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PROCRASTINATION AND FUTURE DISCOUNTING

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Abstract

Many studies examine delay discounting and procrastination independently in literature. The current study investigates for the relationship between procrastination and future discounting, unlike others. A difference between procrastinators and non-procrastinators in terms of their tendency to discount is also expected. Further, the response times of participants are expected to differ according to discount values (k values) that derived from each preference. Research was conducted with 104 undergraduates. The expected relations and differences were found to be statistically significant. The results shed light on the psychological correlations of participants' discount rates and procrastination scores.

Keywords: Procrastination, future discounting, k parameter,

Introduction

Theoretical investigations of discounting have developed relatively independently in experimental psychology and in economics; researchers from different disciplines have used different definitions to describe discounting. In this study, the term delay discounting refers to the reduction in the present value of a future reward (subjective value) as the delay to that reward increases (Kirby, 2006). Researches on delay discounting were conducted on choice between immediate and future reward. It is a choice between two delayed rewards; a smaller amount of money available sooner and a larger amount of money available later. The rate of discounting decreases as the delay to the sooner reward increases (Green et al, 2005). Consider the cases in which a group of participants asked to choose between 10\$ today and 11\$ tomorrow (Case 1), another group of participants asked to choose between 10\$ in 30 days and 11\$ in 31 days (Case 2). You might simultaneously choose 10\$ in case 1 and 11\$ in case 2. Even though the differences between amounts and delays in both cases are similar, the choices are different. Since case 2 requires prolonged period of time for both rewards, participants prefer to receive larger reward. Consequently, delay discounting is not a term independent of delay.

There are various mathematical expressions that have been proposed to describe delay discounting. The most efficiently formalized functions of discounting are exponential and hyperbolic functions. Economic analysis of future discounting assumed that the rate of discounting is exponential; constant across delays and amounts (Loewenstein, 1992). Exponential function can describe by the following equation:

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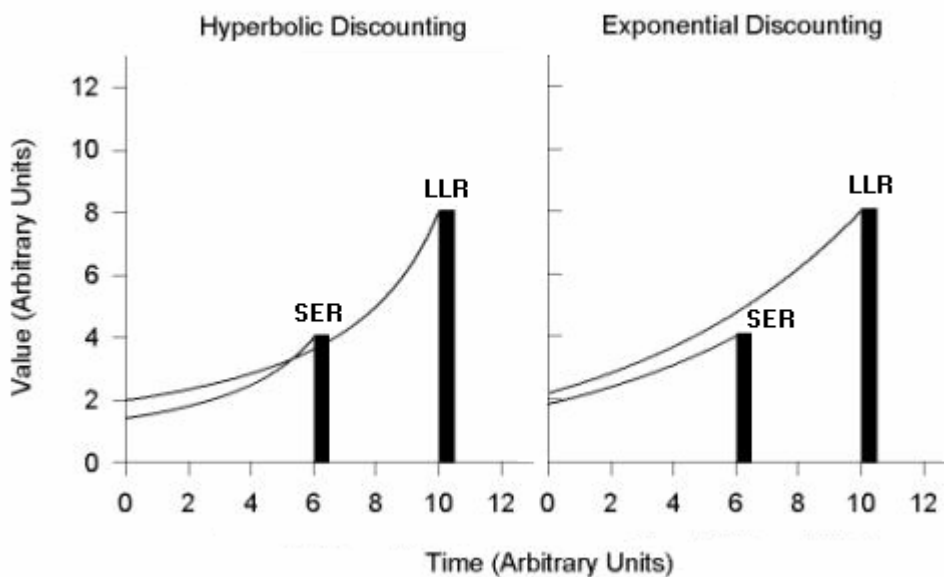
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$$V = Ae^{-kD}$$

where V is the present value of the delayed reward, A is the amount of delayed reward, D is the delay, and k is the discounting rate parameter. Hyperbolic functions provide an alternative form of discounting in which the discounting rate is not constant across delays (Mazur, 1987):

$$V = \frac{A}{1 + kD}$$

Hyperbolic discounting is substantiated in an experimental literature on animal behavior (Baum & Rachlin, 1969; Chung & Herrnstein, 1967; Mazur, 1987). Mazur (1987) found the hyperbolic function in his study of pigeons' choices between food reinforcers at varying delays. Hyperbolic function successfully describes discounting behavior of animal and human. Hyperbolic discounting rates provided a better fit to future discounting data than did the exponential model. Comparisons of these models of discounting have consistently found that the hyperbolic model accounts for a greater proportion of the variance than the exponential model in human and nonhuman animal studies of inter temporal choice (Kirby, 1997; Kirby & Marakovic, 1995).



Graph 1. Hyperbolic and Exponential discounting curves

The hyperbolic functions are steeper at small delays and flatter at long delays than the exponential, which allows hyperbolic curves to cross (Kirby & Marakovic, 1996).

For such a common, troubling and growing psychological research area in part because of its ability to unify theoretical approaches can be applied to diverse psychological phenomena (such as delay of gratification; Green & Myerson, 2004) and their behavioral manifestation (such as drug use). Discounting studies within the behavioral analytic framework extensively focused on impulsiveness; is a construct composed of many factors including risk-taking, behavioral disinhibition, and inability to delay gratification (Evenden, 1999; Monterosso & Ainslie, 1999). Level of impulsivity of groups that exhibited often impulsive behavior such as people with addictive disorders (drug, alcohol, pathological gambling, smoking), Attention Deficit and Hyperactivity Disorder and brain injuries was measured by their performance on temporal choice task. These groups were found to have greater tendency to discount the delayed rewards

more steeply than the control groups. (Bickel & Marsch, 2001; Petry, 2001; Dixon et al., 2003; Bickel, et al., 1999; Barkley et al., 2001; Schweitzer & Sulzer-Azaroff, 1995; Yi, Gatchalian, Bickel, 2006). Additionally, discounting of non-monetary rewards such as health, goods and food was also studied (Kirby & Herrnstein, 1995; Kirby & Guastello, 2001; Wilson & Daly, 2004). In these studies, even though the worth of goods and foods were similar, participants make choices according to their subjective values. Another phenomenon related to discounting is self-control. When self-control is a problem for a person, discount rate is likely to be high; the future rewards in the senses will have little impact on current choices (Kirby & Guastello, 2001). The framework of delay discounting is successful for understanding the development of self-control (Soroma et al., 2007).

In addition to behavioral studies, physiological bases of delay discounting were studied with Functional Magnetic Resonance Imaging (fMRI). It is found that, when participants choose immediate reward instead of delayed one, medial orbitofrontal and medial prefrontal cortices, as well as the ventral striatum, were activated, which were known as related areas in reward expectation. In contrast, when delayed one was chosen, brain activity was detected in lateral prefrontal and parietal areas, which were known as related areas in higher level cognitive functions (Mc Clure et al., 2004; Tanaka et al., 2004).

The general concept of procrastination is behavior of postponing task. Although the definitions of procrastination vary from author to author, more specified definition would be that; procrastination is the tendency to delay irrationally beginning and/or completing tasks that should be completed and delay should create discomfort in individuals (Lay, 1986; Lay, 1994). Lay's definition of procrastination covers general procrastination. Besides, a considerable attention has been given to the academic procrastination. Measuring academic procrastination would give results of tendency to procrastinate only in a specific task (academic task). Individuals may not procrastinate in their daily tasks even though they procrastinate in their academic life. Thus, in present research general procrastination is studied.

Procrastination behavior is viewed as a negative personality trait and conceptualized as, lack of self-control (Ariely & Wertenbroch, 2002), failure of self-regulation, waste of time, low levels of self-efficacy and self esteem (Klassen & Kuzucu, 2009) accompanied by fear of failure, self handicapping (Ferrari & Tice, 2000), task aversiveness, high levels of anxiety, stress, illness (Ferrari, 2005; Schraw, Wadkins, & Olafson, 2007, Tice & Baumeister, 1997), unsatisfactory performance (Steel, 2007) and emotional upset (Chu & Choi, 2005; Ferrari, O'Callaghan, & Newbegin, 2005; Solomon & Rothblum, 1984).

The researches mentioned above were conducted regardless of adaptive aspects of procrastination. Previous studies found that, even though there are apparent consequences of procrastination, students persist to put off their work (Conti, 2000; Saddler & Bulley, 1999; Schouwenburg, 1995). In fact, procrastination tends to increase as individuals advance in their academic career and become more self regulated (Ferrari, 1991). Adaptive aspects of procrastination would be a possible explanation for frequent appearing of procrastination behavior. The reason why people are likely to delay tasks when deadline is far away lies in a phenomenon known as temporal delay. As the deadline for a task is far away, people have a tendency to procrastinate; because a task that is completed at last minute before deadline accompanied with an immediate gratification. Tendency to procrastinate can be said to be a tendency to seek for immediate gratification. It is also a coping mechanism for individuals to escape negative emotions, to reduce stress and anxiety provoked by aversive tasks (Gura, 2007; Schraw, Wadkins, & Olafson, 2007; Pychyl et al., 2000).

Inability to focus on future goal and tendency to seek for immediate reward can be seen in both procrastination behavior and delay discounting tendency. When delay discounting is to discount future, procrastination is to discount present time. Both are related with time preferences. Cognitive processes take place in these two concepts, therefore it is thought of the dance between brain and situation. Discounting is defined as an evolved psychological

mechanism that underlies various daily preferences related with time. Since it is thought that, a relationship between procrastination and future discounting exists; procrastination would have an evolved psychological mechanism similar as in discounting.

In literature, there are lots of studies that examine delay discounting and procrastination separately. Perhaps, the most important difference of this study from other dozens of studies is searching for the relationship between procrastination and future discounting. A difference between procrastinators and non-procrastinators in terms of their tendency to discount (k values) is expected. Also, procrastination and discounting tendencies are expected to differ with respect to gender. Further, the response times of participants are expected to differ according to discount values (k values) that derived from each questions.

Method

Participants

Research participants were 49 female (age; $M = 20.30$, $SD = 1.08$, range: 18-23) and 55 male (age; $M = 21.69$, $SD = 1.71$, range: 18-25) undergraduates who volunteered from Izmir University of Economics. Participants were asked whether they had a defect of vision or not. Due to a technical problem in computer, one of the participant data was not recorded.

Materials

Participants' tendency to discount future was measured using a Parameter Estimation Procedure developed by Kirby and Marakovic (1995) on the basis of hyperbolic equation (Mazur, 1987). Procedure included 21 choice trials of monetary rewards consisted of one smaller immediate reward and one larger delayed reward. Immediate reward ranged from \$16 to \$83, delayed reward ranged from \$30 to \$85. Each immediate reward presented tonight and delayed rewards were ranged between 10-75 days. For each pair of alternatives, hyperbolic discounting parameter values (k) calculated for which the discounted value of the delayed reward is equal to the immediate reward (Kirby and Marakovic, 1995). 21 trials were assigned to 7 ranks. In each ranks choice trials were similar in delays and amount differences. For example, at rank 1, a paired choice would be \$34 tonight or \$35 in 43 days whereas a paired choice at rank 7 would be \$30 tonight or \$85 in 14 days. Trials were not presented in increasing order of discounting ranks. None of the trials from same rank were presented sequentially. For example, first question in presentation order was from rank 7, second question from rank 5, third question from rank 4, forth question from rank 1, etc. Discounting rate parameters, choice trials, ranks, orders are shown in Table 1. As shown in the table, in Kirby & Marakovic's study (1995), percentages of subjects choosing the delayed reward are similar in each rank and ascending order of percentages are consistent with the ascending order of the ranks.

Order	Choice Trial	Hyperbolic	Rank	% Ss
4	\$34 tonight or \$35 in 43 days	0,0007	1	12
15	\$53 tonight or \$55 in 55 days	0,0007	1	12
7	\$83 tonight or \$85 in 35 days	0,0007	1	12
20	\$27 tonight or \$30 in 35 days	0,0032	2	17
9	\$48 tonight or \$55 in 45 days	0,0032	2	34
12	\$65 tonight or \$75 in 50 days	0,0031	2	44
8	\$21 tonight or \$30 in 75 days	0,0057	3	36
16	\$47 tonight or \$60 in 50 days	0,0055	3	57
14	\$30 tonight or \$35 in 20 days	0,0083	4	44

10	\$40 tonight or \$65 in 70 days	0,0089	4	67
3	\$67 tonight or \$85 in 35 days	0,0077	4	70
18	\$50 tonight or \$80 in 70 days	0,0086	4	74
11	\$25 tonight or \$35 in 25 days	0,0160	5	68
2	\$40 tonight or \$55 in 25 days	0,0150	5	71
19	\$45 tonight or \$70 in 35 days	0,0159	5	90
21	\$16 tonight or \$30 in 35 days	0,0250	6	86
6	\$32 tonight or \$55 in 20 days	0,0359	6	94
17	\$40 tonight or \$70 in 20 days	0,0375	6	97
5	\$15 tonight or \$35 in 10 days	0,1333	7	99
13	\$24 tonight or \$55 in 10 days	0,1292	7	99
1	\$30 tonight or \$85 in 14 days	0,1310	7	99

Table 1. Trials numbers in the left margin, show the presentation order of trials. Trials are shown in increasing order of discounting rank, with trials within ranks in increasing order of delayed reward size. With the hyperbolic values, trials can be grouped into roughly 7 impulsiveness ranks. The last column shows the percentages of subjects choosing the delayed reward on each trial in the study.

In current study, this Estimation Procedure was reorganized to adapt (customize) for Turkish sample. Dollars (\$) are supposed to have confounding effect and changed into Turkish Lira (TL). Subjects' daily plans can affect tendency to choose immediate rewards. Therefore, "tonight" statement is changed into "tomorrow" phrase.

Different from majority of the procrastination studies that focus on academic procrastination, current study measures *General Procrastination* by using Lay's 20 item General Procrastination Scale (1986). General Procrastination was measured using a five-point scale, anchored by 'not true of me' (1) and 'very true of me' (5). Lay's General Procrastination Scale examines behavioral procrastination tendencies; delays in the start and/or completion of tasks. Examples of items on the procrastination scale include "In preparing for some deadline, I often waste time by doing other things," and "I usually buy even an essential item at the last minute". The 10 items (2, 3, 5, 8, 10, 11, 14, and 16) of the scale were reversed items. Cronbach's alpha coefficient was found to be .81. Since the scale was developed abroad, it was translated from English into Turkish. For the adaptation of the scale was back-translated into English by two linguistic experts and two bilingual experts in psychology. The Turkish version of the scale was then checked and compared by the psychology professionals. Regarding the feedbacks from professionals; scale was revised. Demographic items such as age, gender, and grade were included in the scale. Initially; the scale was administered to the 6 of the IEU college undergraduate students in order to monitor whether the questions were comprehensively understood. The final version of the scale was applied to 200 IEU undergraduate college students (103 females, 97 males) by the researchers. After the administration of the scale, the reliability analysis was conducted and the item-total correlations of the items were examined (see, Table 2). Four items with item-total correlations were below the .25 were omitted, and 16 item left. According to results of explanatory factor analysis, the scale was found to be one dimensional, as indicated in Lay's study (1986). The eigen value of this factor was 4.96, and the explained variance was 31.08 %. Cronbach alpha coefficient of scale with 16 items was found to be .84.

General Procrastination Scale Items		Item Total Correlations
**	Genelde kendimi günler öncesinden yapmaya niyetlendiğim işleri yaparken buluyorum.	-,1668
	Biletleri zamanında almadığım için genellikle konser spor ve buna benzer aktiviteleri kaçıyorum.	,3674
*	Bir partiyi planlarken, gereken düzenlemeleri önceden yaparım.	,2506
*	Sabah uyandıgımda, genellikle yataktan hemen kalkarım.	,2983
**	Yazdığım mektubu/e-postayı göndermeden önce, günlerce bekletirim.	,2088
***	Cevapsız aramalara hemen geri dönerim.	,1733
	Oturup hemen yapılabilecek işlerimi bile, günler boyunca yapmadığım olur.	,5760
*	Kararlarımı mümkün olduğunca kısa sürede veririm.	,3545
	Yapmak zorunda olduğum işlere başlamayı geciktiririm.	,6029
	Seyahat ederken, havaalanı/otogar/istasyona zamanında ulaşabilmek için acele etmek zorunda kalırım.	,3809
*	Dışarı çıkmaya hazırlanırken, son dakikaya yapılacak iş bırakmam.	,4446
	Bir işi yetiştirmeye çalışırken, başka şeylerle uğraşarak vakit kaybederim.	,5241
***	Tutarı az olan bir fatura geldiğinde ödemeyi hemen yaparım.	,2339
*	Herhangi bir davet aldığımda, davete katılıp katılmayacağımı kısa bir süre içerisinde bildiririm.	,3049
*	İşlerimi genellikle gerektiğinden daha kısa bir sürede bitiririm.	,5292
	Doğum günü ya da yılbaşı hediyelerimi son dakikada alırım.	,2919
	Alınması çok gerekli olan şeyleri bile son dakikada alırım.	,5764
*	Gün içinde yapmayı planladığım bütün işleri bitiririm.	,5985
	Kendime sürekli "Bunu yarın yaparım." derim.	,4732
*	Akşam oturup dinlenmeden önce bitirmem gereken bütün işleri bitirmeye özen gösteririm.	,5455
" * " indicates reversed items		
" ** " indicates omitted items		
" *** " indicates reversed and omitted items		

Table 2. General Procrastination Scale (Lay, 1986).

Procedure

The study consists of 2 stages; experimental task in which the discounting tendency were measured as a first stage and administration of procrastination scale as a second stage. Completion of procedure generally took 10-15 minutes Consent to participate was obtained from all participants. In most of the future discounting studies, a random choice of a random participant that is selected by computer paid in cash. This encouraged subjects to regard each trial as though it were the only choice they faced. However, this technique would effect participants choices relevant to their financial context, daily plans, also school holidays, impending vacations, birthdays of friends and relatives, graduation dates, even a weekend date and so on (Kirby and Herrnstein, 1995). No compensation was provided for completion of the experimental task.

Participants completed the procedure in test development room of Izmir University of Economics Psychology Lab. During the session subjects were seated at computers located in small testing cabins containing a desk, a chair, and the computer. All experimental procedures were completed on Windows-based desktop computers that were programmed in DirectRT™ Version 2008.1. Hypothetical monetary amounts, delays, and instructions were displayed on the computer screen. Instruction was as follows:

“In this study, some hypothetical monetary offers will be presented to you. You are asked to choose which amount of money you would like to have. Think of each trial as though they are really offered.”

Generally, the first trials are orientation trials for participants in order to understand comprehensively the idea about how to proceed in experiment. Since the response rate of the participants would be affected by orientation process of first trials; participants were completed 2 test trials under the supervision of researchers. The days and amounts in these test trials are different from trials in estimation procedure. Hypothetical reward pairs (two amounts of money, one is immediate, and the other is delayed rewards) that are presented to participants were prepared on Microsoft Office PowerPoint2007 as bitmap image file format (.bmp) compatible with Direct RT. The delayed amount of money was located on the right-hand side of the computer display and below this amount of money the delay time was displayed. The immediate amount of money was located on the left-hand side of the computer display and below this amount of money “tomorrow” was displayed. Responses were accomplished by pushing on 2 keyboard buttons (a left button on notepad for the left choice, and a right button for right choice. Responses and the reaction times for each trial were recorded by DirectRT.

Second stage of the procedure is administration of procrastination scale. After conducting the computer-based task, participants were asked to complete 16-items General Procrastination Scale.. Participants were informed of the procedure to follow, and told not to skip any items and demographic questions. Scale was given to each participant individually.

Data Analysis

Pearson Correlation Analysis is used to examine the correlation between procrastination and delayed discounting. In General Procrastination Scale, individuals who scored greater than to 0.5 standard deviation above the mean were classified as procrastinators ($n= 39$), individuals who scored less than to 0.5 standard deviation below the mean were classified as non-procrastinators ($n=38$). A t-test for independent samples was performed between procrastinators and non-procrastinators on their k values (discount preferences). Furthermore, ANOVA for repeated measures was performed on the response times at different ranks. The analyses were conducted by using SPSS 11.0 for Windows.

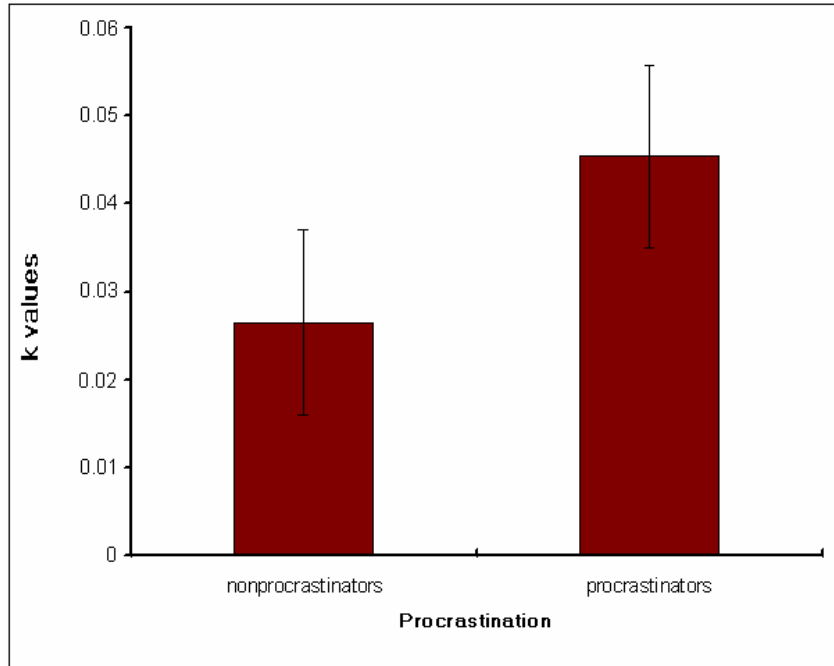
Results

In order to investigate the relationship between procrastination and discounting, Pearson Correlation coefficient was obtained. There was a significant relationship between procrastination and discounting ($r = .251, p < .05$).

For the gender differences, independent samples t-test was conducted on the procrastination scores and k parameter values separately. There were no significant mean difference between males and females in terms procrastination ($t_{(95,905)} = .831, p = .408$) and k values ($t_{(101,928)} = -.910, p = .365$).

Procrastination	N	Discount Rate		Significance (2-tailed)
		Mean	SD	
non-procrastinators	38	.026526	.0322	.035
procrastinators	39	.045374	.0439	

Table 3. Discount Rates of Procrastinators and Non-procrastinators



Graph 3. K Values of procrastinators and non-procrastinators

Another independent t-test was used to compare mean k values of the procrastinators and non-procrastinators. The results showed that there is a significant mean difference between two groups in k values ($t_{(75)} = -2.145, p < .05$). Procrastinators ($M = .045, SD = .044$) discount the future steeper than non-procrastinators ($M = .027, SD = .032$).

Finally, 7 ranks were categorized into 3 groups of low (1,2), medium (3,4,5) and high (6,7) ranks and one way repeated measures ANOVA was conducted for the response time. Mauchly's test indicated that the assumption of sphericity had been violated, $\eta^2(5) = 20.86, p < .05$, therefore degrees of freedom were corrected using Huynh-Feldt estimates of sphericity ($c = .86$). The results showed that response times were significantly differed in terms of ranks, ($F_{(1.71, 176.43)} = 41.56, p = .00, \eta^2 = .29$).

The analysis showed that the mean response time for the preferences with the high rank was the highest ($M = 3899.26$), while the mean for the low rank was the lowest ($M = 2847.93$). The participants spent less time while responding the low rank preferences. The response time differences in terms of ranks were examined in detail with pairwise comparisons by using Bonferroni correction. The comparisons indicated that the mean differences between the preferences with low rank and the other ranks were significant ($M.D_{low-Medium} = -716.81, M.D_{Low-High} = -1051.34, p < .00$) but the mean difference between medium and high rank was not significant ($M.D_{Medium-High} = .05, p > .05$).

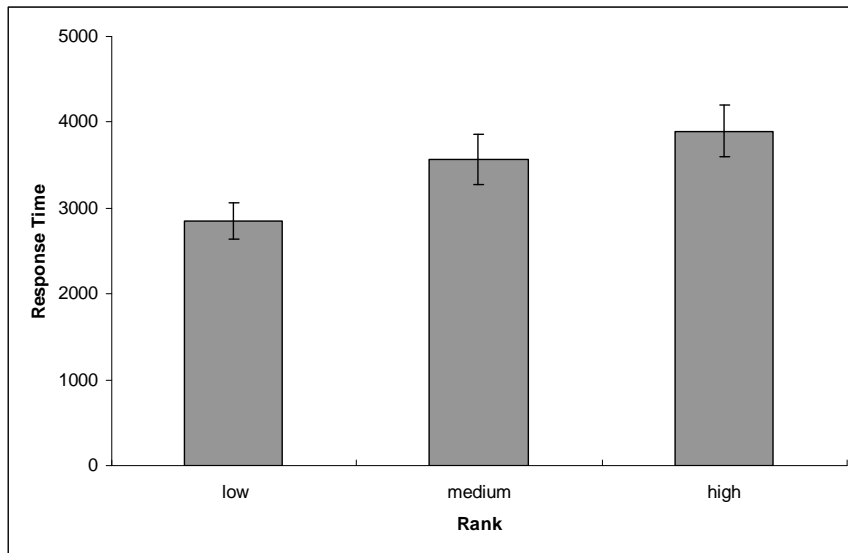
	Mean	SD	Significance
Rank1	2847.92	1076.13	
Rank2	3564.73	1484.51	.000
Rank3	3899.26	1503.81	

Table 4. ANOVA Results for Response Times of Each Rank

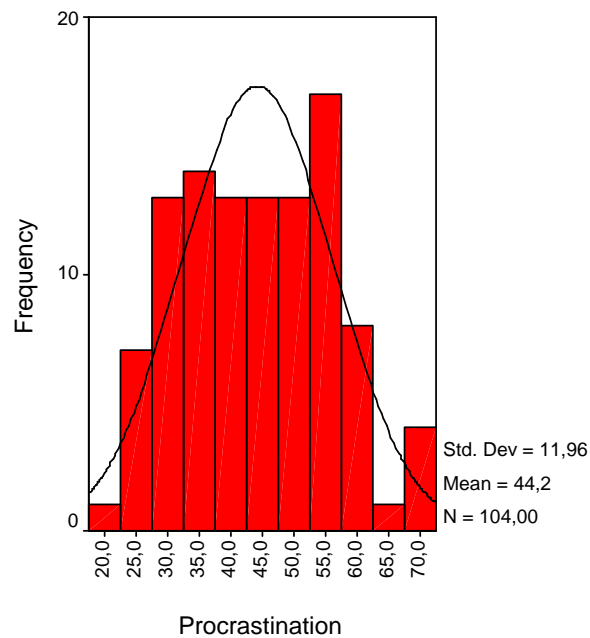
(I) Rank	(J) Rank	Mean Difference (I - J)	Significance*
1	2	-716.809	.000
1	3	-1051.337	.000
2	1	716.809	.000
2	3	-334.527	.054
3	1	1051.337	.000
3	2	334.527	.054

* The mean difference is significant at the .05 level

Tablo 5. Pairwise Comparisons for Response Times of Each Rank



Graph 4. Response time differences of each ranks



Graph 5. Distrubution of procrastination scores

Discussion

The purpose of this study was to extend understanding of future discounting and procrastination. The results shed light on the psychological correlations of participants' discount rates and procrastination scores. Another data provides differences between k values of procrastinators and non procrastinators that support the relationship. Procrastinators who has greater tendency to procrastinate, choose immediate reward steeper than non procrastinators who has lower tendency to procrastinate. At the beginning of the study it was considered that there are common aspects and underlying mechanisms that would explain tendency to put off works and seek for immediate gratification. The hypothesis about the relationship between procrastination and future discounting and whether there is a difference between procrastinators and non-procrastinators in terms of their tendency to discount (k values), were verified through findings mentioned above.

To gain deeper understanding of origin and mechanism of procrastination behavior, the reasons why individuals put off their works repetitively should be examined. Individuals struggle allocating limited time between their works and their personal relationships. In order to manage their time, they should be selective while allocating their time. Therefore, procrastinators learn to manage their time more efficiently. In fact, on conditions that realistic limits defined for completion of work and planning for the work done in last minute, concentration bursts, wasting time due to boredom decreases, increase in productivity and creativity and individuals achieve peak experience. In this way, people safeguard their personal time. Another important reason for procrastinating is getting feedback/reward right away. To escape from the stress and anxiety provoked by aversive task, procrastination works as a coping mechanism as well. Individuals generally procrastinate more when the task is aversive. As reward is received immediately, stress is released intensively. Procrastination behavior is reinforced with imminent reward. According to Ainslie's theory of specious reward, humans have tendency to choose short-term reward over long-term reward. Procrastination is a choice between pleasurable or immediately rewarded task and aversive task (Schraw, 2007; Pcyhyl et al., 2000; Ainslie, 1975).

The present results also revealed no significant gender difference in both discounting and procrastination. In previous procrastination studies of Ferrari et al., (1997) and Ferrari & Tice (2000) did not find any gender difference similarly to literature and this study. Thus, this finding is consistent with literature. Kirby and Marakovic (1996) have found that males had a greater discount value than females. Conversely, result of this study does not provide a gender difference, which is the -only- finding different from the literature.

The parameter estimation procedure of Kirby and Marakovic (1996) provide a significant difference between small, medium and large delayed reward sizes, parallel to this study. Therefore, this result yields internal validity of the procedure in the study. The last hypothesis is that response times of participants are expected to differ according to discount values (k values) that derived from each preference. As the discount values of ranks increased, the response time to choose either immediate or delayed rewards increased. As mentioned in introduction when participants choose immediate reward, ventral striatum was activated which area is known to be involved in reward expectation and this process takes short time. In contrast, when delayed one was chosen, brain activity was detected in lateral prefrontal and parietal areas which areas are known to be involved in higher level cognitive functions, and similar to the results of this study. This specific anterior insula activation was reported in decision making under uncertainty (Vols et al., 2003), in risk taking situations (Paulus et al., 2003), in studies on preference judgments (Paulus and Frank, 2003) and when receiving monetary rewards (Knutson et al., 2000). Choosing delayed reward instead of immediate one requires more complex cognitive processes. The ascending pattern of the response time given to each preferences within the order of ascending ranks are consistent with literature, and is a valid finding that supported with neurological functions within the evolutionary framework.

It is observed in the Rosati et al. (2007), which examined people's discounting tendencies on monetary tasks within the evolutionary framework, human beings discount more than bonobos and chimpanzees in food tasks. When the same preferences studied with same people on monetary tasks, the tolerance increased. This situation reveals humans share similar levels of patience with bonobos and chimpanzees in some contexts. Also results indicate a capacity for patience in the context of food reward evolved before human lineage split. While food is supportive reward for survival of animals, monetary reward takes a place of food for survival of human. Thus, the effects of adaptation which exists in different environment are observed in different evolved mechanism. The people who have more chance to reach monetary sources have different behavior and goals than people who has less chance to reach monetary sources. Due to this reason, decisions about money are not necessarily representative for all decisions. It is essential to examine preferences across a wide range of context to fully understand both the evolutionary pressures shaping human choose and cognitive mechanisms underlying decision makings. Our first study within these concepts contributes to anticipate following researches that indifference point would be calculated precisely with a procedure that preferences are independent from delay and amount. This study would be an initial step for researches relevant with discounting such as sexual discounting, physiological aspects of discount behavior, and testosterone effects on discounting.

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