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McLeish, Kendra N and Oxoby, Robert J

University of Calgary

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Robert J. Oxoby
University of Calgary
and
Kendra N. McLeish
University of Victoria

Department of Economics
University of Calgary
Calgary, Alberta, Canada
T2N 1N4

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Kendra N. McLeish[1] Robert J. Oxoby[2]

Abstract

We explore intertemporal decision making to test the extent to which elicited discount rates and a self-reported scale of impatience measure the same behavioral characteristic. We conduct experiments in which we elicit discount rates using monetary rewards and a self-reported measure of impatience (the Barratt Impulsiveness Scale, BIS-11). Although researchers have utilized these measures to infer aspects of intertemporal preferences, we find no significant correlation between discount rates and the BIS-11 except in the special case where discount rates were elicited after individuals were primed with negative feedback.

KEYWORDS: intertemporal choice, impulsiveness, discounting, experiments

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[1] Department of Economics, University of Calgary, 2500 University Drive NW, Calgary AB Canada T2N 1N4; knmcleis@ucalgary.ca

[2] Corresponding author: Department of Economics, University of Calgary, 2500 University Drive NW, Calgary AB Canada T2N 1N4; tel (403) 220-2586; fax (403) 282-5262; oxoby@ucalgary.ca

1 Introduction

Intertemporal preferences are largely affected by individuals' impulsiveness and impatience. As such, one may expect individuals' impulsivity to affect the ways in which they make decisions involving delayed costs and benefits. Indeed, in the economic and psychological literature there is significant research on the ways in which impulsivity affects decisions involving trade-offs between present and future costs and benefits. For example, increased impulsivity has been associated with greater procrastination and reduced self-control (O'Donoghue and Rabin, 1999, 2001; Thaler and Shefrin, 1981). As such, there is a strong and identifiable link between impulsivity and aggression (Stanford et al., 1995), sexual behavior (Clift et al., 1993), and risk taking (O'Donoghue and Rabin, 2000; Stanford et al., 1996). In terms of socially and economically relevant behaviors, greater impatience affects the manner in which individuals plan for retirement (Banks et al., 1998; Laibson, 1997), invest in human capital (Thompson et al., 1983), engage in criminal behavior (Eysenck and McGurk, 1980), and make choices regarding their diets (Shapiro, 2005).[3]

For psychologists and economists who study decision making, it is imperative that we identify the extent to which impulsiveness affects decision making. That is, only when we can properly gauge the impact of impulsiveness on decision making (versus other types of motivations or preferences) can we utilize self-report measures of impulsiveness and elicited discount rates to analyze behavior and, if necessary, develop welfare improving policies or practices. As such, further research on the methods that social scientists use to measure impulsiveness and impatience is required to assure that the proper tools are used to assess impulsiveness. Further, we need evidence that allows us to directly apply these measures to behavior. That is, if an individual reports that they always save for the future (a self-report measure of impulsiveness), but are identified as having a high discount rate (an economic measure of impatience), it is hard to argue that the discount rate is appropriate for analyzing the individual's savings behavior.

The purpose of this paper is to provide a detailed investigation of two different measures of preferences over intertemporal decision making. Specifically, we compare an incentive compatible measure of an individual's intertemporal discount

[3]Karp (2005) agues that consumers' impatience affects patterns of global warming.

rate with a self-report measure of trait impulsiveness (the Barratt Impulsiveness Scale BIS-11, Patton et al., 1995). These measures of impatience and impulsiveness have been used to gauge poverty and redistributive programs (e.g. Harrison et al., 2005; Eckel et al., 2002), assess the effectiveness of drug interventions (e.g. Hollander et al., 2005), and identify individuals at who are likely to relapse into the consumption of addictive substances, engage in risky behaviors (e.g. drug use, drunk driving), and suffer from attention-deficit/hyperactivity disorders (Doran et al., 2004; Stanford et al., 1996; Fossati et al., 2002). Our interest here is to identify the extent to which these measures identify a common behavioral trait. To the extent that they do, both measures gain credibility as tools to help us identify individual characteristics and potentially paths towards diagnostic and policy ends. That is, if the self-report measure is aligned with the elicitied discount rate, we have evidence that the discount rate is associated with trait impulsiveness. As such, both of these instruments are measuring the same phenomenon, and further, each one can be more broadly applied to individual behavior.

Moreover, given recent research on the relationship between intertemporal decision making and affective state (Loewenstein, 1996; Loewenstein and O'Donoghue, 2004; Read and vanLeeuwen, 1998), we compare BIS-11 measures to discount rates elicited under different feedback treatments. That is, apart from merely comparing the two measures in a neutral setting, we are able to identify the feedback conditions (which can be associated with affective states) under which the self-report measure of trait impulsivity and the elicited discount rate are most closely aligned.

While both of these measures are aimed at identifying preferences over intertemporal choice, we find that there is little correlation between them. The aggregate score and the subscales from the BIS-11 are surprisingly uncorrelated with the elicited discount rate. Even the individual items of the BIS-11, which would be expected to be directly related to the discount rate (e.g. statements regarding savings and current versus future consumption), are vastly independent of our discount rate measure. Notably, the only significant correlation between the BIS-11 measures and discount rates is in the special case where the discount rate was elicited after individuals were primed with negative feedback. That is, our data suggests that the behavioral characteristic characterized by the BIS-11 is only isolating the type of intertemporal decision making exhibited in a “negative feedback” economic environment. More importantly, this calls into question the appropriateness of using

these measures in order to identify common determinants of behavior.

2 Related Literature

Intertemporal discounting refers to the manner in which individuals trade-off future and present costs and benefits, with the value of future costs and benefits being lower than that of identical, but more temporally proximate, costs and benefits.[4] In the economics literature, experiments in intertemporal choice utilize a well-known procedure for eliciting discount rates: Participants are presented with choices between an amount of money x in the immediate future and a larger amount $x+y$ in the more distant future. An individual's discount rate is approximated based on the value of y such that the individual is indifferent between the two options. Methodologically, the advantage of such an elicitation technique is that participants' choices are incentive compatible: Participants are making choices resulting real in payoffs of x or $x+y$, each of which is implemented with some known probability. Such techniques have been successfully used by Coller and Williams (1999), Harrison et al. (2002) and Wilson and Daly (2003). These studies demonstrate that nominal discount rates can be assumed to be constant within a household but differ with respect to demographic variables (Harrison et al., 2002). Specifically, discount rates appear to decline with age and women have lower discount rates than men (Coller and Williams, 1999; Wilson and Daly, 2003).

Trait-impulsivity is characterized by behaviors reflecting a preference for immediate rewards and significant difficulty in resisting such rewards (Mitchell, 1999; Monterosso and Ainslie, 1999). A frequently used self-report measure of impulsivity is the Barratt Impulsiveness Scale (BIS-11) consisting of 30 statements of personal characteristics (presented in appendix A). Respondents are asked to indicate the extent to which the statements apply to them using a four-point scale ranging from rarely/never to always/almost always. The raw impulsiveness measure is the sum of the scores of these responses (the larger the sum, the more impulsive is the participant). The scale can be decomposed into three subscales measuring specific aspects of impulsivity: motor impulsiveness, nonplanning impulsiveness and

[4] See Frederick et al. (2003) for a comprehensive review of the literature on intertemporal decision making.

attentional impulsiveness.[5] The BIS-11 has been used with a variety of populations (e.g. Crean et al., 2000; Kirby et al.,1999; Mitchell, 1999; Stanford et al., 1996) and has demonstrated reliability and validity (Carrillo-de-la-Pe~na et al., 1993; Fossati et al., 2002; Patton et al., 1995).

Our interest is in the relationship between the measure of impatience characterized by the discount rate and the measure of impulsiveness obtained from the BIS-11, with special attention to the implications this has for the applicability of these measures. While past studies have focused on aggregate correlations between self-report questionnaires and practical measures of impatience, these studies have utilized subject pools consisting of individuals with self-control issues (e.g. drug addicts, problem drinkers, psychiatric outpatients). For example, Coffey et al. (2003) compared self-reported measures of impulsivity to the traditional economic discount rate among individuals with cocaine dependencies. While these measures should characterize similar aspects of an individual's intertemporal decision-making, correlations were insignificant. Similarly, Kirby et al. (1999) compared heroin addicts' responses to the BIS-10 with discount rates elicited from choices between immediate and delayed monetary rewards. While no aggregate correlation between the BIS-10 measure and the discount rate was identified, both nonplanning impulsiveness and cognitive impulsiveness were significantly correlated with the discount rate. This correlation between the discount rate and two subscales of the BIS-10 (albeit with a very specific participant pool) begin to suggest that the two measures may be only tangentially related.[6]

3 Method

Our experiment focused on the elicitation of discount rates from 83 participants recruited from the undergraduate student population at our university. Each participant returned every two weeks, participating in a maximum of four sessions thereby permitting multiple observations of participants' discount rates and self-

[5] Attentional impulsiveness is related to cognitive impulsiveness present in previous incarnations of the Barratt Impulsiveness Scale.

[6] The lack of correlation between psychological measures of impatience and discount rates is not specific to the BIS-11. For example, while Madden et al. (1997) and Richards et al. (1999) (using opioid addicts and problem drinkers) find some correlation between a self-reported measure of impatience (the Eysenck Personality Questionnaire) and elicited discount rates, Crean et al. (2000) and Vuchinich and Simpson (1998) (using psychiatric outpatients and problem drinkers) find no correlation between this measure of impulsivity and discount rates.

reported measures. With attrition over the seven-week period, this yielded 259 observations of elicited discount rates and self-reported measures.

In each experimental session, participants were asked to complete the Barratt Impulsiveness Scale (BIS-11, presented in appendix A). Participants were asked to indicate the extent to which each statement applied to them using a four-point scale ranging from rarely/never to always/almost always. We utilized the BIS-11 given previous evidence that this measure is a better predictor of impulsiveness across a variety of respondent populations (e.g. Carrillo-de-la-Pe~na et al., 1993; Mitchell, 1999; Stanford et al., 1996)[7].

After completing the BIS-11, individuals participated in an unrelated bargaining game (see appendix B) after which discount rates were elicited. The results of the bargaining were used to introduce a feedback manipulation: While all subjects participated in the bargaining game, only a randomly assigned group learned the outcome of the game (i.e. their payoffs) prior to the elicitation of discount rates (cf. Charness and Levin, forthcoming, among others). This provided a measure of the effect of feedback (yielding changes in affect or mood) on elicited discount rates.[8] Given that many of the studies utilizing the BIS-11 have used participants pools consisting of addicts or individuals suffering mood disorders, we wished to explore the extent to which the BIS-11 perhaps coincided better with intertemporal decisions undertaken in "non-neutral" emotional states.

In the elicitation of discount rates, participants indicated their preference between \$40 in two weeks and \$40+ y in five weeks (see Figure 1). Discount rates were approximated by the point at which participants ceased choosing the first payment option and began choosing the second payment option (as in Coller and Williams, 1999; Harrison et al., 2002, 2005). Options were delineated by three-week interest rates ranging from 2% to 30% in 2.5% increments.[9]

Participants were aware that they were making decisions resulting in real payoffs with some probability: In each session there was a 10% probability that a participant would receive her chosen options from Figure 1. Participants were

[7]In the context of this paper, impulsivity is defined as having a strong preference for sooner rewards.

[8]Capra (2004) finds that individuals experiencing good mood are more altruistic and helpful in experimental games. Similarly, Charness and Levin (forthcoming) find evidence of "emotional reinforcement" influencing deviations from Bayesian updating. One might expect discount rates elicited in an economic experiment to vary with mood just as they may in the presence of heightened levels of hunger, pain or other visceral factors (Loewenstein, 1996).□

informed of their payoff at the end of the next session and (if chosen) received the payment at the specified date (i.e. two weeks or five weeks after the session). For the last of the four sessions, participants were informed of their payoff from Figure 1 by email and told after which date they could receive payment.[10]

Figure 1 about here.

4. Results

Our data includes 259 observations across four treatments. In the *control treatment* 97 observations involved no feedback on the outcome of the bargaining game between the answering the BIS-11 and the elicitation of the discount rate. In the three other treatments, participants learned the outcome of the bargaining game after answering the BIS-11 but prior to the elicitation of discount rates. As such, the outcome of the bargaining game (or the mood engendered by knowing this outcome) may have affected the elicited discount rate. In the *positive feedback treatment* 61 participants learned they had received a payoff strictly greater than $5 in the bargaining game.[11] In the *negative feedback treatment* 52 participants learned they had received a payoff strictly less than $5 in the bargaining game. Finally, in the *neutral treatment* 49 participants learned they had received a payoff of exactly $5 from the bargaining game. Our attention to these treatments is to identify any ways in which the BIS-11 correlates with discount rates elicited under altered states of affect or mood. Note that feedback is only salient for the elicitation of the discount rate; the BIS-11 was always completed prior to feedback being received.

To begin, we investigated the reliability of the Barratt Impulsiveness Scale. The Cronbach's Alpha coefficient calculated from our data is 0.845, evidence that responses on the scale are consistent across the 30 items (cf. Fossati et al., 2002; Patton et al., 1995, in which Cronbach Alpha coeffcients range from 0.79

[9] One exception is the first increment of 3.0%.

[10] The experiments were conducted over computers and programmed in z-Tree (Fischbacher, 1999).

[11] We chose $5 as the cutoff for the feedback treatments as it was the median monetary payoff in each of the bargaining games.

to 0.83 with different subject pools).[12] Summary statistics from the Barratt scores and (three-week) discount rates are reported in Table 1. We find no differences in discount rates (in the control or positive affect treatments) or self-reported measures across genders (cf. Coller and Williams, 1999; Harrison et al., 2002; Patton et al., 1995; Stanford et al., 1996).

Table 1 about here.

Turning our attention to the relationship between the BIS-11 and elicited discount rates, we consider three comparisons of BIS-11 responses and discount rates elicited under the control, positive feedback, and negative feedback treatments.[13] First we consider the aggregate impulsiveness score calculated by summing an individual's responses to the 30 items of the BIS-11. Using both Spearman Rank and Kendall Rank correlations on data from the control treatment, we are unable to reject the hypothesis that the discount rate and the aggregate BIS-11 measure are independent ($p = 0.7263$ and $p = 0.8496$). Indeed, the Spearman Rank correlation coefficient between the elicited discount rate and the aggregate BIS-11 measure is negative, -0.0360 (see Table 1). Similar results hold for the correlation between the discount rate elicited after positive feedback. It is only with respect to discount rates elicited after negative feedback that we are able to reject the hypothesis that the discount rate that the aggregate BIS-11 measure are independent. Moreover, it is only under these conditions that we observe a positive correlation between these two measures of impatience. Thus, taken at the aggregate level, it appears that it is only when primed with negative feedback that elicited discount rates and the BIS-11 provide measures of the same behavioral characteristic.[14]

Table 2 about here.

[12]We also calculated Cronbach's Alpha coefficient for the BIS-11 for each session separately, finding values ranging from 0.838 to 0.868.

[13]For simplicity and exposition, the neutral feedback treatment is not analyzed here. In terms of results, the correlation of the neutral treatment to responses from the BIS-11 mirrors that of the control treatment. Intuitively, it is not clear what type of "mood" this feedback generates. The inclusion of $5 as a potential outcome in the bargaining games highlighted the positive or negative feedback associated with getting a higher or lower payoff than one's bargaining partners.

[14]Among smokers, Doran et al. (2004) find no association between trait-impulsiveness and post-quit changes in affect.□

To gain greater insight into the relationship between these two measures, we decompose the BIS-11 into the nonplanning impulsiveness, motor impulsiveness and attentional impulsiveness subscales. The Spearman Rank correlation coefficients between the subscales and the discount rate elicited in the control, positive feedback, and negative feedback treatments are reported in Table 2. The results are similar to those obtained from the analysis of the aggregate BIS-11 score: With respect to the control and positive feedback conditions, we are unable to reject the hypothesis that elicited discount rates and the scores on each subscale are independent. Moreover, while positive correlations are expected, many of the correlations are negative. However, we can reject the independence hypothesis with respect to discount rates elicited under the negative feedback condition, and even then only with respect to the motor impulsiveness subscale. Overall, this suggests that there is no relationship between the Barratt Impulsiveness Scale and the economic discount rate except in the special case where discount rates were measured after priming with negative feedback. Even then, the discount rate is only significantly correlated with a single subscale.

Finally, we consider the relationship between elicited discount rates and the individual items of the BIS-11. As there exists a possibility that discount rates may be correlated with one specific item in the scale, we measure the direct relationship between the discount rate and each BIS-11 item, calculating a Spearman rank correlation coefficient between the discount rate and each item (Table 3). As in the above analysis, no strong pattern emerges except in the case of the negative feedback treatment. That is, discount rates elicited after individuals were primed with negative feedback are correlated with a higher number of Barratt items than those in either the control or positive feedback treatments. Also note that all the significant correlations between the discount rate in the control or positive feedback treatments and the Barratt items are negative. With respect to the significant correlations between the discount rates in the negative feedback treatment and the Barratt items, the majority are positive.

Table 3 about here.

5 Discussion

It is interesting to note which of the items on the BIS-11 correlate with the discount rates elicited after negative feedback. In particular, the items "I buy things on impulse" (item 8), "I spend or charge more than I earn" (item 11) and "I *do not* save regularly" (item 21, reverse scoring) are positively and significantly correlated with elicited discount rates. This is striking as each of these items address economists' conception of impatience and fit well with decisions that are functions of the discount rate (i.e. consumption and savings).

The items "I act on the spur of the moment" (item 7) and "I say things without thinking" (item 18) are similarly correlated but are more focused on impulsive behavior. These items indicate an interesting parallel between the concept of impatience captured in the discount rate and psychologists' concept of impulsiveness. Finally, the items "I *do not* like to think about complex problems" (item 19, reverse scoring) and "I get easily bored when solving thought problems" (item 23) may be tied to the idea of bounded rationality (e.g. limited cognitive resources, limited attentional facilities; see Conlisk,1996). This suggests that greater impatience (or the lack thereof) may be linked to the degree of normative rationality individuals display.

Taken together, these statements of impatience and impulsiveness demonstrate a connectedness between the discount rate and trait impulsiveness, particularly in negative feedback states. This may be valuable in shedding greater insight and developing policy prescriptions regarding the high daily discount rates observed by Shapiro (2005). Among those individuals receiving assistance (i.e. food stamps), daily discount rates are manifest in a 10% to 15% decline in caloric intake over the food stamp month. This implies a dramatically high rate of impatience within this population, many of whom are living in poverty and may be experiencing states of negative affect or symptoms of depression (Brown, 2002; McLeod and Shanahan, 1993). In such circumstances, psychological measures such as the BIS-11 may complement the elicitation of discount rates and offer policy prescriptions based on behavioral approaches to poverty.

Overall, we find that the composite measure of the Barratt Impulsiveness Scale, the Barratt subscales, and a large number of the individual items on the Barratt scale are only significantly correlated with the economic discount rates elicited after participants were primed with negative feedback. This is a signal that the Barratt

Scale may be more effective in predicting the discount rates of those in negative affective states. As discussed above, much of the research conducted on the relationship between elicited discount rates and self-reported measures of impulsivity has been conducted with subjects whose affective state may be considered non-neutral (e.g. heroin and cocaine addicts, psychiatric outpatients). Given our results, it is perhaps unsurprising that scales such as the BIS-11 have been frequently utilized in the analysis of such subject pools. As discussed by Elster (1999), the effects of cognitive antecedents to discount rate elicitation in our experiments may parallel the effects of the antecedents facing individuals with addiction issues.

However, when considering more general populations, it appears that these measures of impatience are uncorrelated. Therefore, because we are unable to reject the hypothesis that the BIS-11 and elicited discount rates are predominantly independent, we are lacking the evidence that allows us to relate one or both of these measures to more broad behavior. Further research is needed in order to identify which of these measures (if any) are able to be used in this manner.

One possible explanation for the discrepancy between the Barratt Scale and the economic discount rate is the lack of incentive compatibility in the elicitation of responses to the BIS-11 (Hertwig and Ortmann, 2001). Most importantly, without incentives for participants to answer truthfully to each item of the BIS-11, participants may be less precise about their response whereas elicited discount rates are incentive compatible in that participants (with some probability) receive their chosen payoff. This incentive compatibility assures that participants exert a reasonable amount of diligence to align their selections with their preferences. That said, one would expect the effect of incentives (or the lack thereof) to be uniform across treatments, yielding no correlation between the BIS-11 measures and discount rates in each treatment (i.e. the randomness in responses to the BIS-11 items should be uniform across feedback conditions). The fact that we find correlations with respect to discount rates elicited after negative feedback is an indication that the absence of explicit incentives (for the BIS-11 responses) does not fully explain our results.

6 Conclusion

To the extent that scores on the Barratt Impulsiveness Scale and discount rates are both directed at measuring intertemporal preferences, one would expect to identify a

strong correlation between each measure. However, our analysis finds only insignificant correlations between the Barratt Impulsiveness Scale (with respect to the aggregate measure, the subscales, and individual items) and elicited discount rates. It appears that only when participants are primed with negative feedback does the Barratt scale predict individuals' discount rates. Thus, our results imply that, in anything other than a negative feedback environment, one or both of these measures lacks practical predictive power and likely measures something other than impulsivity. This result raises concerns about reliance on these measures when looking at the determinants of behavior.

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A Barratt Scale: BIS-11

Below are the 30 personal statements of the Barratt Impulsiveness Scale as listed in Patton et al. (1995). Each is rated on a 1 (rarely/never) to 4 (always/almost always) scale. The scoring on items 4, 5, 13, 14, 15, 16, 17, 19, 20, 21, and 26 is reversed (4 (rarely/never) to 1 (always/almost always)).

1. I “squirm" at plays or lectures.
2. I am restless at the theater or lectures.
3. I don’t “pay attention."
4. I concentrate easily.
5. I am a steady thinker.
6. I act “on impulse."
7. I act on the spur of the moment.
8. I buy things on impulse.
9. I make up my mind quickly.
10. I do things without thinking.
11. I spend or charge more than I earn.
12. I am happy-go-lucky.
13. I am a careful thinker.
14. I plan tasks carefully.
15. I am self-controlled.
16. I plan trips well ahead of time.
17. I plan for job security.
18. I say things without thinking.
19. I like to think about complex problems.
20. I like puzzles.
21. I save regularly.
22. I am more interested in the present than the future.
23. I get easily bored when solving thought problems.
24. I change residences.
25. I change jobs.
26. I am future oriented.
27. I can only think about one problem at a time.
28. I often have extraneous thoughts when thinking.

29. I have “racing" thoughts.
30. I change hobbies.

B Description of Games

The following are descriptions of the games played in each session. The results of these games are consistent with results in the existing literature (see Camerer, 2003).

1. Week One: Discrete-Choice Dictator Game

Participants were randomly matched into anonymous groups of two. Each participant was given the choice between three payoff options: (a) $9 for self, $0 for other person (b) $5 for self, $5 for other person (c) $6 for self, $2 for other person. The computer then randomly chose and implemented one of the partners' choices for each pairing. The distribution of chosen offers is presented below. The deviations from pure self-interested behavior are consistent with other, similar games.

Option	Payoffs	Frequency
A	(9,0)	35.7%
B	(5,5)	48.8%
C	(6,2)	15.5%

2. Week Two: Redistribution Game

Participants were randomly matched into anonymous groups of four. Each participant was allocated $10, and had the option of redistributing their money to a public fund paying each person in the group 0.25 times the sum of all contributions within the group. That is, an individual's payoff was $\$10 - \text{their contribution} + 0.25$ times the sum of all contributions within the group. Participants' choices were made simultaneously. Consistent with various linear public good games, the average contribution (standard deviation) was 1.22 (1.86).

3. Week Three: Discrete-Choice Dictator Game

Participants were randomly matched into anonymous groups of two. Each participant was given the choice between three payoff options: (a) $10 for self, $0 for other person (b) $5 for self, $5 for other person (c) $6 for self, $2 for other person. The computer then randomly chose and implemented one of the partners' choices for each pairing. The distribution of chosen offers is presented below. The deviations from pure self-interested behavior are consistent with similar games.

Option	Payoffs	Frequency
A	(10,0)	79.4%
B	(5,5)	15.9%
C	(6,2)	4.8%

4. Week Four: Stylized Ultimatum Game

Participants were randomly matched into anonymous groups of two and randomly assigned the roles of proposer and responder. The proposer was given $10 and chose how much of this endowment she was to share with the responder. At the same time, the responder indicated the minimum offer she would accept from the proposer (cf. Mitzkewitz and Nagel, 1993; Oxoby and McLeish, 2004). If the offer was greater than or equal to the minimum acceptable offer, each player received the amount agreed upon. However, if the actual offer was less than the minimum acceptable offer, both players received nothing. The average (standard deviation) offer was 4.84 (1.23). The average (standard deviation) minimum acceptable offer was 3.36 (2.19). This is consistent with similar ultimatum games.

Table A:

Payoff Alternative	Payment Option A (pays amount below in 2 weeks)	Payment Option B (pays amount below in 5 weeks)	Payment Preferred (circle A or B)	
1	$40	$40.80	A	B
2	$40	$42	A	B
3	$40	$43	A	B
4	$40	$44	A	B
5	$40	$45	A	B
6	$40	$46	A	B
7	$40	$47	A	B
8	$40	$48	A	B
9	$40	$49	A	B
10	$40	$50	A	B
11	$40	$51	A	B
12	$40	$52	A	B

Figure 1. Table A used in the experiment.

	Barratt Score All Treatments	Discount Rate Control Treatment	Discount Rate Positive Feedback	Discount Rate Negative Feedback
All	62.749	13.773	14.393	13.529
Observations	(10.368)	(8.136)	(8.703)	(8.155)
Males	61.923	12.198	14.875	11.897
	(10.007)	(8.245)	(7.732)	(7.543)
Females	63.981	15.670	13.700	16.611
	(10.816)	(7.670)	(10.065)	(8.584)

Table 1. Summary of Means (Standard Deviations) for the BIS-11 Score and the Economic Discount Rate.

	Control Treatment		Positive Feedback		Negative Feedback	
	Spearman Rank Corr. Coef.	Test of H_0: Indep. ($prob > \|t\|$)	Spearman Rank Corr. Coef.	Test of H_0: Indep. t ($prob > \|t\|$)	Spearman Rank Corr. Coef.	Test of H_0: Indep. ($prob > \|t\|$)
Agg.	-0.0360	0.7263	-0.1021	0.4336	**0.2988**	**0.0314**
NI	-0.0318	0.7570	-0.0500	0.7020	0.1839	0.1918
MI	0.0139	0.8922	0.0234	0.8581	**0.3515**	**0.0106**
AI	-0.1623	0.1123	-0.1838	0.1563	-0.0044	0.9753

Table 2. Spearman Rank Order Correlation Coefficients Between Discount Rates and the Aggregate BIS-11 Score (Agg.) and BIS-11 Subscales: Nonplanning Impulsiveness (NI), Motor Impulsiveness (MI), and Attentional Impulsiveness (AI).

	Control Treatment		Positive Feedback		Negative Feedback	
	Spearman Rank Corr. Coef.	Test of H_0: Indep. ($prob > \|t\|$)	Spearman Rank Corr. Coef.	Test of H_0: Indep. t ($prob > \|t\|$)	Spearman Rank Corr. Coef.	Test of H_0: Indep. ($prob > \|t\|$)
ARate						
Item 1	-0.0616	0.5486	-0.1274	0.3279	**-0.2795**	**0.0448**
Item 2	-0.0613	0.5509	0.0186	0.8871	-0.0983	0.4882
Item 3	-0.0701	0.4950	-0.0640	0.6243	0.1262	0.3726
Item 4	-0.1377	0.1787	**-0.2138**	**0.0980**	0.1432	0.3112
Item 5	-0.1109	0.2797	**-0.2710**	**0.0346**	0.1374	0.3312
Item 6	-0.0170	0.8688	0.1517	0.2433	0.1961	0.1635
Item 7	0.0028	0.9783	0.1656	0.2020	**0.4537**	**0.0007**
Item 8	0.1002	0.3289	-0.0013	0.9919	**0.3946**	**0.0038**
Item 9	-0.1536	0.1331	0.0003	0.9980	0.1617	0.2520
Item 10	**-0.1832**	**0.0725**	-0.1713	0.1868	0.0419	0.7682
Item 11	-0.0721	0.4829	0.1312	0.3135	**0.2955**	**0.0334**
Item 12	0.0768	0.4549	0.1592	0.2204	0.0579	0.6836
Item 13	-0.0838	0.4147	-0.1805	0.1640	0.0623	0.6606
Item 14	-0.0845	0.4106	-0.1254	0.3356	-0.1248	0.3781
Item 15	-0.1456	0.1547	-0.0820	0.5300	0.0557	0.6951
Item 16	-0.1598	0.1180	0.0245	0.8513	-0.0130	0.9274
Item 17	-0.0931	0.3643	-0.1493	0.2507	**-0.3278**	**0.0177**
Item 18	**-0.1678**	**0.1003**	-0.0814	0.5329	**0.2479**	**0.0765**
Item 19	0.0013	0.9902	0.0295	0.8214	**0.3923**	**0.0040**
Item 20	0.1173	0.2525	0.0460	0.7250	0.1484	0.2936
Item 21	0.0199	0.8464	0.1433	0.2705	**0.3130**	**0.0239**
Item 22	0.1287	0.2091	-0.0616	0.6372	-0.0795	0.5755
Item 23	0.0808	0.4312	-0.1177	0.3663	**0.5185**	**0.0001**
Item 24	0.1367	0.1819	0.1430	0.2714	0.0843	0.5526
Item 25	0.1088	0.2886	0.0140	0.9149	0.2016	0.1519
Item 26	0.0434	0.6731	**-0.2168**	**0.0932**	0.0150	0.9159
Item 27	0.0793	0.4400	-0.1698	0.1909	0.0144	0.9194
Item 28	-0.0534	0.6031	-0.1633	0.2086	0.1371	0.3323
Item 29	-0.0651	0.5266	-0.0422	0.7465	-0.0796	0.5750
Item 30	-0.1362	0.1834	-0.0494	0.7056	-0.0083	0.9534

Table 3. Spearman Rank Order Correlation Coefficients Between Discount Rates and BIS-11 Items.