



# An Investigation of Sex Differences in Emotion Based Decision Making

Warren D. Anderson<sup>1</sup>, Anthony Steven Dick<sup>2</sup>, and Willis F. Overton<sup>1</sup>

Temple University<sup>1</sup>  
The University of Chicago<sup>2</sup>



## Introduction

The Iowa Gambling Task (IGT) is generally believed to provide an index of real life online decision making when the decision making process involves the use of emotional information (Bechara, et al., 1994). Recent investigations indicate that males outperform females in this task (Reavis & Overman, 2001; Overman, et al., 2004). In the present study we attempt to gain a better understanding of this sex difference by manipulating either the task or the task context to test possible hypotheses that might explain this phenomenon.

To complete the Iowa Gambling Task, a participant makes a series of selections from four decks of cards (Table and Figure 1). For every card selected, the participant receives positive feedback (wins some amount of money), followed by negative feedback (loses some amount) on some occasions. Two of the decks (C and D) produce a long term monetary gain, while two produce a long term loss (A and B).

In this study we tested three possible hypotheses that might explain the IGT sex difference favoring males:

- Hyp 1: Females are more sensitive to the frequency of losses and thus adopt a negative avoidance approach (see Table 1; Overman, 2004). We changed negative feedback in a net value version of the task and expected that this would reduce the sex difference.
- Hyp 2: Females are less motivated. We tested this hypothesis using the lottery condition. Adding this incentive was expected to reduce the sex difference.
- Hyp 3: Implicit stereotypes regarding sex differences in quantitative tasks might affect females such that they focus less on the monetary values in the task (Spenser, et al., 1999). We used the motivation condition, and expected this to reduce the sex difference.

Table 1. Iowa Gambling Task: Average wins and losses across ten trials.

	Deck			
	A	B	C	D
Win (Per Card)	\$100	\$100	\$50	\$50
Loss (Per 10 Cards)	\$250	\$1250	\$50	\$250
# of Losses	5	1	5	1
Net	-\$250	-\$250	\$250	\$250

Note. Previous research, including work in our lab, indicates that females make most of their selections from decks B and D at the end of the task, while males select mainly from decks C and D at the end.

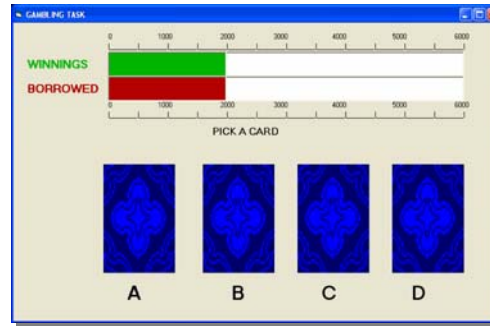


Figure 1. The Iowa Gambling Task.

## Prior Research

In a prior study, we replicated the sex difference in the IGT. However, we failed to find a sex difference when the same participants completed a reasoning task (the Wason Card task). The control condition of the present study was an attempt to further replicate the sex difference.

## Method

**Participants:** Participants were 300 college students (164 females).

**Task:** A computerized version of the Iowa Gambling Task (IGT). Participants make 100 selections from 4 decks of cards where a monetary reward is given for each card selected, at the same time there are monetary deductions for some cards (see Table 1).

**Experimental Conditions:**

1. **Control:** The standard version of the IGT.
2. **Net Value:** The IGT was modified such that when a card was selected, the only information provided to the participant was the net amount of money won or lost.
3. **Lottery:** Prior to completing the task, participants were told that if they did well enough, their names would be entered into a lottery and they would have a chance to win \$200.
4. **Motivation:** Prior to completing the task, females were told that women tend to do better than men on the IGT. Males were told that men tend to do better than women on the task.

**Note.** The standard version of the IGT, along with standard instructions, was used in the control, lottery, and motivation conditions. The task and task instructions were modified for the net value condition.

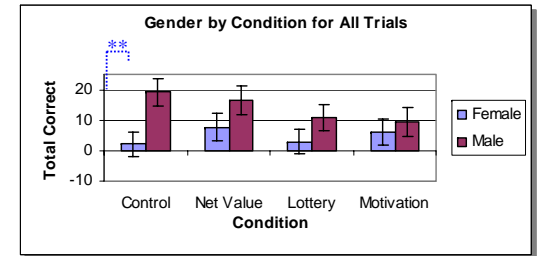


Figure 2. Gender differences by condition in the Iowa Gambling Task. \*\*  $p < .01$

## Results

The dependent measure was the number of “good deck” selections minus “bad deck” selections. There was a main effect for sex, with males outperforming females ( $p < .01$ ). Simple effects analysis revealed that this effect was driven by the control condition ( $p < .01$ ), which replicates prior findings. As predicted, there were no significant sex differences in any of the other conditions (see Figure 2).

## Discussion

The main finding of this study is that the IGT sex difference can be attenuated by experimental manipulation. The net value condition was designed to reduce the frequency of losses in the C deck. The lottery condition added an additional motivational factor. The motivation condition was used based on the possibility that implicit stereotypes affect performance. All of these manipulations led to a reduction in the sex difference. The results suggest that multiple factors may play a role in emotion based decision making, and that subtle manipulations can affect performance. Future investigations could further delineate factors that influence emotion based decision making.

### References

- Bechara, A., Damasio, A.R., Damasio, H., & Anderson, S.W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, 50, 7-15.
- Overman, W.H. (2004). Sex differences in early childhood, adolescence, and adulthood on cognitive tasks that rely on orbital prefrontal cortex. *Brain and Cognition*, 55, 134-147.
- Overman, W.H., Frazzard, K., Ansel, S., Trawalter, S., Bies, B., & Redmond, A. (2004). Performance on the Iowa card task by adolescents and adults. *Neuropsychologia*, 42, 1838-1851.
- Reavis, R., & Overman, W.H. (2001). Adult sex differences on a decision-making task previously shown to depend on the orbital prefrontal cortex. *Behavioral Neuroscience*, 115, 196-206.
- Spenser, S.J., Steele, C.M., & Quinn, D.M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology*, 35, 4-28.

Correspondence can be directed to Warren D. Anderson  
Current address: Center for Neuroscience, 446 Crawford Hall, University of Pittsburgh, Pittsburgh, PA 15260  
E-mail: warrena@temple.edu