined and prompted period for the participant to think about the next card choice

❖Time given was potentially too short in duration

❖Not enough time for SCL to return to baseline

➢Future Research

➢Cognitive Models of the decision-making on the Iowa Gambling Task

❖Expectancy-Valence Model (Stout et al., 2002)

➢Other psychophysiological correlates

❖Facial Electromyography (EMG)

❖Electroencephalogram (EEG)

❖Functional Magnetic Resonance Imaging (fMRI)

❖Positron Emission Tomography (PET)

Special Appreciation to Dr. Tricia King and her lab for their assistance with data collection, processing, and analyses. For more information please email CorySInman@gmail.com