The Ultimatum Game and Expected Utility Maximization-In View of Attachment Theory

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ABSTRACT

In this paper we import a mainstream psycholgical theory, known as attachment theory, into economics and show the implications of this theory for economic behavior by individuals in the ultimatum bargaining game. Attachment theory examines the psychological tendency to seek proximity to another person, to feel secure when that person is present, and to feel anxious when that person is absent. An individual's attachment style can be classified along two-dimensional axes, one representing attachment "avoidance" and one representing attachment "anxiety". Avoidant people generally feel discomfort when being close to others, have trouble trusting people and distance themselves from intimate or revealing situations. Anxious people have a fear of abandonment and of not being loved. Utilizing attachment theory, we evaluate the connection between attachment types and economic decision making, and find that in an Ultimatum Game both proposers' and responders' behavior can be explained by their attachment styles, as explained by the theory. We believe this theory has implications for economic behavior in different settings, such as negotiations, in general, and more specifically, may help explain behavior, and perhaps even anomalies, in other experimental settings.

Introduction

In this paper we import a mainstream psycholgical theory, known as attachment theory, into economics and show the implications of this theory for economic behavior by individuals in certain settings. We test these implications by appealing to the much researched Ultimatum Game, and demonstrate the ability of the theory to help explain some of the differing behavior across individuals in this game.

Attachment theory is meant to describe and explain people's enduring patterns of relationships from birth to death. This domain overlaps considerably with that of Interpersonal Theory. Because attachment is thought to have an evolutionary basis, attachment theory is also related to Evolutionary Psychology. Bowlby (1969), who first applied this idea to the infant-caregiver bond, was inspired by studies from ethology. Ethology is concerned with the adaptive or survival value of behavior and its evolutionary history. It was first applied to research on children in the 1960s, but has become more influential in recent years. Bowlby created an alternative to psychoanalytic theory, one much more solidly grounded in primate ethology, cognitive developmental psychology, and clinical research. Basically, attachment theory is a theory of personality and social behavior.

Today, because of this auspicious theoretical and psychometric foundation, attachment theory has spawned a large and complex literature comprising thousands of empirical studies, a literature that continues to reflect Bowlby's psychoanalytic origins. As a personality theory, attachment theory combines psychoanalytic, evolutionary, developmental, social-cognitive, and trait-like constructs in a systematic framework that transcends the usual typologies of personality theories. Still, the subheadings used in textbooks that systematically compare personality theories – structure, motivation, dynamics, individual differences, development, and mental health or optimal adjustment – are useful in organizing and explaining attachment theory and its research literature.

The paper is organized as follows. The next section reviews attachment theory as developed in the psychology literature. Section 2 presents a short exposition of the Ultimatum Game and presents some literature on how personal traits affect behavior in the Ultimatum Game. Section 3 provides the experimental design and the hypotheses. Section 4 contains the results and the analyses. A brief summary and discussion can be found in Section 5.

1. Introduction to Attachment Theory

Attachment theory was first suggested by Bowlby (1969, 1973, 1980, 1988) to help explain the emotional connection that is formed between infants and their caregivers. This connection, called attachment style, is credited with assisting the infant's survival during times of stress or threat. Different modes of communication evolve over time to assist in creating this attachment system. According to Bowlby, the attachment system is activated through the answer to the following fundamental question: Is the attachment figure nearby, accessible and attentive? If the child perceives the answer to this question to be "yes," he or she feels loved, secure, and confident, and, behaviorally, is likely to explore his or her environment, play with others, and be sociable. If, however, the child perceives the answer to this question to be "no," the child experiences anxiety, and, behaviorally, is likely to exhibit attachment behaviors ranging from simple visual search to active search expressed by crawling and crying in an attempt to find the attachment figure.

Although Bowlby believed that the basic dynamics described above captured the normative dynamics of the attachment behavioral system, he recognized that there were individual differences in the way children appraised the accessibility of the attachment figure and how they regulated their attachment behavior in response to a threat. However, it wasn't until his colleague, Mary Ainsworth, began to systematically study infant-parent separations that a formal understanding of these individual differences came to fruition. Ainsworth and her students developed a technique called "the stranger situation." In this technique, 12-month-old infants and their parents were brought to the laboratory and were systematically separated (and replaced by a stranger) and reunited. In "the stranger situation," most children (about 60%) behaved in accordance with Bowlby's "normative" theory. They became upset when the parent left the room, but when he or she returned, they actively sought the parent and were easily comforted by him or her. Children who exhibit this pattern of behavior are often called secure. Other children (about 20% or less) are uncomfortable initially (perhaps because of the new surroundings), and, upon separation, become extremely distressed. When reunited with their parents, these children often exhibit conflicting behaviors that suggest that on the one hand they want to be comforted, but on the other hand, they also want to "punish" the parent for

leaving. These children are often called anxious-ambivalent. The third pattern of attachment that Ainsworth and her colleagues documented is called avoidant. Avoidant children (about 20%) don't appear too distressed by the separation, and, upon reunion, avoid seeking contact with their parent, sometimes even turning their attention to play-objects on the floor.

To sum up, at least three types of children exist: those who are secure in their relationship with their parents, those who are anxious-ambivalent, and those who are avoidant.[1] These individual differences are correlated with infant-parent interactions in the home during the first year of life. Children who appear secure in the "stranger situation," for example, tend to have parents who are responsive to their needs. Children who appear insecure in the stranger situation often have parents who are insensitive to their needs or inconsistent or rejecting in the care they provide.

Although Bowlby primarily focused on understanding the nature of the infant-caregiver relationship, he believed that attachment characterizes human experience in all stages of life. Attachment styles in adults are thought to stem directly from the working models (or mental models) of the self and other, which were developed during infancy and childhood. The dynamics of the attachment system develop during a life span by social interactions with attachment figures, eventually resulting in fairly stable individual differences in mental representations of past attachment experiences (Fraley and Shaver, 2000).

Hazan and Shaver (1987, 1994) were two of the first researchers to explore Bowlby's ideas in the context of adult romantic relationships. According to Hazan and Shaver, the emotional bond that develops between adult romantic partners is partly a function of the attachment behavioral system that gives rise to the emotional bond between infants and their caregivers. They argue that attachment theory provides not only a framework for understanding emotional reactions in infants, but also a framework for understanding love, loneliness, and social interactions in adults. On the basis of these parallels, Hazan and Shaver argue that during adolescence, a new way of approaching attachment is formed. This new form of attachment is predictive of attachment

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[1] In several studies, it was noted that many infants did not fall into any of the original three categories previously described. A fourth attachment pattern has been proposed in order to describe infants who displayed a pronounced mixture of ambivalent and avoidant patterns of behavior. This style is the "disorganized" attachment style.

behavior in future life, such as with one's own kids or in marital relationships. It has to be remembered though, that the relationship between parents and children does not become less important during adolescence; the adolescent just becomes less dependent on the parents.

Hazan and Shaver (1987) designed a self report questionnaire composed of questions relating to interpersonal beliefs and expectations from attachment figures. Respondants were asked to choose which interpersonal expectation best fit their own interpersonal relationships. The "secure" person was described as someone who develops close relationships relatively easily, is comfortable with the mutual dependence that accompanies such a relationship, is not anxious about separation or abandonment and tends to be more satisfied in his relationships than insecure adults. The "avoidant" person was described as someone who feels discomfort when close to someone, has trouble trusting that person, and has a feeling that others have more interesting and intimate relationships than he has. The "anxious-ambivalent" person was described as someone with fears of abandonment or of not being loved, while at the same time having an urge to develop a tight relationship with their significant other.

Initially, adult attachment research was based on Ainsworth *et al.*'s (1978) three category typology of attachment styles in infancy – secure, anxious and avoidant – and Hazan and Shaver's (1987) conceptualization of similar adult styles in the domain of romantic relationships. Subsequent studies (e.g., Bartholomew and Horowitz, 1991; Brennan *et al.*, 1998) indicated that attachment styles are more appropriately conceptualized as regions in a continuous two-dimensional space (Figure 1).

One dimension has been labeled *attachment anxiety*. People who score high in this dimension tend to worry whether their partner is available, responsive and attentive. People who score in the low range of this dimension are more secure in the responsiveness of their partners. The other dimension is called *attachment avoidance*. People on the high end of this dimension prefer not to rely on others or open up to others. They strive to maintain behavioral independence and emotional distance from partners. People on the low end of this dimension are more comfortable being intimate with others and are more secure depending upon others and being depended upon. A prototypical secure adult is low on both of these dimensions.

These dimensions create a space within which an individual's attachment tendency can be represented. In the *secure* region both anxiety and avoidance are low. In the *preoccupied* region (referred to later on as the "anxious" region) anxiety is high and avoidance is low. In the *avoidance* region, obviously, avoidance is high.

The use of attachment theory allows us to define a different framework for understanding certain aspects of individual behavior. In this paper we use attachment theory to examine the connection between attachment types and economic decision making in the Ultimatum Game.

2. The Ultimatum Game

The Ultimatum Game is one of the most extensively studied games in experimental labs. This is a two-player bargaining game: the first player (the proposer) makes a proposal of how to divide a certain sum of money with another player, who has the option to accept or reject the proposed division. If the second player (the responder) accepts the offer, each player gets his agreed share of the pie. If the responder rejects the offer, each player earns zero.

In this paper, we use attachment theory to tackle the questions of why proposers offer high shares of their endowment and why responders reject a substantial proportion of the offers. The Ultimatum Game naturally involves situations of negative and positive reciprocity, and of certainty and uncertainty, all crucial variables in attachment theory. In much of the literature, the behavior of subjects in the Ultimatum Game is partially explained by social preferences or other regarding behavior. In this work, we extend this trend, and show that an individual's attachment style can be instructive in understanding his behavior in the Ultimatum Game.

Classifying the players according to their attachment types, we find that insecure types react in different ways to the game. As proposers, anxiously attached individuals send a high proportion of their endowment, while avoidant individuals send a low proportion, i.e., we find a positive correlation between offer and anxiety, and a negative correlation between avoidance and offer. Analyzing the behavior of the responders, we found a positive correlation between anxiety and the acceptance rate, and a negative, but not statistically significant, relationship between avoidance and the acceptance rate.

2.1 Relevant Literature Review

The Ultimatum Game was initially presented in Güth *et al*. (1982). Assuming players' utility is monotonically increasing in their monetary payoffs and that they care about their own payoffs and not those of their opponents, game theory predicts that proposers should offer zero or the smallest non-zero amount possible, and responders should accept (if the offer is zero, the responder should be indifferent between accepting and rejecting). The data are inconsistent with both of these predictions; proposers tend to offer amounts higher than the minimum, and responders tend to reject if offered a relatively small share. In their experiment, Güth *et al*. (1982) find that for both experienced and inexperienced players the mean offer was about 37% of the "pie," which is significantly more than the epsilon predicted by the subgame perfect equilibrium, and low offers were often rejected. In the replication, after a week to think about it, first players' offers decreased (the mean offer was 32%), but still were significantly higher than epsilon. As a result, there was an even higher rate of rejection by the responders, (but higher payoffs to the proposers whose low offers were accepted by responders). While for proposers such behavior can be "rationally" justified (since they have to consider "irrational" behavior on the part of responders), for responders justification within the strict confines of standard economic theory is more elusive.

These results have since been replicated in many different settings and with various nuances, and various explanations for the findings have been given. Many authors altered the precise setting, and demonstrated how different setups can affect the results, but the basic results have been shown to be quite resilient to structural changes. These early studies differentiated between different experimental designs, but not between people.

In a pioneering study, Roth *et al*. (1991) suggested that cultural differences could affect the way in which the game is played, and proceeded to run the Ultimatum Game in Jerusalem, Ljubljana, Pittsburgh, and Tokyo, being careful to keep things as similar as possible in all locations. They show that the distribution of offers was significantly different in different countries. In the U.S. and Slovenia, the modal offer in the tenth round remained 500 tokens (50%), as in the first round. In Japan, the most

frequent offers at the tenth round were between 400 tokens and 450 tokens. In Israel, they were 400 tokens. Henrich *et al.* (2001) conducted the experiment in small communities in 15 developing countries, and found even more variation in behavior, however, the variation was according to societal characteristics, e.g., the degree of market integration or cooperation, and not according to measurable individual socio-economic characteristics. Oosterbeek et al. (2004) conducted a meta-analysis of 37 papers covering ultimatum experiments in 25 different countries, and used measures of cultural traits to explain the differences across countries. These studies demonstrated convincingly that one should not expect identical behavior from people with different cultures. They did not, however, differentiate between people with the same culture.

Eckel and Grossman (2001) were the first to investigate whether gender affects play in this game. They found that women offer slightly more than men on average although the differences were only marginally significant, and are significantly more likely to accept unequal splits. An additional important finding is that women are *perceived* to be more egalitarian than men. For a survey of research on gender differences and consequences of the perceived differences, see Eckel *et al.* (2008).

More in line with our research, Meyer (1992) and Carpenter *et al.* (2005) included a personality scale known as the Mach (Machiavelli) Scale as an explanatory variable in the Ultimatum Game. Construction of the Mach Scale is accomplished by posing 20 statements with which the subject is asked to agree or disagree on a seven-point scale. The Mach Scale is meant to capture a person's level of cynicism about others, willingness to engage in manipulative behavior and concern about morality. Meyer (1992) found that those with high Machs are less likely to reject low offers. Carpenter *et al.* (2005) found no evidence that the Mach Score has an effect on offers (although it does have an effect on offers in the Dictator Game).

Brandstätter and Königstein (2001) examined individual differences in behavior within an ultimatum game. The authors found that personality measures contribute significantly to understanding decisions. High scores on independence and tough-mindedness are positively correlated with proposer demands. For responders, people who are either emotionally unstable and extraverted or emotionally stable and introverted reject more often, which is interpreted as an act of angry retaliation (negative reciprocity).

Swope *et al*. (2008) classify people by a psychological preference measure known as MBTI (Myers-Briggs Type Indicator), and derive testable hypotheses with respect to behavior in four experiments including the Ultimatum Game. They are unable to test the effect on rejection rates (there were only 4 rejections in 47 observations), but they do find an effect of certain traits on offers. Specifically, they show that people who are both extroverts and feeling (as opposed to thinking) types make higher offers.

3. Experimental Design and Hypotheses

We ran a standard Ultimatum Game experiment consisting of 4 sessions of 10 periods each, conducted in a computer laboratory in Bar-Ilan University. Eighty four undergraduate economics students participated, with each session lasting about 45 minutes. Before the beginning of the session subjects were given the instructions of the game, and asked to fill out a questionnaire that verified that they understood the instructions. Subjects' roles (proposer or responder) were determined randomly before the first round of play and remained constant through all rounds. Players were matched randomly and then rematched randomly after each round in order to preserve the one-shot property of the Ultimatum Game. All participants received a 20 NIS (New Israeli Shekels, approximately $5, close to the hourly minimum wage) show-up fee and, in addition, the proposers received 50 NIS which they could allocate as they saw fit between them and the responders. After each round of play, subjects were informed of the outcome. Subjects were given record sheets on which they could record their outcomes. At the end of the experiment, one of the rounds was chosen randomly, and the payment to the subjects was determined based on their performance in this round. While the payoffs were calculated and prepared (paid in cash), the subjects filled out an ECR questionnaire, a 36-item self report attachment measure developed by Brennan *et al*. (replicated in the Appendix). The levels of avoidance and anxiety were measured from this questionnaire; avoidance is calculated as the average of the answers to the odd-numbered questions on the ECR questionnaire, and anxiety is measured as the average of the answers to the even questions on the ECR questionnaire.[2]

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[2] Professor Mikulincer has notified us that based on thousands of questionnaires he has reviewed, the average levels of anxiety and avoidance in the population are approximately 3.

Participating in the Ultimatum bargaining game is a stressful task. The proposer faces uncertainty: will his offer be accepted? What offer will yield the highest (expected) payoff? The responder faces ex-ante (but not ex-post) uncertainty as well, since he does not know what the allocated sum will be. Those feelings of uncertainty, combined with the interaction with another (anonymous) player, can lead to individual differences through attachment styles. The hypotheses we will be testing are:

Hypothesis 1: Attachment anxiety positively correlates with offers on the proposer's side.

Hypothesis 2: Attachment anxiety positively correlates with the acceptance of lower offers on the responder's side.

Explanation of Hypotheses 1 and 2: Anxious individuals strive to fully merge with their attachment figure, need constant reassurance of their good behavior (appreciation) and long for approval from their surroundings, all of which diverts their attention from the goals of fairness, punishment or utility maximization. Therefore, a proposer who scores high on the attachment anxiety scale is expected to offer higher shares in order to get appreciation from the responder. The anxiously attached responder is expected to accept very low offers, so that the proposer will appreciate his cooperation.

Hypothesis 3: Attachment avoidance negatively correlates with offers on the proposer's side.

Hypothesis 4: Attachment avoidance negatively correlates with the acceptance of lower offers on the responder's side.

Explanation of Hypotheses 3 and 4: Individuals who score high on attachment avoidance activate distancing and self-reliance strategies. The main purpose of these subjects is not to activate their attachment system in order not to feel that they are being exploited and used, feelings that lead to frustration. High offers create dependency on the behavior of the responder that may bear an emotional toll in case of a rejection. Avoidant individuals perceive rejection of high offers as a rejection of

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themselves. In contrast, low offers do not put the proposer in such a vulnerable position, because they can explain the rejection as resulting from the low offer. By making low offers, they protect themselves from getting hurt. They activate distancing strategies in order to prevent a situation where they are dependent on someone else, the Ultimatum Game being a good example. Proposers who scored high on attachment avoidance are expected to offer lower shares of the total amount: higher shares might make them feel gullible and exposed to interactions with the responder. Responders who score high on attachment avoidance are expected to reject higher offers, again in order not to feel gullible.

It is important to stress that the anonymous setting works against us finding the stated effects. Attachment theory deals with situations in which people are in close contact with one another. We are extending the theory to include situations of anonymity, and we fully expect that any findings would be strengthened in a non-anonymous setting.

4. Results

4.1. Non-Parametric Tests

We first present the results in general and then test the relevance of attachment type for behavior.

Figure 2
Distribution of offered amounts.
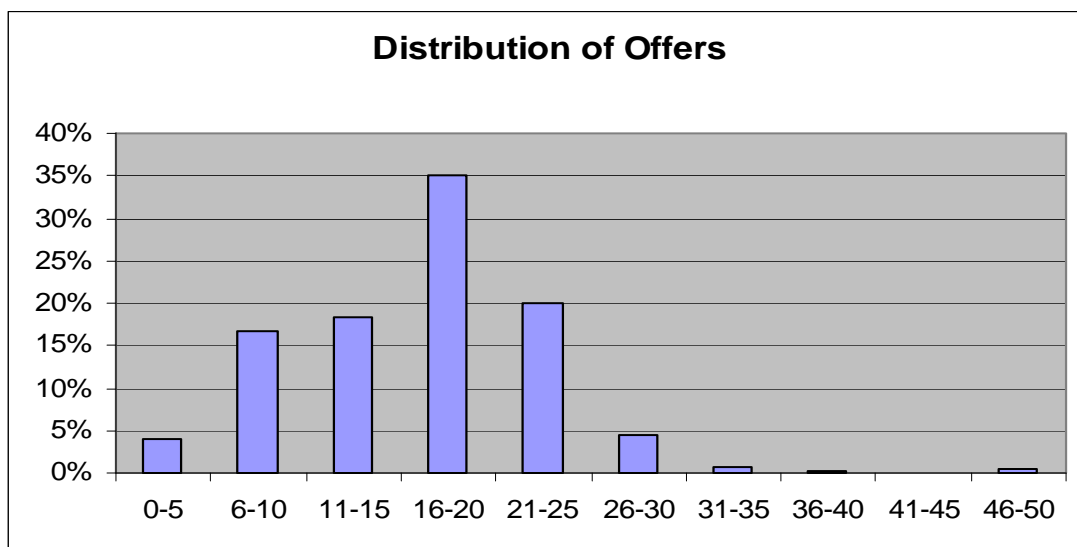
Figure 2 depicts the probability distribution of offers throughout all rounds of the experiment. As can be seen, the modal offer was between 16 and 20, and, in fact, almost a quarter (103/420) of all offers was exactly 20 (as opposed to only 14% who offered an equal split). Twenty is also the median, whereas the mean offer is lower (18). This finding is in line with the result in Roth, *et al*. who found that in Israel the modal offer was 40% of the pie (as opposed to 50% in the US and Yugoslavia and 40-45% in Japan).

Figure 3
Rejection rates as a function of the offered amount
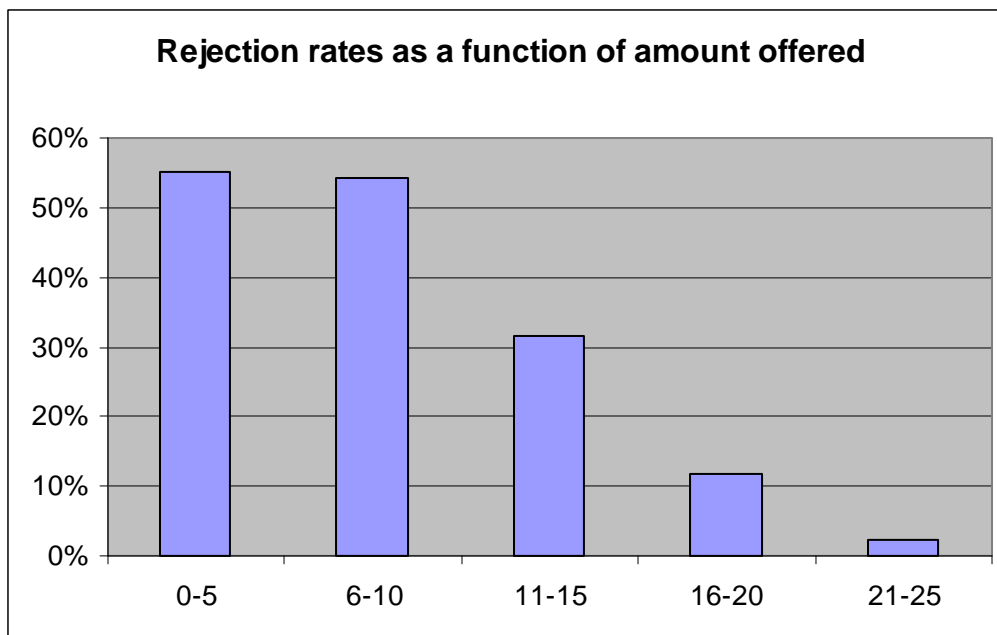
Figure 3 shows the rejection rates as a function of the offer. The rejection rate decreases sharply when offers are higher than 10 (20% of the initial endowment), and almost all offers bigger than 20 (40% of the initial endowment) are accepted. No offer of more than an even split was rejected.

Referring back to Figure 1, it is appealing (but problematic, as explained below) to divide subjects along each of the axes separately – according to avoidance and according to anxiety. To this end, we divide the population (first proposers, then responders) into two equal sized groups – those whose index place them below the median and those who are above the median – first for anxiety and then for avoidance. Of course, there is nothing particularly relevant about the median – Bowlby's theory says that there are different attachment styles, but does not say where to draw the line, and does not predict an equal number of people in each group.

Figure 4
Offers according to Anxiety level.
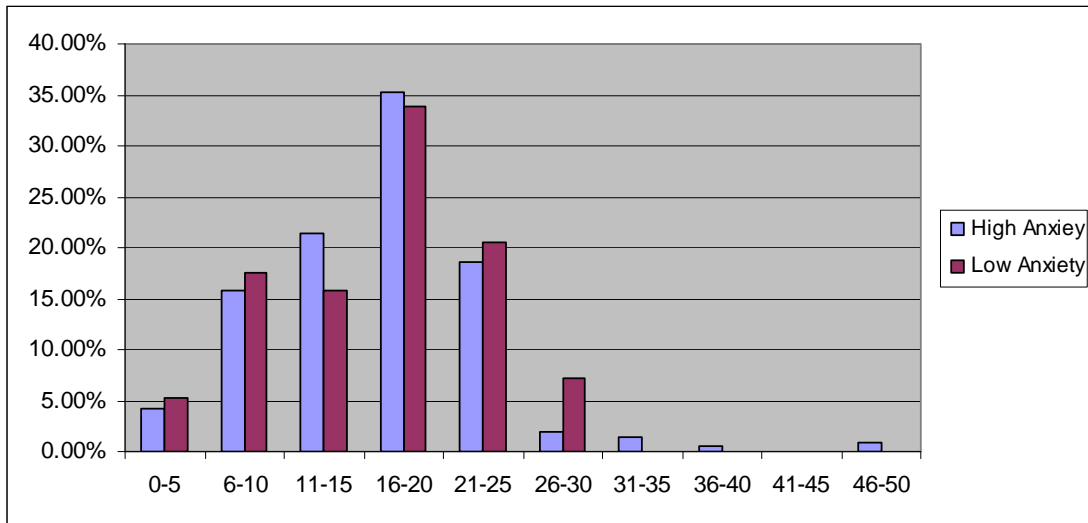
Figure 5
Rejection rates according to Anxiety level.
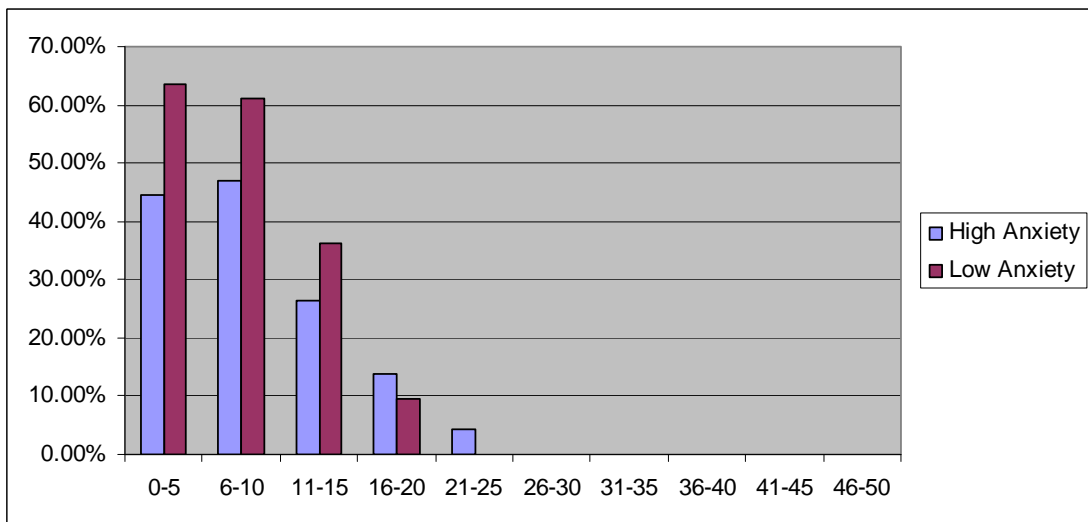
Behavior of proposers are presented in Figure 4 and rejection rates for responders are presented in Figure 5. A Mann-Whitney test and an Epps-Singleton test both show that there is no discernable difference (Hypothesis 1) between high anxiety and low anxiety proposers. Responder behavior (Hypothesis 2) is more difficult to assess since the offers faced by the individuals are not identical. Nevertheless, we see high anxiety people accepting lower offers, although the difference may not be significant. All told, low anxiety people rejected 52 of 210 proposals, and high anxiety individuals rejected "only" 41 of the 210 proposals.

Figure 6
Offers according to Avoidance level.
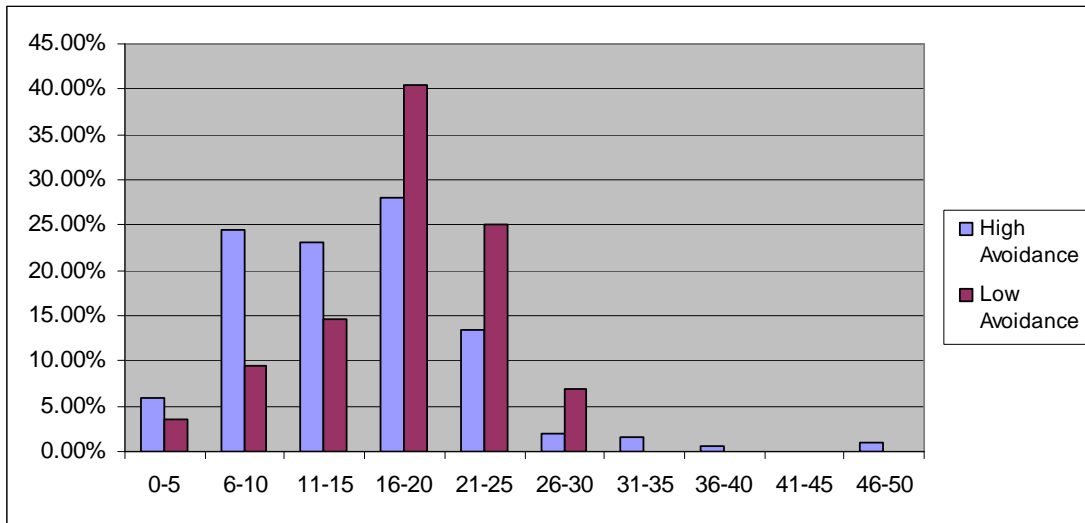
Figure 7
Rejection rates according to Avoidance level.
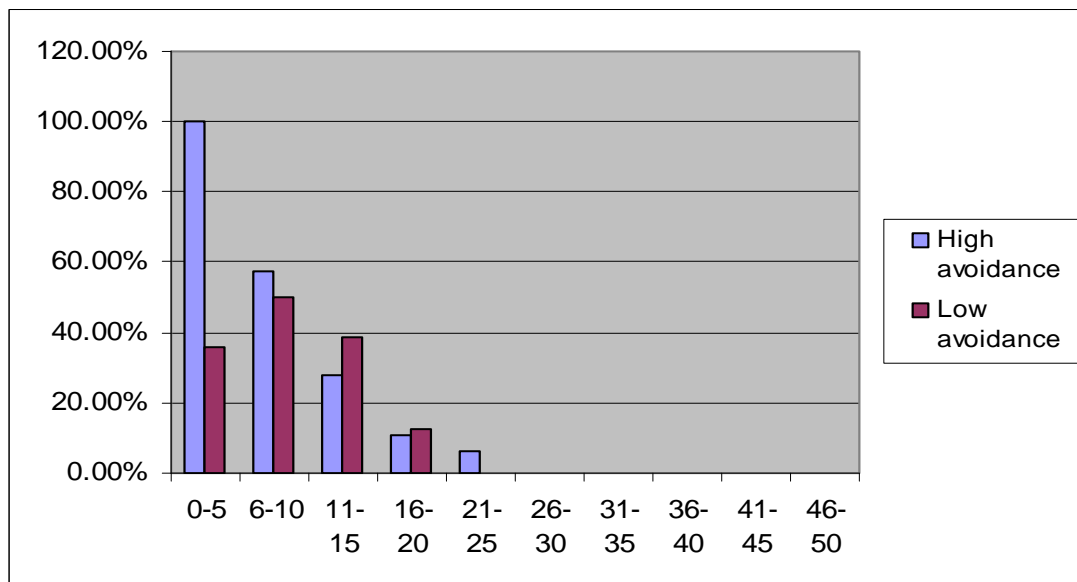
With respect to avoidance levels (Figures 6 and 7), The Mann-Whitney test and Epps-Singleton test show that proposer behavior is significantly different ($p<0.0001$). As to responder behavior, the difficulty of comparing remains. With respect to the number of rejections 57 of 210 proposals are rejected for high avoidance people and only 36 of 210 for low avoidance people. However, looking at the offers accepted shows a more extreme picture. Low avoidance individuals accepted very low offers (an offer of 0, an offer of 1, 7 out of 9 offers of 5 and both offers of 8), while high avoidance responders rejected all offers below 8, and accepted only 2 of 3 offers of 8. As the

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theory predicts, high avoidance individuals make low offers (Hypothesis 3) and are more likely to reject low offers (Hypothesis 4).

The problem with these tests is that they are one-dimensional; they do not take into account that the fundamental nature of attachment theory is two-dimensional. In fact, looking at avoidance or anxiety alone can be misleading, since someone may easily have any combination of high/low avoidance and high/low anxiety, as depicted in Figure 1. In our experiment, for instance, the correlation between anxiety and avoidance among our 84 participants was only 0.11. Thus, we want to strengthen our comparison by considering those who are relatively low in anxiety but high in avoidance (whom we label dismissing avoidant) and are thus expected to give little and reject much, with those who are relatively high in anxiety but low in avoidance (whom we label preoccupied), from whom we expect the diametric opposite. For this comparison we retained only those who were above the median for one and below the median for the other, and discarded all those who were either above the median in both or below the median in both.

Figure 8
Offers according to attachment type
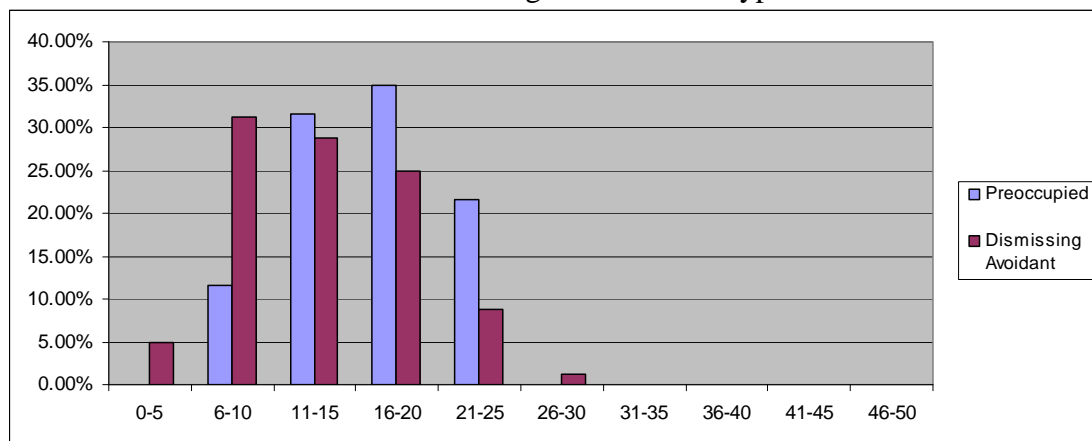
Figure 8 shows the results for the six proposers who are preoccupied and the eight who are dismissing avoidant (see Figure 1). The other 29 proposers were either fearful avoidant or secure types. A Mann-Whitney test and an Epps Singleton test both clearly show that these individuals play differently ($p<0.0001$), as predicted by the theory.

Figure 9
Rejection rates according to attachment type.
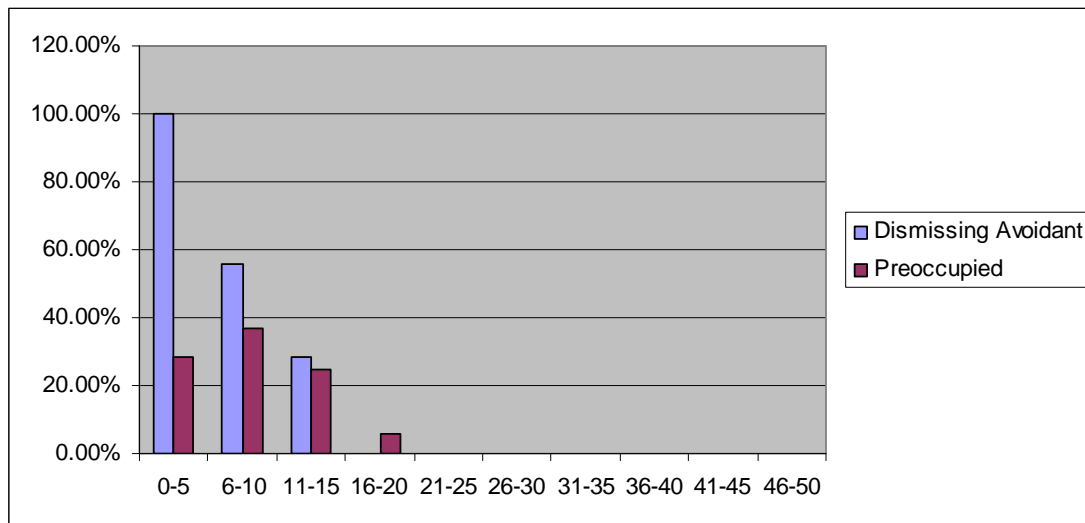
Among the responders there were ten preoccupied individuals and ten who were dismissing avoidant. As seen in Figure 9, the dismissing avoidant individuals were far more likely to reject low offers than were the preoccupied ones. In fact, of the 100 offers in each group, there were 24 rejections in the first group and only 13 in the second.

4.2. Regression Analysis

Since there are two dimensions to attachment theory, it becomes natural to use regression analysis to separate the effects and test for their significance. To this extent, we ran OLS regressions to examine proposer behavior, and Logit regressions to examine responder behavior. The central explanatory variables are Anxiety and Avoidance, both continuous variables between 1 and 7.

The fact that we have ten rounds of data for each individual raises some econometric issues. Since our explanatory variables include individual specific measures, we cannot use fixed effect or random effect variables to capture any missing variables at the individual level, since these variables would be perfectly correlated with the explanatory variables. Running a regression including all the data therefore leads to a situation in which observations are not independent.

This issue is discussed at length in Botelho, *et al.* (2005), where a number of solutions are suggested which we adopt. First, we assume simply that there are no missing

explanatory variables and thus no problem, and use all the data in our regression. For proposers, for whom the measures of anxiety and avoidance are the <u>only</u> explanatory variables, this yields the same point estimates (but smaller standard errors) as using the average offer (this will not be true for responders, as presented below), and we therefore do not present this regression. Instead, we present the regression in which we use all the data and include fixed effects for each round rather than for each individual. This is appropriate if there is some type of round effect, such as learning. We also present the results of running the regression with a single observation per individual. We present the results when we use both the average proposal, and the results in the first round. In this manner observations are independent, but many data points are lost (90%). Finally, we run a Generalized Estimating Equation (GEE), which estimates the effects of variables that have no intra-panel variation, and uses population-averaged estimation methods.[3]

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[3] Additional issues arise from the fact that the dependent variable can only take on certain values. Specifically, the proposal could only be in whole Shekels, and was limited to values between 0 and 50. Because the number of possibilities is so great, it is unlikely that this had an affect. To test whether this was indeed so, we ran interval censored regressions and Tobit regressions. As expected, the qualitative results did not change.

Table 1
Offers by Proposer

	OLS			GEE
	All Rounds	Average	First Round	
Constant	20.51*** (2.20)	19.63*** (4.47)	13.69* (6.91)	19.74*** (4.29)
Anxiety	1.57*** (0.36)	1.57* (0.80)	3.36** (1.24)	1.56** (0.77)
Avoidance	-2.27*** (0.47)	-2.27** (1.07)	-2.28 (1.65)	-2.30** (1.02)
Second Round	-1.93 (1.41)			
Third Round	-1.26 (1.41)			
Fourth Round	-1.14 (1.41)			
Fifth Round	-0.60 (1.41)			
Sixth Round	-0.95 (1.41)			
Seventh Round	-0.86 (1.41)			
Eighth Round	0 (1.41)			
Ninth Round	0.05 (1.41)			
Tenth round	-2.07 (1.41)			
N	420	42	42	420
R^2	0.093	0.156	0.174	

Standard errors are in parentheses.
*Significantly different from 0 at the 10% level.
**Significantly different from 0 at the 5% level.
***Significantly different from 0 at the 1% level.

The results for proposers are presented in Table 1, and are quite similar across specifications. The size of the offer by the proposer is greater the more anxious and less avoidant he is. This result is consistent with the Hypotheses 1 and 3 above. Note that using the average offer must yield the same coefficients for anxiety and avoidance as running the regression on all the data with fixed effects. We include both simply because the standard errors differ. With respect to the fixed effects, the category left out was the first round. None of the fixed effects were significantly different from zero (i.e., no round was significantly different from round 1), though they are almost all negative, and, in fact, the average offer in the first round was higher than in most other rounds. It is interesting to note that the coefficient on

avoidance is not significant in the first period, although the point estimate is almost exactly the same as in later rounds.

When considering the behavior of responders, an additional coefficient is required – the amount offered. Because of this we cannot use an average over all rounds, and we are still unable to include specific or random effects into the model for the reason raised above. In addition, there is little to be learned from looking at the first round alone since there were only three rejections in the first round (an offer of 5 and two offers of 10). We do include specific effects for round number. Since the dependent variable is binary (accept=1, reject=0), we use a logit regression specification. The results are presented in Table 2.

Table 2
Responder Behavior

	Without Round Dummies	With Round Dummies
Constant	-2.76*** (0.93)	-1.19 (1.1)
Anxiety	0.27** (0.12)	0.3** (0.13)
Avoidance	-0.12 (0.19)	-0.13 (0.19)
Offer	0.21*** (0.02)	0.23*** (0.02)
Second Round		-1.14 (0.85)
Third Round		-2.38** (0.82)
Fourth Round		-2.93*** (0.82)
Fifth Round		-2.19*** (0.82)
Sixth Round		-1.78** (0.84)
Seventh Round		-1.85** (0.84)
Eight Round		-1.75** (0.85)
Ninth Round		-1.59* (0.87)
Tenth round		-1.56* (0.83)
N	420	42
Log likelihood	169.84	158.7
Pseudo R^2	0.23	0.28

Standard errors are in parentheses.
*Significantly different from 0 at the 10% level.
**Significantly different from 0 at the 5% level.
***Significantly different from 0 at the 1% level.

Naturally, the most important explanatory variable is the amount offered – the more offered the higher the probability of acceptance. As per Hypothesis 2, higher anxiety individuals are more ready to accept low offers. Hypothesis 4, however, is not supported by the data; while the coefficient is of the right sign, it is not significantly different from 0. Interestingly, all of the round coefficients are negative and almost all are significant, i.e., the likelihood of rejection in the first round was higher than in later rounds. This seems to stem from two factors – first, as stated above, offers were higher in the first period than in later periods. Second, some very low bids were

accepted in the first period but rejected later on (an offer of 0, two offers of 5 and four offers of 10 were all accepted in period 1).

4.3. Attachment Style and Optimal Proposals

As shown in Roth, *et al*. (1991), given the behavior of responders, the optimal offer by proposers (the offer that maximizes the expected return) is well above zero, and, in fact, proposers (on average) behave optimally. In this section we will show that optimal proposer behavior depends on whom you are facing, and that if you know the attachment type of the person with whom you are dealing you can benefit by taking this information into account. This type of information could be quite useful in, say, negotiations (see, for instance, Eckel and Grossman, 2001).

Following Roth *et al.* (1991), we examined what offers maximize the expected return for the proposers according to attachment type. To this end, we use the first specification in Table 2 to calculate the expected acceptance rate from each offer for each group as a function of the levels of anxiety and avoidance, and multiply this by the amount retained by the proposer to calculate the expected return from an offer. We then show how this expected return is affected by attachment type.

Figure 10
Expected Income – Extreme Values
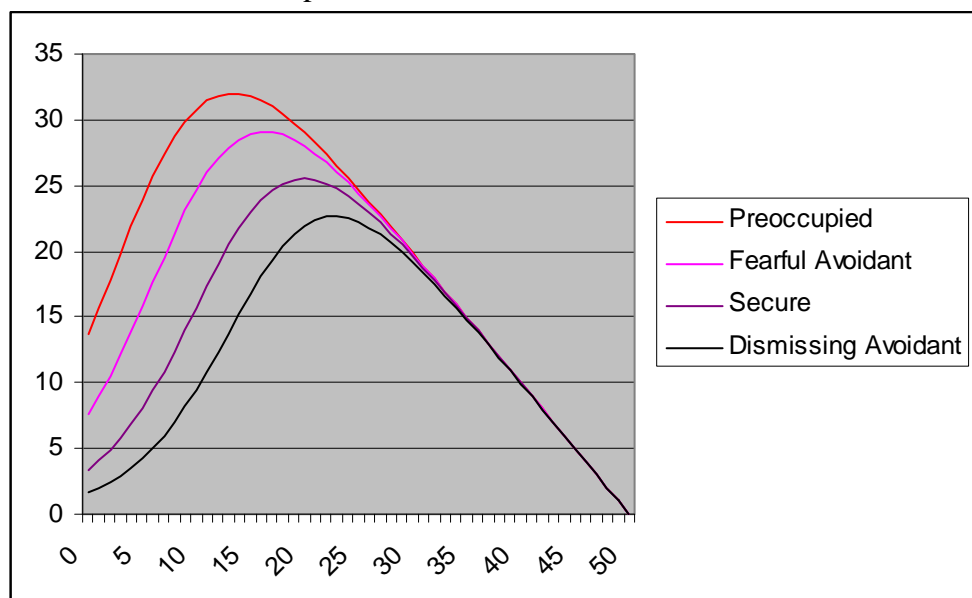
In Figure 10 we take this comparison to the extreme by comparing persons with anxiety levels of 1 and 7 and attachment levels of 1 and 7. The results are shown in Figure 10. As seen, the optimal offer depends on whom you are facing. The top half of Table 3 presents the optimal offers and the expected income from that offer.

Table 3
Proposer's Profit Maximizing Offers and Expected Income by Type of Responder

Type	Anxiety Level	Avoidance Level	Optimal Offer (out of 50)	Expected Income
Extreme Preoccupied	7	1	13.37	32.03
Extreme Fearful Avoidant	7	7	16.32	29.08
Extreme Secure	1	1	19.89	25.52
Extreme Dismissing Avoidant	1	7	22.74	22.67
Average Preoccupied	4.84	2.89	16.67	28.74
Average Fearful Avoidant	4.49	3.99	17.58	27.83
Average Secure	2.97	2.84	18.66	26.74
Average Dismissing Avoidant	3.13	4.03	19.07	26.34

As can be seen in the graph and in the table, the attachment type of the responder can have a very substantial effect on optimal behavior and on the expected outcome. To take the extreme cases, when facing an extreme preoccupied individual it is best to offer only 13.37 NIS out of the 50 NIS allocated for division and one should expect an income of 32.03 NIS, while if facing an extreme dismissing avoidant individual the optimal offer is 22.74 and the expected income is 22.67. Obviously one should be careful about taking this comparison to the extreme for two reasons: first, there are probably very few people whose behavior is that extreme, and second, because of the logit equation, there is a positive probability of rejecting even very generous offers. It is interesting to note that the expected income from bargains with the extreme dismissing avoidant individual is below 50% of the pie!

Figure 11
Expected Income – Subject Averages
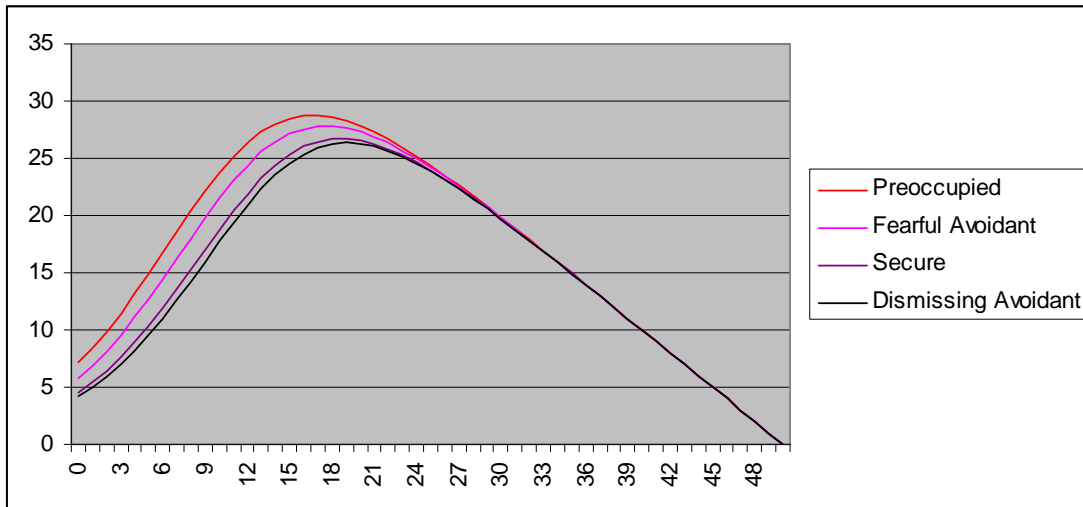
In Figure 11 we do a similar comparison for our population (see also the bottom half of Table 3), where, as before, we divide the subjects into four groups – above and below each of the medians of anxiety and avoidance. We use the average levels of anxiety and avoidance in each of the groups to again calculate the optimal offers and the expected incomes, and find that the order is unchanged, but the differences are significantly reduced when compared with extreme values. As discussed above, the groups we take are not indicative of Bowlby's actual categorization; but, it does allow comparison between different segments of our subject base.

5. Discussion

In this paper we considered the effect of the attachment style on individual economic behavior in the context of the Ultimatum Game. A number of significant effects of attachment style on behavior were uncovered.

We found that if the proposers are anxiously attached, they offer higher shares of their endowment. As established by the psychological literature, the main goal of anxiously attached individuals is to get proximity and to be loved and appreciated. Therefore, as expected, anxiously attached proposers offer high shares to responders. In addition since the desire of anxiously attached individuals is to be loved and appreciated, they are very sensitive to "anti-goal" states (a situation that creates distress, such as being abandoned by a loved one). Since the game contains uncertainty, that is, the proposer does not know whether his offer will be accepted or not, they will offer high shares of

their endowment in order to avoid an anti-goal state of a rejection of their offer. As for anxiously attached responders, they show a tendency to accept more offers, again, in order to be appreciated.

As for avoidant players, as proposers their offers were low, as expected. The main purpose of subjects who score high in avoidance is not to activate their attachment system in order not to feel that they are being exploited and used, feelings that lead to frustration. High offers create dependency on the behavior of the responder that may bear an emotional toll in case of a rejection. Avoidant individuals perceive rejection of high offers as a rejection of themselves. In contrast, low offers do not put the proposer in such a vulnerable position, because they can explain the rejection as resulting from the low offer. By making low offers, they protect themselves from getting hurt. The same is expected of avoidant responders, and while such a direction is observed, it was not found to be statistically significant.

As discussed above, the essence of attachment theory deals with situations in which the parties are in close contact with one another. Thus, the anonymous setting in which Ultimatum Games are carried out works heavily against our hypotheses, and any findings should be viewed as lower bounds on expected effects in real-life settings. Clearly, if correct, our results suggest that knowledge of these behavioral implications could be useful in many strategic settings, particularly when one is able to discern the type of individual with whom one is dealing (as is the case when dealing with someone with whom you are close). We believe that attachment styles can predict behavior in other experimental, as well as real-world, settings. We leave it to future research to see if this is indeed the case.

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Appendix: Experiments in Close Relationships Scale (Brennan et al., 1998; Mikulincer and Florian, 2000)

Experience in Close Relationships Scale (ECR)

The following statements concern how you generally feel in close relationships (e.g., with romantic partners, close friends, or family members). Respond to each statement by indicating how much you agree or disagree with it. Write the number in the space provided, using the following rating scale:

1	2	3	4	5	6	7
Disagree Strongly	*Disagree*	*Disagree Slightly*	*Neutral/ Mixed*	*Agree Slightly*	*Agree*	*Agree Strongly*

____ 1. I prefer not to show others how I feel deep down.

____ 2. I worry about being rejected or abandoned.

____ 3. I am very comfortable being close to other people.

____ 4. I worry a lot about my relationships.

____ 5. Just when someone starts to get close to me I find myself pulling away.

____ 6. I worry that others won't care about me as much as I care about them.

____ 7. I get uncomfortable when someone wants to be very close to me.

____ 8. I worry a fair amount about losing my close relationship partners.

____ 9. I don't feel comfortable opening up to others.

____ 10. I often wish that close relationship partners' feelings for me were as strong as my feelings for them.

____ 11. I want to get close to others, but I keep pulling back.

____ 12. I want to get very close to others, and this sometimes scares them away.

____ 13. I am nervous when another person gets too close to me.

____ 14. I worry about being alone.

____ 15. I feel comfortable sharing my private thoughts and feelings with others.

____ 16. My desire to be very close sometimes scares people away.

____ 17. I try to avoid getting too close to others.

____ 18. I need a lot of reassurance that close relationship partners really care about me.

____ 19. I find it relatively easy to get close to others.

____ 20. Sometimes I feel that I try to force others to show more feeling, more commitment to our relationship than they otherwise would.

____ 21. I find it difficult to allow myself to depend on close relationship partners.

___ 22. I do not often worry about being abandoned.

___ 23. I prefer not to be too close to others.

___ 24. If I can't get a relationship partner to show interest in me, I get upset or angry.

___ 25. I tell my close relationship partners just about everything.

___ 26. I find that my partners don't want to get as close as I would like.

___ 27. I usually discuss my problems and concerns with close others.

___ 28. When I don't have close others around, I feel somewhat anxious and insecure.

___ 29. I feel comfortable depending on others.

___ 30. I get frustrated when my close relationship partners are not around as much as I would like.

___ 31. I don't mind asking close others for comfort, advice, or help.

___ 32. I get frustrated if relationship partners are not available when I need them.

___ 33. It helps to turn to close others in times of need.

___ 34. When other people disapprove of me, I feel really bad about myself.

___ 35. I turn to close relationship partners for many things, including comfort and reassurance.

___ 36. I resent it when my relationship partners spend time away from me.

Figure 1
Two fundamental dimensions with respect to adult attachment patterns.

HIGH AVOIDANCE

**DISMISSING
AVOIDANT**

**FEARFUL
AVOIDANT**

**LOW
ANXIETY**

**HIGH
ANXIETY**

SECURE

PREOCCUPIED

LOW AVOIDANCE
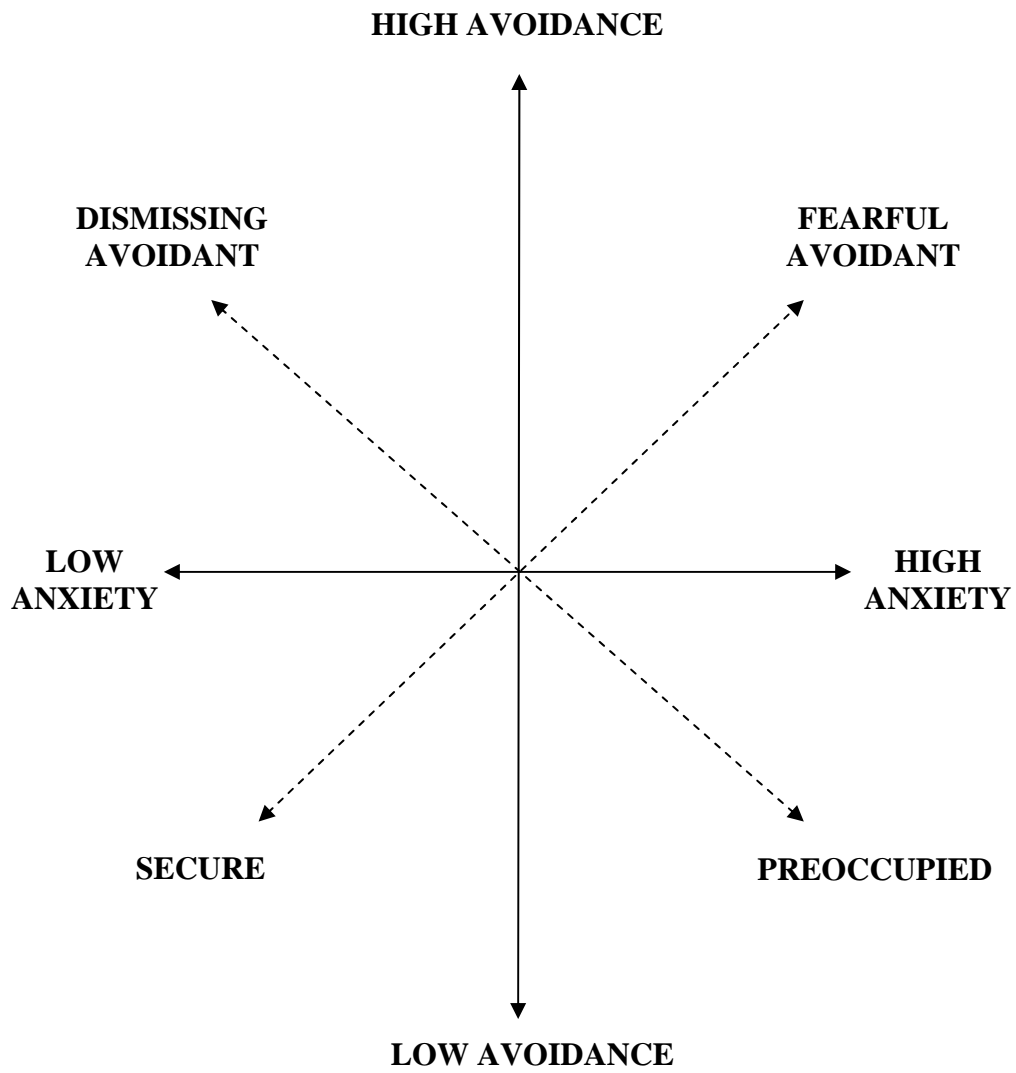
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