Personality Preferences and Pre-Commitment: Behavioral Explanations in Ultimatum Games

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Abstract

This paper uses responder pre-commitment and psychological type, as measured by the Myers-Briggs Type Indicator (MBTI), to gain insight into subject behavior in a laboratory ultimatum bargaining experiment. Three experiment design details are noteworthy: (1) one design requires responders to make a *nonbinding* pre-commitment rejection level prior to seeing the offer, (2) one design requires responders to make a *binding* pre-commitment rejection level, and (3) one design includes a third person (or "hostage") who makes no decision, but whose payment depends on the proposal being accepted. Offers are higher when proposers know that responders make a binding pre-commitment to reject but are not different when a hostage is present. Responders make lower pre-commitments when they are binding and when a hostage is present. Behavior in our experiment is generally consistent with hypotheses based on theoretical underpinnings of the MBTI and its descriptions of psychological type.

1. Introduction

Laboratory economics experiments are useful tools for testing game-theoretic hypotheses. However, games involving interactive behavior between subjects, and non-cooperative games such as bargaining, trust, and prisoner dilemma games in particular, have strong psychological components that cannot be ignored. The inevitable interpersonal nature of these games suggests that attempts to formulate and test game-theoretic hypotheses will benefit from an understanding of the mental processes that affect how subjects approach the decision problems they face. This requires a joint approach using experimental methods and psychological theory to test human economic behavior.

This paper provides such an example by using self-reported responder pre-commitment to reject and information on psychological type, as measured by the widely-used Myers-Briggs Type Indicator (MBTI), to gain insight into subject behavior in a laboratory ultimatum bargaining experiment. The MBTI provides information on three potentially important psychological preferences of subjects participating in an experiment: (1) *perception* – how a person acquires information, (2) *judgment* – how a person makes decisions and comes to conclusions, and (3) *orientation* – the degree to which a person's attention and energy is directed outward or inward. We show that differences between subjects with regard to *judgment* and *orientation* in particular, as measured by the MBTI, lead to significant, predictable, and observable differences in subjects' decisions in our experiment. Our research is the first that we are aware of to employ the MBTI specifically to investigate behavior in the context of a laboratory economics experiment. Using the MBTI and student volunteers from the U.S. Naval Academy also provided a unique opportunity to avoid the uncertain framing effects of

administering a personality test instrument directly either pre or post-experiment because all students completed the MBTI upon entrance to the Academy.

Three experimental design details are noteworthy: (1) one design requires responders to make a *nonbinding* pre-commitment rejection level prior to seeing the offer, (2) one design requires responders to make a *binding* pre-commitment rejection level, and (3) one design includes a third person (or "hostage") who makes no decision, but whose payment depends on the proposal being accepted. The variants with pre-commitment were chosen in order to acquire information from responders beyond that of a simple accept or reject response. The three-player design was chosen to provide a richer experimental environment in which to test the behavioral predictions based on psychological type and are comparable to previous studies using three-player ultimatum games (e.g. Brandstätter and Güth (2002), Kagel and Wolfe (2001), and Fershtman and Gneezy (2001)).

In general, we find behavior in our laboratory experiment to be consistent with hypotheses based on theoretical underpinnings of the MBTI and its descriptions of psychological type. That is, individuals with preferences for feeling (F) in judgment and extraversion (E) in orientation make higher offers than those with preferences for thinking (T) and introversion (I). The effect of a feeling (F) preference on offers is more pronounced in females than in males, although gender alone has no apparent effect. Offers are also higher when proposers know that responders make a binding pre-commitment but are not different when a hostage is present. Extraversion (E) in orientation is consistent with a pre-commitment to accepting significantly lower offers than introversion (I). Responders also make lower pre-commitments when they are binding and when a hostage is present. The effect of a hostage on pre-commitment is more

pronounced in females than in males even after controlling for judgment and orientation preferences.

Several previous studies have investigated the role of psychological characteristics, such as personality differences between subjects, in explaining individual decisions in laboratory economics experiments. There are none that we are aware of that use the well-developed MBTI as the personality measurement instrument. There are also none that we are aware of for which administration of the personality test instrument is fully separated from the experiment itself.

Boone, et al (1999) find that internal locus of control, high self-monitoring, and high sensation are all positively correlated with cooperative behavior in a prisoner's dilemma game, particularly in repeated games, while type-A behavior decreases the likelihood of cooperation. Brandstätter and Güth (2002) find that subjects' self-reported "benevolence" is more important for offers when the responder is "powerless" (as in the dictator game) than when he is "powerful" (as in the ultimatum game). They also find that powerful responders' scores on "social reciprocity" are positively correlated with how much they expect to receive from proposers. They find no significant correlation between self-reported levels of "intelligence" and either offers or demands. Ben-Ner, et al (2004a, 2004b) find that the more a*greeable* and *open* subjects are, as measured by the NEO five-factor inventory, the more they send and reciprocate in a two-part dictator game.

Because the personality characteristics of the subjects in Boone, et al (1999), Brandstätter and Güth (2002), and Ben-Ner, et al (2004a, 2004b) were elicited in close connection with administration of their experiments, it is possible that the correlations between personality and behavior were generated, in part, by the framing effects. Our subjects' personality preferences were elicited in an entirely different setting, up to four years prior to the experiment. We are

confident, therefore, that the subjects had no particular expectations about how their decisions in the experiment would be evaluated.

We maintained anonymity in our experiments by separating participants by role (that is, proposers, responders, and hostages reported to, remained in, and left from different rooms) and by paying all subjects privately, in cash, at the conclusion of the experiment. We avoid any learning or sequencing effects that may be present in previous studies by using a simple, one-shot ultimatum game.

The remainder of our paper proceeds as follows. Section 2 briefly describes the experimental design, subjects, and setting. Section 3 explains the fundamentals of the personality test instrument we used. Section 4 develops testable hypotheses for behavior based on theory and previous studies of psychological type and presents experimental results. Section 5 provides some discussion of the results, followed by concluding remarks in Section 6.

2. The Experiment

We conducted six variants of the simple, one-round ultimatum bargaining experiment based on the presence of three forms of responder pre-commitment and a third player. That is, we conducted two treatments each with alternatively no pre-commitment, nonbinding pre-commitment, and binding pre-commitment. The six treatments resulted from conducting each pre-commitment design with and without a third player (the "hostage") whose payment depended on the bargaining outcome between player 1 and player 2.[1]

In each treatment, player 1 is instructed to propose a split of $15 between herself and player 2 in one-cent increments. Player 1 is instructed to write her offer on a decision sheet, the

[1] The term "hostage" was not used in the instructions. The third player was referred to as player 3 in the instructions. Similar to Fershtman and Gneezy (2001) we refer to this third player as the hostage in our discussion.

offer being the amount out of $15 that player 2 will receive if player 2 accepts her offer. In each pre-commitment treatment, all parties are informed of the pre-commitment and whether the pre-commitment is nonbinding, in which case player 2 must still decide to accept or reject the offer upon receiving it, or binding, in which case rejection is automatic if the offer is less than the pre-commitment level. Player 1 does not observe the pre-commitment decision before or after she makes her offer decision. Additionally, prior to making any decisions, both players are informed, where applicable, that payment of $5 to a third, real, non-decision-making player will be made upon acceptance of the offer. All players are informed that no payments will be made to any individual if the offer is rejected. The offers are collected, transported to the responder room, and matched randomly with a responder. Responders circle their accept/reject responses, except under binding pre-commitment in which case the decision is automatic and enforced by the experimenters, and the decision sheets are returned to the appropriate proposers.[2]

There was no show-up fee.[3] Participants were paid their earnings privately in cash at the conclusion of the experiment. The experimenters verbally assured participants that all players were real. Participants were also directed to one of three rooms upon arrival and were, therefore, generally aware that there were subjects sent to other rooms. We obtained 30 observations for each of the six treatments. Therefore, we obtained 180 total offer decisions, 180 accept/reject responses, and 120 pre-commitment decisions (60 observations under binding and 60 under nonbinding pre-commitment). Subjects participated only once as either proposer or responder.[4]

[2] The instructions for one of the treatments can be found at http://www.usna.edu/Users/econ/pschmitt/SSSM_Instructions.pdf

[3] While a show-up fee would have been preferred for comparing the results of offers and rejection rates found in this paper to the literature, (U.S. Naval Academy) policy did not allow us to pay students for attendance.

[4] To make the task of recruiting easier, we invited some former proposers and responders to participate in later sessions as hostages. We felt that it was important to have real persons in the hostage role, and we did not want to lose the ability of individuals to participate as a proposer or responder by participating first as a hostage. Because the

Participants were students at the U.S. Naval Academy in various years of study. Students were invited to participate via email solicitation. While the solicitation process was quasi-random, we made an attempt to recruit subjects from all personality types. The next section describes the fundamentals of the psychological test instrument.

3. Psychological Type and the MBTI

Personality test instruments, such as the Myers-Briggs Type Indicator, provide a useful point of departure for controlling for individual-specific characteristics of subjects in order to test broader game-theoretic hypotheses. They also provide an interesting and meaningful way to examine any direct link between personality measurables and behavior patterns in laboratory economic experiments.

The MBTI is based on Carl G. Jung's (1923) theory of psychological type which identifies different tendencies in mental activity among normal, healthy people. Jung's initial observations concerned the *orientations* of extraversion (E) and introversion (I) that describe the degree to which a person's attention and energy is directed outward or inward. "In the Extraverted attitude, energy and attention flow out, or are drawn out, to the objects and people in the environment" (Myers, et al, 1998, p. 26). "In the Introverted attitude, energy is drawn from the environment toward inner experience and reflection" (p. 26).

Jung also identified four mental processes: sensing (S), intuition (N), thinking (T), and feeling (F). Sensing (S) and intuition (N) are the *perception* processes and describe how a person gathers information. Sensing "refers to perceptions observable by way of the senses" (Myers, et al, 1998, p. 24) while intuition "refers to perception of possibilities, meanings, and relationships

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hostage makes no decision and is anonymous to both proposer and responder, having individuals participate more than once in this role should have no effect on offers and responses.

by way of insight" (p. 24). Thinking (T) and feeling (F) are the *judgment* processes and describe how a person draws conclusions and makes decisions. Thinking (T) judgment leads to a decision "by linking ideas together through logical connections" (p. 24) while feeling (F) judgment leads to a decision "by weighing the relative values and merits of the issues" (p. 24).

The MBTI is a self-report questionnaire designed to identify which orientation and functions are dominant in an individual. Therefore, the MBTI identifies an individual as having a preference for extraversion (E) or introversion (I) in orientation, a preference for sensing (S) or intuition (N) in perception, and a preference for thinking (T) or feeling (F) in judgment. The MBTI also adds a fourth dichotomy not explicitly mentioned by Jung. This fourth dichotomy reflects whether a person prefers to use a judgment (J) attitude or a perception (P) attitude when "interacting with the outside, extraverted world" (Myers, et al, 1998, p. 26). "In the Judging attitude, a person is concerned with making decisions, seeking closure, planning operations, or organizing activities" (p. 26) while "In the Perceiving attitude, a person is attuned to incoming information" (p. 27). For more information on the development and uses of the MBTI, including reliability and validity estimates, consult Myers, et al (1998).

Figure 1 gives a breakdown of our subject pool by whole MBTI types. The most common whole type combination in our subject pool is ISTJ. The least common is INFJ. Table 1 provides a summary of our subjects by gender and MBTI dichotomies. For comparison, the table also provides personality type figures for the Naval Academy overall, and estimates for the U.S. population according to Hammer and Mitchell (1996).[5] The percentages for our experiment are the end-product of the recruitment process and the choice of subjects to volunteer. As evident

[5] See Myers, et al (1998) for more information on the distribution of types for males, females, and various ethnic groups.

from the table, they do not reflect perfectly the actual percentages of types either at the Naval Academy or in the general population. Furthermore, the personality preference categories are largely independent for our subject pool.

A final note concerns the appropriate use of the MBTI data for statistical purposes. The nature of the self-report test is such that two individual's quantitative scores are not directly comparable. Raw scores indicate "how sure the respondent is that she or he prefers one pole of the dichotomy over its opposite" (Myers, et al, 1998, p. 120). Scores do not indicate that a respondent has more or less of a particular preference. Therefore, we follow the dichotomous approach recommended by the developers of the MBTI for statistical purposes. That is, we use binary classifications of individuals for the four pairwise personality dichotomies rather than raw scores.

4. Behavioral Hypotheses and Results

Because many economic experiments require individuals to obtain information, make decisions, and interact with others (directly or indirectly), it is straightforward to expect that behavior may be influenced by differences in perception, judgment and orientation, as well as changes in the experimental design. In the following subsections, we develop testable hypotheses regarding personality, gender, and the experimental treatment variables as well as report the results from our experiment.

Note that our personality hypotheses concern only main effects and two-way interactions. While more complex interactions may exist among the personality dichotomies, gender, and the experimental treatment variables, we have little theoretical basis for establishing predictions regarding such deeper interactions. Therefore, we neither hypothesize about nor test for these more complex dynamics.

Before developing the hypotheses, we present summary statistics and explain the testing procedures leading to our results. We analyze the experimental results from three perspectives: offers, pre-commitment levels, and responses. Table 2 provides descriptive statistics regarding offers and pre-commitment levels for each of the six treatments. The ranking of mean offers from lowest to highest both with and without a hostage is – nonbinding pre-commitment, no pre-commitment, and then binding pre-commitment. Mean offers were higher with a hostage than without in the no pre-commitment and nonbinding pre-commitment designs, but were lower with a hostage in the binding pre-commitment designs.

As shown in Table 2, mean pre-commitment levels were consistently lower when binding and with a hostage. Pre-commitment levels were only statistically significantly lower when the pre-commitment level was binding in the no hostage treatments (Mann-Whitney, p-value = 0.0084). Figure 2 displays the percentage frequencies of pre-commitments at selected levels for both binding and nonbinding pre-commitment sessions. The figure shows the pooled results for both hostage and no hostage treatments. A small number of subjects (approx. 7%) pre-committed to accepting any offer when pre-commitment was nonbinding. Interestingly, however, when pre-commitment was binding, one-fourth of all responders pre-committed to accepting $0 or $0.01 offers (10 out of 30 with a hostage, 5 out of 30 without a hostage).

Out of 180 offers, a total of 19 were rejected (a rejection rate of 10.5%). Five of the rejections occurred in the no pre-commitment treatments, eight in the nonbinding pre-commitment treatments, and six in the binding pre-commitment treatments. Seven rejections occurred with a hostage, twelve without a hostage. The 19 rejections occurred by MBTI dichotomies as follows: 9 E, 10 I; 8 N, 11 S; 13 T, 6 F; and 9 J, 10 P. No female rejected an

offer. Figure 3 shows a breakdown of subject responders and rejections by whole personality types.

The most direct way to control for experimental treatment variables and individual subject characteristics and thus test the following hypotheses is through regression analysis. Table 3 provides main-effects OLS regression results for offers in which we treat pre-commitment in three different ways. Column one in the table considers simply pre-commitment (binding and nonbinding) versus no pre-commitment. Column two looks separately at binding pre-commitment relative to no binding pre-commitment (that is, no pre-commitment and nonbinding pre-commitment). Column three looks separately at binding pre-commitment and nonbinding pre-commitment relative to no pre-commitment. Each regression also includes gender, the presence of a hostage, and the four personality dichotomies as explanatory variables. The four excluded dummies are introversion (I) in orientation of energy, feeling (F) in judgment, sensing (S) in perception, and perceiving (P) in orientation to the outer world. Because the x-regressors are all dummy variables, the coefficients are interpreted as differences in mean offers.

Table 4 provides main-effects OLS regression results for pre-commitment levels. Again, the other explanatory variables are gender, the presence of a hostage, and the four MBTI personality classifications. Here, we need only distinguish between binding and nonbinding pre-commitment. Because two of the treatments had no pre-commitment, there are only 120 pre-commitment observations to analyze. Our regression analysis of responses involves a probit analysis of responses (0 if reject, 1 if accept) with offer, personality, gender, hostage, and binding pre-commitment dummies as explanatory variables. The results from this regression can be found in Table 5. Note that, as one might expected, the results indicate that the actual offer is the most significant determinant of responses.

Finally, in the following subsections we explore potentially interesting interaction effects between the variables. Our procedure was to drop all insignificant variables from a given regression, and then systematically check for significant pairwise interaction terms that provide additional meaningful insight into more complex personality dynamics. This results in a comparison of conditional means. For simplicity, we do not provide all of our statistical results from this type of analysis, but only highlight our significant findings in pertinent subsections below as well as in Section 5.[6]

4.1 Judgment – Thinking (T) versus Feeling (F)

Based on the theory underlining the MBTI, we expect the mental function of *judgment* to be one of the most likely personality variables to have explanatory power in the specific context of the simple ultimatum game. Quenck (2000, p. 7) writes, "When Feeling judgment is being used, there is concern for the impacts and consequences of a decision on individuals or groups of people. The goal of a Feeling decision is to maximize harmony and well-being for people and situations." Myers, et al (1998, p. 24) state, "Thinking judgment relies on impartiality and neutrality with respect to the personal desires and values of both the decision maker and the people who may be affected by the decision." Thorne and Gough (1991, p. 74), describe male thinking types in their studies as "planful, steady, organized, efficient and ambitious, as seeking objectivity and rationality, but also as being power-oriented." These descriptions clearly suggest that feeling types should offer more as proposers and pre-commit to less and be less likely to reject as responders than thinking types. We formalize this expectation in Hypothesis 1:

<u>Hypothesis 1</u>: Judgment - When comparing individuals with a preference for feeling (F) to individuals with a preference for thinking (T):

[6] Statistical results for the two-way interaction analysis are available from the authors upon request.

1A. F types will make higher offers than T types.

1B. F types will make lower pre-commitments than T types.

1C. F types will be less likely to reject an offer than T types.

We find strong support for Hypothesis 1A. As indicated in Table 3, feeling (F) types make higher offers than thinking (T) types, with offers averaging about $0.90 higher (sig. one-tailed < 0.01). We find only weak support for Hypothesis 1B. Although the point estimate does indicate higher pre-commitments for T types, the difference is not statistically significant (see Table 4). There was also no statistically significant difference in pre-commitment that could be attributed to judgment when interacted with either gender or orientation. Finally, we find only weak support for Hypothesis 1C. While the point estimate of the coefficient in Table 5 is directionally consistent (i.e. lower probability of acceptance by T types), the significance level is inadequate to draw any clear conclusion. This is certainly due in part to the low number of rejections.

4.2 Orientation of Energy – Extraversion (E) versus Introversion (I)

Orientation of energy seems likely to be equally as important as judgment, especially in the context of the ultimatum game. Extraversion is characteristic of individuals who prefer activities involving socialization or interaction with others. Thorne and Gough (1991, p. 74) describe extraverted types as believing in the "intrinsic merit of interpersonal cohesion". They find that introverts "also appear to find more experiences to be ego-wounding than do Extraverts" (p. 72). In the context of an ultimatum game, we interpret making a low offer, or rejecting a low offer as actions that cause interpersonal disharmony and are thus actions that an extraverted type would avoid. Furthermore, accepting a low offer could potentially be viewed as ego-wounding. This leads to our second hypothesis:

<u>Hypothesis 2</u>: Orientation of energy -When comparing individuals with a preference for extraversion (E) to individuals with a preference for introversion (I):

2A. E types will make higher offers than I types.

2B. E types will make lower pre-commitments than I types.

2C. E types will be less likely to reject an offer than I types.

We find only weak support for Hypothesis 2A. As shown in Table 3, the coefficient on the extraversion dummy is positive as expected, but the effect is not statistically significant. However, as seen in Table 4, we do find strong support for Hypothesis 2B. Extraverted types pre-committed to accepting offers that average $1.08 less (sig. one-tailed < 0.05) than did introverts (I), all else equal. Finally, we find only weak support for Hypothesis 2C. As with Hypothesis 1C, the point estimate of the coefficient in Table 5 is directionally consistent (i.e. lower probability of acceptance by I types), but the difference is statistically insignificant.

We also hypothesize that extraversion (E) when combined with feeling (F) should result in an even stronger desire to avoid interpersonal disharmony. This is based on Myers, et al's (1998) description of persons with the combination of extraversion (E) and feeling (F) as "action-oriented cooperators" who "like to make things happen for the pleasure and welfare of others. They focus on liking others and being liked and on connecting people with each other" (p. 58). Indeed, we find that extraversion (E) in orientation, though not significant over all, is a significant determinant of offers when interacted with feeling (F) judgment. Although offers by ET types were found to be no different than for IT types, offers by EF types averaged $1.10 higher (sig. one-tailed < 0.05) than for IF types. Furthermore, out of the 180 total offers, three were $15 offers (i.e. the proposer offered the entire pie). All three were male EF types. Although this last part is purely anecdotal evidence, it is consistent with Myers, et al's (1998) description.

In terms of pre-commitment, orientation of energy seems to be equally important for both feeling (F) and thinking (T) types in judgment, but not for both males and females. That is, ET types' pre-commitments were lower than IT types' on average by $1.04 (sig. one-tailed < 0.05) and EF types' pre-commitments were lower than IF types' on average by $1.09 (sig. one-tailed = 0.105). Similarly, E_male pre-commitments were $1.24 lower on average than I_male (sig. one-tailed < 0.05), but interestingly there was no such difference between E_female and I_female. The latter two's pre-commitment levels were virtually identical.

4.3 Perception – Sensing (S) versus Intuition (N)

Because the mental function of perception (sensing versus intuition) describes only how individuals tend to acquire information, we have no basis for translating differences in perception into differences in observed behavior in the context of the ultimatum game. We believe the acquisition of information is not the fundamental mental function of interest in the ultimatum game, as the game is fairly simple and transparent. The more interesting dynamic stems from the individual's need to balance monetary gain with their own internal values and beliefs, and this is predominantly a function of judgment and not of perception. This yields the following condensed hypothesis:

> **Hypothesis 3: Perception - When comparing individuals with a preference for sensing (S) to individuals with a preference for intuition (N), no difference in offers, pre-commitments, or rejections will be observed.**

As shown in the regression result Tables 3, 4 and 5, we are unable to reject the nulls of no difference in offers, pre-commitment levels or rejections between S and N types.

4.4 Orientation to the Outer World – Judging (J) versus Perceiving (P)

Because responders in the ultimatum game must be attuned to incoming information (offers) we do speculate that individuals who tend to remain longer in the perception mode

(namely, perceiving (P) types) may be more likely than judging (J) types to change their mind and, thus, violate their own nonbinding pre-commitment. However, we do not expect any difference with respect to offers, rejections or pre-commitment levels by J and P types. This yields our next hypothesis:

> **<u>Hypothesis 4</u>: Orientation to the Outer World - When comparing individuals with a preference for judging (J) to individuals with a preference for perceiving (P):**
>
> **4A. No difference in offers, pre-commitments or rejections between J and P types will be observed.**
>
> **4B. P types will be more likely to violate their nonbinding pre-commitment than J types.**

We find support for Hypothesis 4A in that we are unable to reject the nulls of no difference in offers, pre-commitment levels or rejections between J and P types (see Tables 3, 4, and 5). We find weak support for Hypothesis 4B. Responders rejected approximately 1/3 of the 25 offers that were less than the non-binding pre-commitment level (8 rejections). J types rejected 3 of 13 "rejectable" offers, while P types rejected 5 of 12 "rejectable" offers. However, this difference is not statistically significant.[7]

4.5 Gender – Male versus Female

Controlling for differences in judgment and orientation, we do not expect gender alone to have any impact on offers, pre-commitments, or probability of rejection.

> **<u>Hypothesis 5</u>: Gender – In general, no difference in offers, pre-commitment, or rejections is expected between males and females.**

[7] The only statistically significant role we found anywhere in our data analysis for either orientation to the outer world (J versus P) or perception (S versus N) occurred when we interacted the two while examining pre-commitment. Controlling for the known variables of significance (binding vs. nonbinding and the presence of a hostage), NP pre-commitments were $1.32 lower than NJ pre-commitments (sig. two-tailed < 0.10). However, the reverse was true for sensing (S) types. That is, SP pre-commitments were $1.15 *higher* than SJ pre-commitments (sig. two-tailed = 0.13). While it seems reasonable that perception and orientation to the outer world may play a role in the responder's decision process, we did not predict the above results, but felt it worthy of comment.

With regard to offers and pre-commitment, we find no significant differences between males and females (see Tables 3 and 4). There were no rejections by a female. However, interpretation of this with respect to what effect gender has on rejections is complicated by the relatively small number of rejections in conjunction with the relatively low number of female participants. As such we make no statement of finding one way or the other.

Interaction of gender with judgment (F vs. T) reveals that while feeling (F) increases offers relative to thinking (T) in both males and females, there is a dramatic difference in the absolute magnitude of the effects. Whereas F_male offers averaged $0.66 higher than T_male offers (sig. one-tailed < 0.05), F_female offers averaged $2.23 higher than T_female offers (sig. one-tailed < 0.01). In fact, thinking females had the lowest average offers, and feeling females had the highest average offers.

4.6 Third Player - Hostage versus No Hostage

We predict that the presence of a hostage will lead to higher offers and lower pre-commitments in general. According to Jungian theory, all individuals use feeling judgment at certain times, even if they have a preference for thinking judgment. We expect the presence of a third, powerless player to trigger feeling judgment in both proposers and responders. This leads to the next hypothesis

Hypothesis 6: Hostage - When comparing sessions with a hostage to sessions without a hostage:

6A. Offers will be higher when there is a hostage.

6B. Pre-commitments will be lower when there is a hostage.

6C. Offers are more likely to be accepted when there is a hostage.

We find only weak support for Hypothesis 6A. As shown in Table 3, the coefficient on the hostage dummy is positive as expected, but the effect is not statistically significant. However, as seen in Table 4, we do find strong support for Hypothesis 6B in that pre-commitments with a hostage average $1.50 less (sig. one-tailed < 0.01) than without. While there is no statistically significant evidence in favor of Hypothesis 6C (see Table 5), there is some anecdotal evidence that the presence of a hostage affected the decision to reject. In the nonbinding pre-commitment treatment with a hostage, responders rejected an offer that was lower than the pre-commitment level only once out of nine opportunities and the one offer that was rejected was a $0 offer. When no hostage was present, responders rejected such offers 7 out of 16 times. When there was no pre-commitment, responders rejected two offers with a hostage, and three offers without a hostage.

We also hypothesized that, given the description of feeling judgment and extraverted orientation, the general effect of a hostage, if present, should be more pronounced in individuals with a preference for feeling in judgment and extraversion in orientation. The presence of a hostage, however, seemed to remove any differences attributed to judgment or orientation. While we found no statistically significant difference between thinkers and feelers or extraverts and introverts in the presence of a hostage, we did uncover an interesting result when interacting the hostage and gender variables. In terms of pre-commitments, females (controlling for binding pre-commitment) tended to respond much more dramatically to the presence of a hostage than males. While male pre-commitments averaged $0.89 lower with a hostage than without (sig. one-tailed < 0.05), female pre-commitments were $4.48 lower on average with a hostage than without (sig. one-tailed < 0.01). For comparison purposes, female pre-commitments were lower than male pre-commitments by $2.18 when there was a hostage (sig. one-tailed < 0.05), but were actually

higher than male pre-commitments by $1.40 (sig. two-tailed = 0.13) when there was no hostage. Furthermore, our results with respect to the interaction of hostage and gender were completely robust to adding controls for orientation and judgment as well.

4.7 Pre-commitment – Binding, Nonbinding, and No Pre-commitment

Because nonbinding pre-commitment serves no strategic function, we expect it to have no impact on offers. Furthermore, except for the fact that binding pre-commitment changes the sequential nature of the game to a simultaneous game, it does not change the fundamentals of the responder's decision problem. Neither do we find any compelling argument for why nonbinding pre-commitment should differ from binding pre-commitment if individuals are accurately reporting nonbinding pre-commitments. However, if individuals view the process of choosing a pre-commitment decision as involving a stochastic component (that is, the dollar amount they initially record may be above or below their true willingness to accept), or if their willingness-to-accept is somehow a function of the actual offer, then the imposition of binding pre-commitment may induce lower pre-commitment levels as an insurance-like premium to cover the case that their true pre-commitment level is lower than they initially think. Therefore, we formalize our expectations in the following hypothesis:

Hypothesis 7: Pre-commitment - When comparing treatments with no pre-commitment, nonbinding pre-commitment, and binding pre-commitment:

7A. Offers will be no different under binding pre-commitment, nonbinding pre-commitment and no pre-commitment.

7B. Binding pre-commitments will be lower than nonbinding pre-commitments.

We do not find support for Hypothesis 7A. In fact, offers are statistically significantly higher (sig. one-tailed < 0.05) when proposers face binding pre-commitments by responders

relative to no or nonbinding pre-commitments. However, as shown in Table 4, we do find support for Hypothesis 7B in that pre-commitments that are binding average $1.54 less (sig. one-tailed < 0.01) than when nonbinding.

5. Discussion

Our general results are consistent with those of previous studies of behavior in the simple ultimatum game. Proposers offered significantly more on average than the minimum allowable amount (in excess of $6 out of $15), and responders sometimes rejected positive offers. However, the results offer some interesting insight into the impact of psychological variables, namely personality and pre-commitment, on individual offers and responses.

It came as no surprise to us that individuals with a so-called preference for "feeling" in judgment (F) would make higher offers than those with a preference for "thinking" (T). We were somewhat surprised by the lack of a similar statistically significant difference with respect to pre-commitment levels. However, one can argue possibly that, contrary to our Hypothesis 1B, both F and T types should pre-commit to accepting low offers, but their reasons may differ. On the one hand, F types in general may view rejecting an offer as an uncooperative decision that brings about harm to the proposer, a value-based decision. On the other hand, T types may view rejecting an offer as a value-neutral decision that simply leaves money on the table. However, both views influence behavior in the same direction, making it unclear that either should pre-commit to accepting lower offers than the other. In general, it does appear that EF types demonstrate the greatest "cooperative" behavior in the context of the ultimatum game, consistent with the Myers, et al (1998) description of such types as "action-oriented cooperators." It would be interesting to know if similar results hold for other non-cooperative games.

Our results with respect to gender are generally consistent with Solnick (2001) in that we find no systematic difference between males and females with respect to offers or willingness to accept offers. It is possible that previous studies such as Eckel and Grossman (2001) who find that females make higher offers than males and exhibit a higher probability of accepting a given offer are capturing the predominance of feeling judgment in females. Neither of these studies control for judgment (thinking versus feeling), and feeling judgment is more frequently dominant in females (75.5%) than in males (43.5%) (Myers, et al, 1998, p. 157-8). However, although we did find a greater reaction by females to the presence of a hostage, we actually found females characterized as thinking types to be the "toughest" responders in terms of their self-reported pre-commitments to reject.

Furthermore, the effect of a powerless third party did appear to invoke a "feeling" response by responders, regardless of their preference for thinking versus feeling judgment according to the MBTI. That is, pre-commitments were significantly lower for both thinkers and feelers when a hostage was present. This provides some validation for the theory that non-dominant mental functions are used in certain situations. The lack of an effect of a hostage on offers can probably be attributed to the fact that proposers can have no direct impact on the payoff to the hostage – it ultimately depends, of course, on the responder's decision.

We find the impact of binding pre-commitment on both offers and responses to be intriguing. Offers appear to increase when the proposer knows that the responder makes a binding pre-commitment. Meanwhile, responders make lower pre-commitments when they are binding. The story here appears to be one of risk aversion and time inconsistency. That is, responders appear unsure of what they will truly accept. When pre-commitment is non-binding, responders make a "wishful thinking" pre-commitment to reject that they are unable to stick to

once the offer is received. The time inconsistency problem appeared obvious to proposers. In fact, proposers actually made slightly *lower* offers on average under nonbinding pre-commitment compared to no pre-commitment, possibly due to a framing effect generated by the treatment that caused proposers to focus more heavily on the idea of a lowest acceptable offer. However, when pre-commitment was binding, responders seem to react to their own uncertainty by choosing a lower, risk-averse pre-commitment, with many responders (nearly one-fourth) pre-committing to accepting basically any offer. Proposers, on the other hand, responded in a similar risk-averse fashion by making higher offers.

Our final comments concern rejections. Our hypotheses indicated that individuals with the MBTI preference combination of extraversion (E) and feeling (F) should be the least likely to reject an offer. Remarkably, Figure 3 shows that only a single rejection occurred by an individual with an EF personality preference combination. While it is also true in general that, as predicted, more rejections resulted from I types than E types, and from T types than F types, these rejection rates by personality preference are roughly proportionate to the percentage of types in the sample, yielding little convincing evidence about which, if any, personality attributes matter for the final accept/reject response.

6. Conclusions

This paper provides an example of the insight into human economic behavior that can be gained by combining theories of mental activity from psychology with laboratory economic experiments. We have shown that differences between subjects with regard to *judgment* and *orientation* in particular, as measured by the Myers-Briggs Type Indicator, lead to significant, predictable, and observable differences in subject decisions in a simple ultimatum game. Our research is the first that we are aware of to employ the MBTI specifically to investigate behavior

in the context of a laboratory economics experiment. Using the MBTI and student volunteers from the United States Naval Academy (USNA) provided a unique opportunity to avoid the uncertain framing effects of administering a personality test instrument directly either pre or post-experiment.

In general, we found behavior in our laboratory experiment to be quite consistent with expectations based on theoretical underpinnings of the MBTI and its descriptions of psychological type. That is, individuals with preferences for feeling (F) in judgment and extraversion (E) in orientation tended to make higher offers than those with preferences for thinking (T) and introversion (I). The effect of a feeling (F) preference on offers was more pronounced in females than in males, though we found no apparent effect of gender alone. Offers were also higher in general when proposers knew that responders were making a binding pre-commitment, but were not different when a hostage was present.

The research also sheds light on the decisions of responders to reject an offer. The results show that when responders were asked to write down their lowest acceptable offer, subjects pre-committed to significantly lower amounts when the pre-commitment was binding compared to nonbinding. Extraversion (E) in orientation was consistent with a pre-commitment to accepting significantly lower offers than introversion (I). Responders, both those with a preference for thinking and those with a preference for feeling judgment, also made lower pre-commitments when a hostage was present, clearly demonstrating an altruistic or "feeling" response in general. The effect of a hostage on pre-commitment was also much more pronounced in females than in males even after controlling for judgment and orientation preferences.

Furthermore, subjects rejected offers that were below their pre-commitment level only about a third of the time in the nonbinding pre-commitment sessions. These results suggest that

subjects have difficulty determining what offer is “acceptable” and that they are strongly influenced by the actual offers. Ex ante unacceptable offers become strangely acceptable ex post.

This research highlights the importance of considering preferences about how subjects acquire information, make decisions, and interact with others in laboratory economic experiments, and it provides validation for psychological test instruments that measure differences in these preferences across individuals.

References

Ben-Ner, Avner, Fanmin Kong, and Louis Putterman. (2004a). "Share and Share Alike? Gender-Pairing, Personality, and Cognitive Ability as Determinants of Giving," *Journal of Economic Psychology* 25(5), 581-89.

Ben-Ner, Avner, Louis Putterman, Fanmin Kong, and Dan Magan. (2004b). " Reciprocity in a Two-Part Dictator Game," *Journal of Economic Behavior and Organization* 53, 333-352.

Boone, Christopher, Bert De Branbander, and Arjen van Witteloostuijn. (1999). "The Impact of Personality on Behavior in five Prisoner's Dilemma Games," *Journal of Economic Psychology* 20, 343-377.

Brandstätter, Hermann, and Werner Güth. (2002). "Personality in Dictator and Ultimatum Games," *Central European Journal of Operations Research* 10, 191-215.

Eckel, Catherine C., and P. J. Grossman. (2001). "Chivalry and Solidarity in Ultimatum Games," *Economic Inquiry* 39 (2), 171 – 188.

Fershtman, C., and Gneezy, U. (2001). "Strategic Delegation: An Experiment," *RAND Journal of Economics*, v32, n2. 252-368

Güth, W. (1995). "On Ultimatum Bargaining Experiments – A Personal Review," *Journal of Economic Behavior and Organization* 27 (3), 329 – 344.

Hammer, A.L. and Wayne D. Mitchell. (1996). "The Distribution of MBTI types in the U.S. by Gender and Ethnic Group," *Journal of Psychological Type* 37, 2-15.

Jung, C. G. (1923). *Psychological types*. Princeton, NJ: Princeton University Press.

Kagel, J. and K. W. Wolfe. (2001). "Tests of Fairness Based on Equity Considerations in a Three-Person Ultimatum Game," *Experimental Economics* 4, 203 – 219.

Myers, Isabel Briggs, Mary H. McCaulley, Naomi L. Quenk, and Allen L. Hammer. (1998). *MBTI Manual: A Guide to the Development and Use of the Myers Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologists Press.

Quenk, Naomi L. (2000). *Essentials of Myers-Briggs Type Indicator Assessment*. New York, NY: John Wiley Sons, Inc.

Roth, A. E. (1995). "Bargaining Experiments," in *Handbook of Experimental Economics*. (J. H. Kagel and A. E. Roth, Eds.) pp. 253 – 348. Princeton, NJ: Princeton University Press.

Solnick, Sara J. (2001). "Gender Differences in the Ultimatum Game," *Economic Inquiry* 39 (2) 189 – 200.

Stigler, G. and G. Becker (1977). "De Gustibus Non Est Disputandum," *American Economic Review* 67, 76 – 90.

Thorne, A. and H. Gough. (1991). *Portraits of Type: An MBTI Research Compendium*. Palo Alto, CA: Consulting Psychologists Press, Inc.

Tables

Table 1. Subject summary by MBTI dichotomy and gender

	Extrovert	Introvert	Intuition	Sensing	Thinking	Feeling	Judgment	Perception	Male	Female
Experiment	E 52%	I 48%	N 46%	S 54%	T 68%	F 32%	J 55%	P 45%	85%	15%
U.S. Naval Academy*	E 56%	I 43%	N 42%	S 57%	T 75%	F 24%	J 59%	P 40%	85%	15%
U.S. Population**	E 46.3%	I 53.7%	N 31.9%	S 68.1%	T 52.9%	F 47.1%	J 58.1%	P 41.9%	49.1% ***	50.9% ***

* Approximately 1% of students have no recorded MBTI results.
**Source: Hammer and Mitchell (1996)
***Source: U.S. Census Bureau, Census 2000

Table 2. Summary statistics by treatment

Treat-ment	*Pre-commitment*	*Hostage*	*Obs.*	*Mean Offer*	*Variance Offers*	*Mean Pre-com*	*Variance Pre-com*
1	None	No	N=30	6.42	4.73	NA	NA
2	None	Yes	N=30	6.73	8.34	NA	NA
3	Nonbinding	No	N=30	5.99	2.41	6.72	6.26
4	Nonbinding	Yes	N=30	6.53	4.46	4.78	8.66
5	Binding	No	N=30	7.40	2.35	4.90	7.21
6	Binding	Yes	N=30	6.75	2.27	3.72	9.26

Table 3. OLS regression results for offers (two-tailed p-values in parentheses)

Independent Variable	*General Pre-commitment*	*Binding Pre-commitment*	*Binding and Nonbinding Pre-commitment*
Constant	7.124	6.889	7.076
	(0.000)	(0.000)	(0.000)
E	0.091	0.063	0.085
	(0.769)	(0.837)	(0.780)
N	-0.033	0.038	0.024
	(0.916)	(0.903)	(0.939)
T	-0.975***	-0.916***	-0.928***
	(0.005)	(0.007)	(0.006)
J	0.196	0.175	0.173
	(0.539)	(0.581)	(0.584)
Female	0.239	0.163	0.187
	(0.575)	(0.701)	(0.659)
Hostage	0.060	0.064	0.063
	(0.844)	(0.831)	(0.835)
Pre-commitment	-0.015		
(Both types)	(0.963)		
Binding		0.558*	0.367
Pre-commitment		(0.088)	(0.331)
Nonbinding			-0.368
Pre-commitment			(0.321)
R^2	0.050	0.066	0.071
Adj. R^2	0.011	0.028	0.028
Sig. F	0.258	0.104	0.116
N	180	180	180

* Significant at α =0.1 ***Significant at α =0.01

Table 4. OLS regression results for pre-commitment levels (two-tailed p-values in parentheses)

Independent Variable	
Constant	7.100
	(0.000)
E	-1.081**
	(0.049)
N	-0.157
	(0.771)
T	0.273
	(0.632)
J	-0.203
	(0.720)
Female	0.053
	(0.943)
Hostage	-1.502***
	(0.005)
Binding	-1.536***
	(0.004)
R^2	0.164
Adj. R^2	0.111
Sig. F	0.005
N	120

** Significant at α =0.05 ***Significant at α =0.01

Table 5. Probit regression results for responses, Accept = 1 (two-tailed p-values in parentheses)

Independent Variable	
Constant	-0.623
	(0.29)
Offer	0.334***
	(0.000)
E	0.128
	(0.664)
N	-0.029
	(0.920)
T	-0.351
	(0.273)
J	0.128
	(0.678)
Female	Dropped
	(no rejections)
Hostage	0.282
	(0.330)
Binding	-0.352
	(0.262)
Pseudo R^2	0.169
LR χ^2	20.51
Sig. χ^2	0.005
N (total decisions)	180
Number of rejections	19

***Significant at α =0.01

Figures

Figure 1. Subject pool by whole personality type

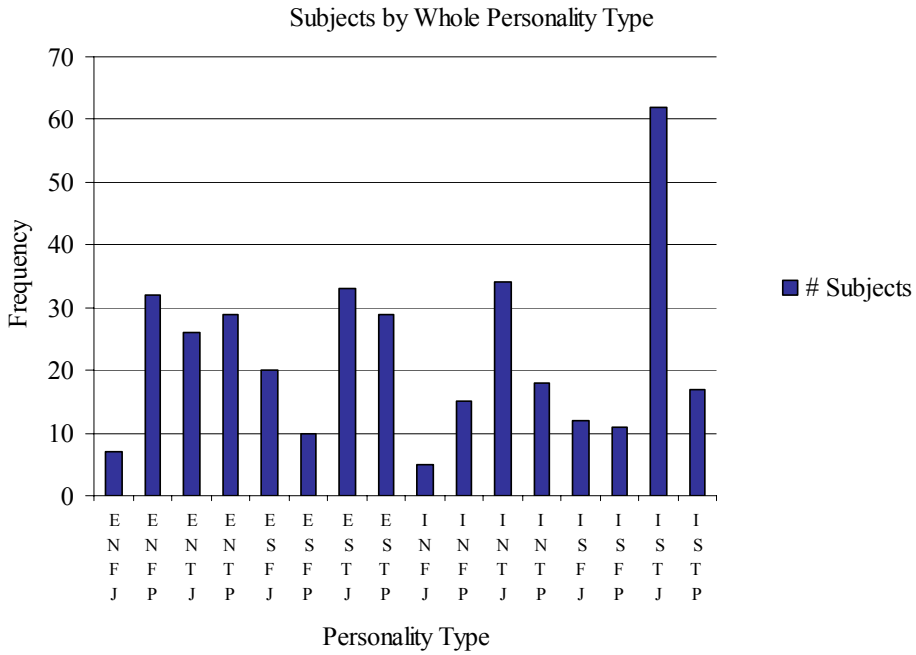


Figure 2. Pre-commitment levels

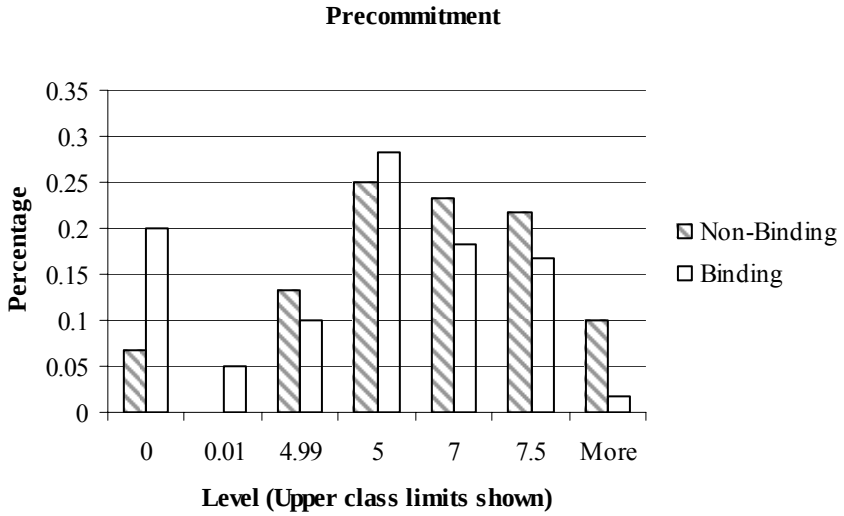
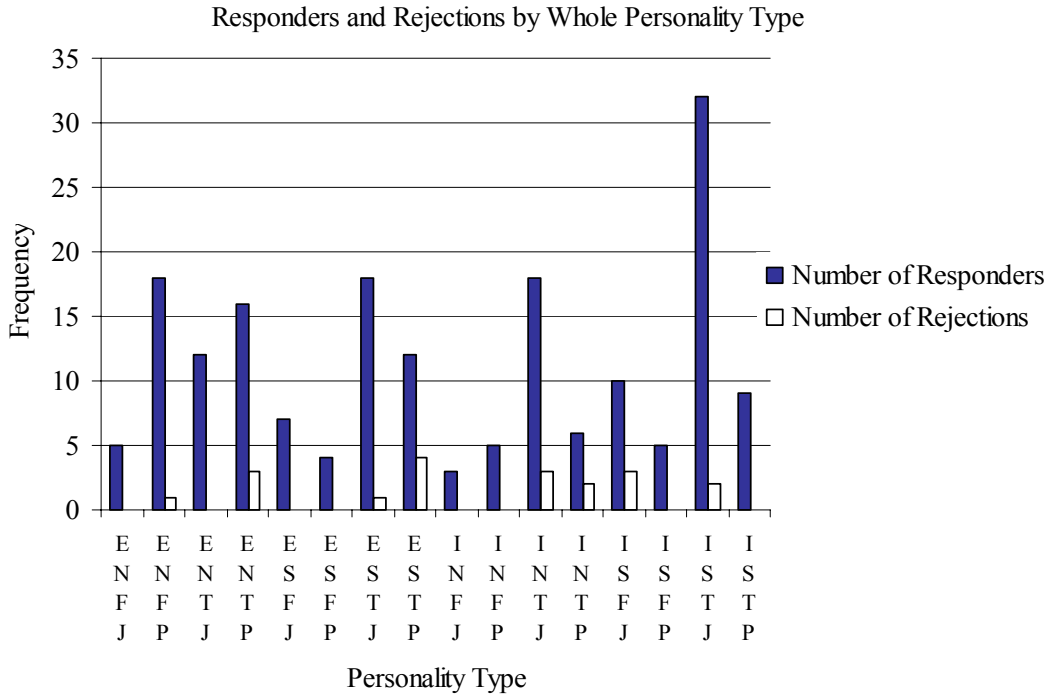


Figure 3. Responders and rejections by whole personality type



(**For the reviewers – to be posted on a website)**

Instructions (Proposer)

Introduction: The purpose of this experiment is to study how people behave in bargaining situations. If you follow the instructions carefully and make good decisions there will be an opportunity for you to make money during the experiment.

You have been randomly assigned to a role with these instructions. You will be randomly matched with a player (or players), but the identity of this player (or players) will remain unknown. At the end of the experiment, you will learn the results of the game. Your experimental earnings will be based on the results of your decisions and the decisions of the player (or players) with whom you are matched.

In this experiment, $15.00 is to be divided between two persons: the "proposer" and the "responder." In addition, a third player, player three, exists and earns money only if the proposed division of the $15.00 is accepted. You are the **proposer.**

Your task is to make an offer of how to split $15.00 between you and the responder. The offer can be any monetary division of the $15.00 except for fractions of a penny. That is, offers are represented in penny increments, i.e. $0.00, $0.01, $0.02, …, $14.98, $14.99, $15.00 are legitimate offers. If the responder rejects the offer, all three players earn nothing. If the responder accepts the offer, you earn $15.00 minus the offer, the responder earns the offer, and player three earns $5.00.

However, prior to seeing your offer, the responder has indicated a lowest acceptable offer (i.e., the lowest amount of the $15.00 they would be willing to accept). The lowest acceptable offer is ***not binding***. That is, after seeing the offer, the responder can still decide whether to accept or reject your offer.

Once again, upon receiving the offer, the responder will either accept or reject the offer.

a) If the offer is accepted, the responder earns the offer, you earn $15.00 minus the offer, and player three earns $5.00.

b) If the offer is rejected, all three players earn nothing.

On the decision sheet, please write your experimental number and your proposed split of the $15.00 in the offer line (this is the amount you are offering to the responder, you earn $15.00 minus this offer, if it is accepted). When completed please hand the decision sheet to the experimenters.

Instructions (Responder)

Introduction: The purpose of this experiment is to study how people behave in bargaining situations. If you follow the instructions carefully and make good decisions there will be an opportunity for you to make money during the experiment.

You have been randomly assigned to a role with these instructions. You will be randomly matched with a player (or players), but the identity of this player (or players) will remain unknown. At the end of the experiment, you will learn the results of the game. Your experimental earnings will be based on the results of your decisions and the decisions of the player (or players) with whom you are matched.

In this experiment, $15.00 is to be divided between two persons: the "proposer" and the "responder." In addition, a third player, player three, exists and earns money only if the proposed division of the $15.00 is accepted. You are the **responder**.

Your task is to decide whether to accept or reject an offer made by the proposer. The proposer will make an offer of how to split $15.00 between the proposer and responder. The offer can be any monetary division of the $15.00 except for fractions of a penny. That is, offers are represented in penny increments, i.e. $0.00, $0.01, $0.02, …, $14.98, $14.99, $15.00 are legitimate offers. If you reject the offer, all three players earn nothing. If you accept the offer, you earn the offer, the proposer earns $15.00 minus the offer, and player three earns $5.00.

However, prior to receiving the offer, you must indicate the lowest amount of the $15.00 you would be willing to accept. This is your "lowest acceptable offer." However, your lowest acceptable offer is ***not binding***. That is, after seeing the offer, you, the responder, can still decide whether to accept or reject the offer.

Once again, upon receiving the proposal, you will respond by either accepting or rejecting the offer.

a) If the offer is accepted, you, the responder, earn the offer, the proposer earns $15.00 minus the offer, and player three earns $5.00.

b) If the offer is rejected, all three players earn nothing.

Please indicate your lowest acceptable offer on the line below

LOWEST ACCEPTABLE OFFER = _____ (Not Binding)

The experimenters will hand you an offer from the proposer you are matched with. Please write your experimental number on the responder number line. Then indicate whether you accept or reject the offer by circling the appropriate response. When completed please hand your response to the experimenters.

Instructions

Introduction: The purpose of this experiment is to study how people behave in bargaining situations. If you follow the instructions carefully and make good decisions there will be an opportunity for you to make money during the experiment.

You have been randomly assigned to a role with these instructions. You will be randomly matched with two players, but the identity of these players will remain unknown. At the end of the experiment, you will learn the results of the game. Your experimental earnings will be based on the results of the decisions of the other players with whom you are matched.

In this experiment, $15.00 is to be divided between two persons: the "proposer" and the "responder." You are **player three**.

Your task involves no decision. The other players are informed regarding your role and the rules concerning your earnings.

The proposer will make an offer of how to split $15.00 between two players (the proposer and the responder). The offer can be any monetary division of the $15.00 except for fractions of a penny. That is, offers are represented in penny increments, i.e. $0.00, $0.01, $0.02, …, $14.98, $14.99, $15.00 are legitimate offers. If the responder rejects the offer, all three players earn nothing. If the responder accepts the offer, you earn $5.00, the proposer earns $15.00 minus the offer, and the responder earns the offer.

Please write your experimental number on this sheet and turn it in when asked. You will be randomly matched to a proposer and responder and your payoff will depend on the outcome of that game.