A Survey of the Iowa Gambling Task

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ABSTRACT: *Somatic Marker Hypothesis (SMH) suggests that decision making in uncertainty relays on somatic markers – emotional reactions reflected in bodily states which lead person towards advantageous decision making. Authors of SMH created a task aiming to access decision making in uncertainty – Iowa Gambling Task (IGT), suggesting that since healthy participants tend to develop advantageous decision-making strategy, they will have good IGT performance. Recent studies however, question good IGT performance among healthy participants thus imposing question on their advantageous decision-making strategies. The aim of this study was to explore IGT performance among healthy participants. Participants (N=268) filled standard version of IGT, consisting of 100 trials in which participants select cards from four decks: A and B, that bring higher rewards and penalties (good decks) and C and D that bring small rewards and penalties (bad decks). At the beginning of the IGT, participants get 2000$ of play money, with instruction to try to gain as much money as possible. Results show that participants tend to lose rather than gain money, with almost half of participants showing impaired IGT performance. In addition, results indicate that frequency of punishment, rather than overall goodness or decks is factor relevant for specific deck selection. Study results question wheatear healthy participants apply advantageous decision-making strategies when performing IGT, indicating that future studies are needed in order to explore factors contributing to advantageous decision making in uncertainty.*

Keywords: Iowa Gambling Task, IGT, Somatic Marker Hypothesis, Decision Making

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1. Introduction

Numerous studies exploring decision making in uncertainty rely on Somatic Marker Hypothesis (SMH) [3, 5, 9]. This hypothesis suggests that normal decision-making in humans is led by somatic markers - bodily states which represent emotional reactions to

different stimuli or to possible courses of action. Authors of SMH suggest that somatic markers, activated in situation of uncertainty can effectively reflect the goodness or badness of the possible outcome, leading a person towards advantageous decision making. Importantly, authors suggest that somatic markers represent a "gut feeling", which can operate both consciously and unconsciously. SMH, thus suggests that somatic markers can lead people to advantageous decision making even though they do not necessarily need to be aware of which decisions are good and which ones are bad [5, 9, 10].

1.1 IOWA Gambling Task

Authors of Somatic Marker Hypothesis created a task aiming to access advantageous versus disadvantageous decision making – Iowa Gambling Task (IGT) [4]. In the IGT, participants are presented with four deck of cards. After selecting a card, participants either win or lose different amounts of play money. Unknown to the participants, selecting cards from two of the decks – C and D will result in eventual gain ('advantageous', or 'good' decks), whereas selecting cards from the other two decks - A and B will result in eventual loss ('disadvantageous', or 'bed' decks). The task has 100 trials, so that, according to authors' idea, participants still could not understand reword punishment scheme. Authors suggested and demonstrated in several studies that healthy individuals will select more cards from the good than the bad decks, thus showing tendency towards advantageous decision making [4, 17]. Task validation was demonstrated in numerous studies which indicated that impaired IGT performance have persons with problems in advantageous decision making in everyday life [7, 12, 14, 15, 18], as well as patients with lesions in the brain region relevant for the judgment and decision-making in real-life settings [4, 6, 9].

Recent studies, however, question whether healthy persons do prefer good over a bed decks and indicate that healthy controls tend to select bed decks equally or even more frequently than good ones [2, 8, 11, 16]. Moreover, when selection of each deck specifically was analyzed, it was shown that bed deck B is equally or even more frequently selected then good decks C and D [8, 11], while bed deck A represent the least selected deck [11, 13, 19]. Possible explanation can be found in differences among frequency of punishment within good and bed decks, resulting in decks A and C being frequent punishment decks, while decks B and D represent non-frequent punishment decks, which was not taken into consideration in the early IGT studies. Studies that included both criteria into analysis of IGT performance, indicated that frequency of punishments, rather than overall goodness of deck seems to be leading participants towards selection of specific decks [8, 11, 13, 19]. Thus, recent studies indicated that it is not certain whether healthy controls show homogeneous tendency towards advantageous decision making and whether overall goodness of decks, or rather frequency of its punishments will be relevant factor for deck selections.

1.2 Present Study

In this study 268 (81.7% females, average age 20 years) participants, completed standard version of Iowa Gambling Task (IGT).

2. Results

On average, participants scored 1475$ on IGT, ranging from - 4525 to 6075, indicating that participants tend to rather lose then gain money on IGT, i.e. that participants, on average, do not show advantageous decision-making strategy. Table 1 presents descriptive measures of each deck selection separately.

Deck	*M*	*SD*	*Min*	*Max*	*zSk*	*zKu*
A	.17	.098	0	.75	8.18**	16.66*
B	.29	.142	0	.72	1.20	.60
C	.23	.156	0	.1	15.21*	27
D	.31	.175	0	.1	9.73**	9.51

Table 1. Descriptive statistic of each deck selection

M – mean; *SD* – standard deviation; *Min* - minimum; *Max* – maximum; *zSk* – standardized Skewness; *zKu* – standardized Kurtosis; ns - $p > .05$; * - $p < .05$; ** - $p < .01$.

Results show that participants the most frequently selected cards from deck *D* and deck *B* subsequently, somewhat less frequently they selected cards from deck *C*, while they selected cards from deck *A* the least frequently among all decks. Table 2. presents percentage of participants who selected cards from good versus bed decks at more than 50% of trials, as well as percentage of participants who selected cards from non-frequent punishments decks *B*, *D* versus frequent punishments decks A and *C* at more than 50% of trials. Results indicate that somewhat less than half of participants have impaired performance [4], i.e. they selected more cards from bed then good decks, while more than three quarters of participants selected more cards form non-frequent punishments decks B and D, in comparation to frequent punishments decks A and C. There is no significant difference in number of participants who selected more cards from good then bed decks [$\chi^2(1) = 2.149$; $p = .143$], while significant difference
was found in the number of participants who selected more cards from non-frequent punishment decks B and D in comparation to selection of cards from frequent punishment decks A and C [$\chi 2(1) = 75.239$; $p < .001$].

		% of participants with more cards from good decks	% of participants with more cards from bed decks
		54.5%	45.5%
% of participants with more cards from non-frequent punishments decks	76.5%	39.9%	36.6%
% of participants with more cards from frequent punishments decks	23.5%	14.6%	9%

Table 2. Percentage of participants who selected more cards from different decks

3. Discussion

Study results indicate that, contrary to IGT authors' expectations, participants tend to lose rather than win money on IGT and that almost half of participants have impaired performance, i.e. more choices from bed then from good decks. This result is in line with studies questioning whether healthy controls prefer good over a bad deck and whether they show overall advantageous decision-making strategy [2, 8, 11, 16, 17].

Results also show that majority of participants prefer non frequent punishment decks B and D in comparation to frequent punishment decks A and C. These results indicated importance of frequency of punishment in deck selection. They are also in line with results of a previous studies that considered both frequency of punishments and overall goodness of decks, indicating that participants tend to the most frequently select cards from deck D (good, non-frequent punishments deck), then B (bed, non-frequent punishments deck), then deck C (good, frequent punishments deck), while they the least frequently select cards from deck A (bed, frequent punishments deck) [1, 8, 11].

Results of this study indicated that healthy controls do not show homogenous IGT performance, nor advantageous decision making strategy. In addition, results indicated than frequency of punishments rather than overall goodness of deck is relevant for deck selection, showing that immediate reword/punishment seems to be more important than long term consequences in decision making. These results do not question Somatic Marker Hypothesis, just call for additional studies that will improve understanding of factors that contribute to good IGT performance, and overall advantageous decision making in situations of uncertainty.

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