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# Personality effect on decision-making among normal university students and comparing gambling task performances of normal university students with a group of normal adults

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## Abstract

In daily life, individuals with decision making deficit, don't learn from negative feedbacks in risky situations and for this reason they fail in social life. The Iowa Gambling Task (IGT) is a neuropsychological test that assesses decision making in daily life through components reward, punishment and ambiguity. In this study, IGT was given to a university student population consisted of 107 participants between ages of 20-25 and 90 participants between ages of 25-60+. The most important finding of the study is performance differences between age groups on their IGT scores and the personality effect on IGT performances of post adolescents.

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## 1. Introduction

Decision-making results from interpretations that include individuals' own experiences and their cognitive skills. An important component of decision-making is processing the novel stimulus under ambiguous situations in daily life. Decision making in ambiguous situations requires several different cognitive processes such as analyzing the advantageous and disadvantageous probabilities, mental flexibility for planning and association of the novel information with the current situation (Gazzaniga et al., 2002). Together with these cognitive processes individuals, generally compare their past experiences and take them as a predictor of consequences of their decisions (Lamar, 2006). Individuals with decision making deficit, don't show any abnormalities in standard neuropsychological test performances but in daily life, they involve in risky situations, they don't learn from negative feedbacks and for this reason they show deficits in their social lives (Bechara, Tranel et al., 2000).

As a result of many neuropsychological researches, decision making can be classified as "decision-making under ambiguous situations" and "decision-making under risky situations". These different types of decision making are seemed to be effected from different types of neuropsychological functions. Decision making under ambiguous situations is less likely related with executive processes and there are evidences that it has an asymmetrical connection with working memory (Brand et al., 2006). Beside this, because decision making under risky situations is related with planning the strategy for future consequences, therefore it is more likely related with subcomponents of executive functions such as mental flexibility, category shifting and monitoring (Brand et al., 2005).

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Patients with ventromedial prefrontal cortex (VMPFC) lesions show the same symptoms. These patients are normal in their neuropsychological assessments but they show worse performance on the Iowa Gambling Task (IGT). IGT is a neuropsychological test that assesses decision making in daily life through components of reward, punishment and ambiguity (Bechara et al., 1994; Bechara et al., 2000). IGT requires participants to choose from decks offering initial rewards and punishments, yielding net losses and gains. Advantageous decks offer low initial rewards but lower initial punishments, disadvantageous decks offer high initial rewards but higher initial punishments. For a successful performance participants should learn long-term outcomes (Hooper et al., 2008).

Considering VMPFC is involved in decision making and it continues to develop through post adolescence, performance differences between age groups on IGT performances are expected. This difference from post adolescence to senility shows itself as an inverted U curve shape (Hooper et al., 2004). Decision-making impairments in adults are thought to be related with general cognitive impairments that occur with age. Beside these findings, specific impairments of cognitive executive functions are thought to be related with the changes of frontal lobe (Raz et al., 1998; West, 1996). Despite the fact that there is no evidence of a conclusive relationship between decision making and cognitive functions such as executive functions, attention, memory and intelligence, there are findings about the correlation between mental flexibility and impulsivity. Prefrontal cortex is involved in higher cognitive functions such as executive functions and also personality. For instance, older adults think less while solving problems and their capacities of executive functions, working memory and information processing durations are lower as compared to younger population (Fein, 2007).

Decision making develops throughout adolescence (Hooper et al., 2008) and risky situations and externalizing tendencies such as substance abuse, alcohol and physical violence increase in adolescence (Shad et al., 2002). Adolescents are differed from other age populations based on their sensation-seeking, maladaptive behaviours and risky situations (Boyer and Byrnes, 2009). Adolescents' and adults' performances with externalizing psychopathology are impaired in IGT and externalizing psychopathology is related with elevated levels of neuroticism and psychoticism (Hooper et al., 2008). Also, an association between poor IGT performance with impulsivity in adults and sensation seeking in adolescents has been shown (Zermatten et al., 2005).

In Eysenck's personality theory there are three dimensions of personality established as extraversion, neuroticism and psychoticism. Neuroticism is a dimension of personality defined by stability and low anxiety at one end and by instability and high anxiety at the other end. Extraversion is one end of the introversion-extraversion dimension of personality characterized by a disposition to be sociable, friendly, impulsive and risk taking. Introversion is the other end of this dimension and it is characterized by a disposition to be quiet, reserved, reflective and risk avoiding. And the last dimension of Eysenck's personality model is psychoticism. It is defined by a tendency to be solitary and insensitive at one end and to accept social custom and care about others at the other end (Cervone, Pervin, 2008: 264).

Beyond the personality traits mentioned, neuroticism, extraversion and psychoticism may also be a potential factor of influencing decision-making behaviour. Although many studies suggest links between personality traits and decision-making, they have rarely been studied together. In sum this study aims at examining the relationship of personality factors especially "neuroticism" with decision-making in post adolescents. More specifically the study intends to frame the differences of human behaviours according to their ages about the behaviour of decision-making among the groups of post adolescents and older adults.

Within the above framework the hypothesis of the study were formulated as follows:

H1: There will be an association between IGT performance and different personality traits.

H2: There will be difference in IGT performance between post adolescent and older adult population.

H3: There will be difference between age groups about the ability of learning to choose from advantageous decks in the second half of the IGT.

### *1.1. Sample Group*

A convenience sample of 107 students aged between 18-25 enrolled in departments of Psychology, Mathematics and Turkish Language and Literature of Istanbul Kultur University participated in the study's post adolescent group. Due to improper reasons, 2 subjects from the adolescent group were eliminated from the study. For the older adult group, 90 participants aged between 26-60+ were selected randomly.

## 1.2. Instrumentation

A computerized version of Iowa Gambling Test developed by Bechara and Damasio is used for assessing decision-making (Fig. 1). Test is provided from the neuropsychology laboratory of Istanbul Medicine Faculty. In this computerized version, participant is presented with four decks of cards (A, B, C, D). The participant chooses one card at a time from a total of 100 trials. Every time participant makes a choice he/she gains or loses some money. The amount of money appears on the computer screen and provides a monetary punishment and reward component for the test. A and B are the disadvantageous decks, C and D are the advantageous decks. Playing from the advantageous decks (C and D) leads to an overall gain and playing from disadvantageous decks (A and B) leads to an overall loss. This information is not given to participants. Also, participants don't have the knowledge of how many cards they must choose to terminate the game. After the administration participants had been asked to know whether they understood the strategy or not. This component was added to the model as "awareness" variable. The participants chose more from advantageous decks had higher scores on IGT. Also the "competition" factor was added as a variable to examine decision making in risky situations in a competitive environment. For this purpose, post adolescent group was divided into three different groups. The "competition group" had been given a list of imaginary high scores and had been told that previous participants had extremely higher scores on IGT. The "non-competition group" had been given a list of imaginary average scores and had been told that previous participants had average scores on IGT. The "neutral group" had not been given any list of scores.

Eysenck Personality Questionnaire was used for assessing personality. This questionnaire assesses personality in three dimensions including 101 simple self-report items designed to tap each of the factors with "yes" or "no" answers and gives a score for psychoticism, neuroticism and extraversion (Cervone and Pervin, 2008). In this study Eysenck Personality Questionnaire was given to only post adolescent population.

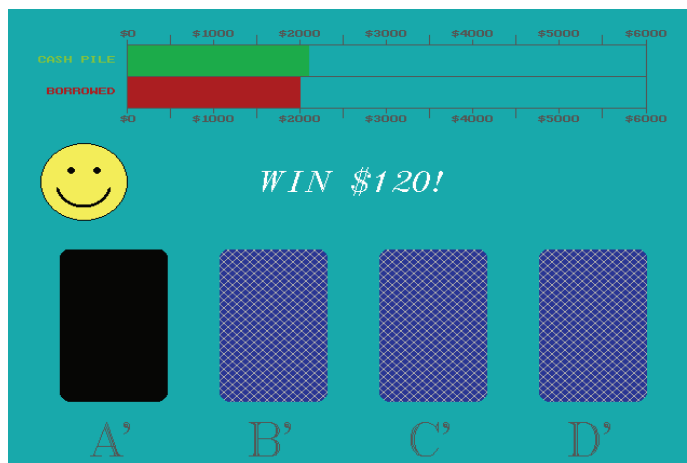


Fig. 1. A computerized version of Iowa Gambling Test developed by Bechara and Damasio

## 2. Analysis and Findings

Data were analyzed with the Statistical Package for the Social Sciences, version 17.0.0 (SPSS) and inspected to ensure that normality assumptions were met.

First, we examined affect of age on decision making. Independent Samples Test was used to determine differences between post adolescents' and older adults' IGT scores. The results showed that adults' performance on the IGT were significantly better than adolescents (Performance means for post adolescents' IGT scores=1234,8, older adults'=1989.9;  $t=-6.74$ ;  $p=.000$ ; Levene=.051) (Fig. 2).

In order to determine the impact of choosing more from advantageous decks on the IGT score, we used One-way ANOVA. Consistent with our previous finding, the number of choices from advantageous decks in the first half [F(1,192)= 16.96; P=.000] and in the second half [F(1,192)= 19.66; P=.000] of the IGT, adults' number of choices were significantly more than adolescents. According to participants' learning strategy we analyzed whether there were age differences between difference of choosing from advantageous decks in the first half and second half of the IGT and excluded from the analysis "age factor" didn't have any significant affect on choices of applicants from advantageous decks ( $t(192) = -.458$ ;  $p = .648$ ).

To determine whether findings were primarily affected by extreme IGT scores, adolescent groups' IGT scores were recorded as low/average/high IGT score by use of standard deviation. Primary data analyses revealed extreme outliers which were excluded from the analysis. Specifically, there were two extreme outliers on IGT score. In order to examine the affects of components of personality on decision-making, Pearson Correlation was carried out. There was a significant negative correlation between post adolescents' IGT scores and neuroticism scores ( $r = -.25$ ) as expected. There was no correlation between the extraversion and the psychoticism dimensions of personality and IGT scores of post adolescents.

In order to examine the impact of being in a competitive environment on decision making, IGT scores of competition group and non-competition group were compared by Kruskal-Wallis Test. The competition group's IGT scores were significantly higher than non-competition group ( $p = .006$ ).

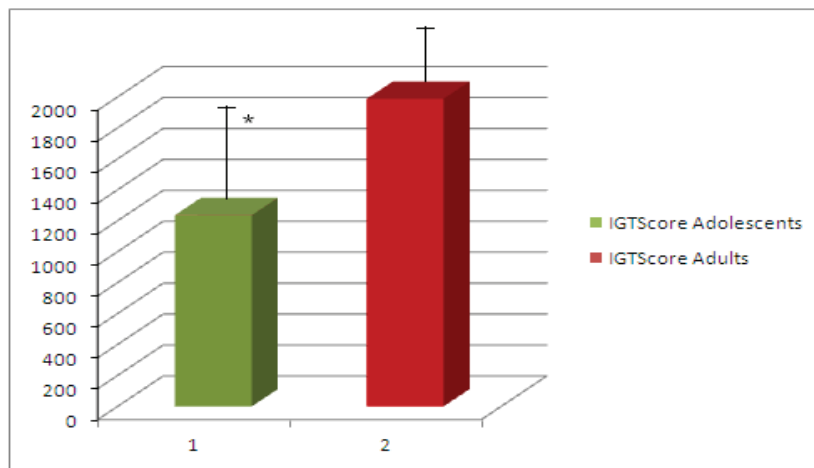


Fig. 2. Post adolescent and older adult subjects' mean scores and standard deviations on IGT.

\* $p = .000$ , mean difference = 754.05

Independent Samples Test was carried out to examine if the adolescents' number of choices from advantageous decks varies by the perception of competition in the environment and no significant difference was found ( $t(78) = 1.500$ ;  $p = .138$ ). Participants' awareness did not reveal any difference in IGT scores compare to those who were not aware of the task's strategy by carrying out Chi-Square Test ( $p = .750$ ) as consistent with their low performances on IGT. Eventually we examined if perception in a competition environment affects the decision making strategy, we carried out Chi-Square Test which indicated no relationship between awareness and competition situation ( $p = .751$ ).

### 3. Results and Discussion

We examined decision making differences between post adolescents and adults by using a computerized task that enables us to compare performances. Adolescence is a developmental stage characterized by impulsive decision making and risky behaviours such as increased alcohol and substance use, physical violence and inattentive injuries are seen (Shad et al., 2011). This distinction in risky behaviours through adolescence can be the reflections of increase in sensation seeking and ongoing development of self control (Steinberg et al., 2008). As a result of our

study, older adults' performances were better than post adolescents' as consistent with inverted U shaped curve mentioned before in this study.

In our second hypothesis, we suggested that there would be an association between IGT performance and personality traits. In adults, lower IGT performance was found to be associated with impulsivity but in post adolescence was found to be associated with sensation seeking (Crone et al., 2003). Externalizing tendencies are increased in post adolescence and individuals with externalizing psychopathology show low performance on IGT (Hooper et al., 2008). We examined personality traits only in post adolescence group and there was no correlation with extraversion and psychoticism.

Although we expected awareness would lead to an increase in IGT scores, to our surprise the result of the study was not in line with this expectation. A quite intriguing finding revealed in this study is that; perceived presence of competitive environment decreased IGT scores of the participants referring to a tendency for risk taking behaviour. The competition group had lower scores on IGT than non-competition group and neutral group. Because decision making is a cognitive process, it can be affected from a stressful situation. Previous studies have found that stress affects executive functions and especially working memory which in turn affects cognitive performances (Preston et al., 2007). One suggestion for this finding is, the participants in competition group had been comparing their scores throughout the test, with scores on imaginary list that had been shown them just before the administration and when they realized their score was decreasing they attempted to choose from disadvantageous decks in order to increase their scores despite they know the strategy.

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