

PERSONALITY AND COGNITIVE DIFFERENCES AFFECTING
THREE PERSON NEGOTIATIONS

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Abstract

Research has examined the influence that individual personality and cognitive characteristics have on dyadic negotiation, but not on coalition formation in more complex settings. We investigated the link between outcomes of three-person, asymmetric negotiations by undergraduate students with various Big 5 personality characteristics and need for cognition. We hypothesized that need for cognition and extraversion will have a positive impact on negotiation outcomes, while agreeableness will have a negative impact. Furthermore, we hypothesized that priming subjects on the merits of individualism prior to negotiations will lead to more competitive behavior, while priming teams toward collaboration will have the opposite effect. Participants with high need for cognition may be more inclined to analyze the situation and to develop and implement the strategic planning needed to claim greater value through coalition bargaining. Extraverted participants may be more likely to initiate and sustain the back and forth communication needed to form coalitions easily. Those with high agreeableness, on the other hand, may be more likely to accept offers proposed to them that may give them far lower value than they might be able to extract otherwise. Indeed, the very first coalition experiments on n-person games by Kalisch et al. (1952) made reference to the apparent impact of personality differences in outcomes but these were never directly tested empirically. In our study, participants completed a series of personality measures then were primed with either an article on cooperation or individualism before engaging in a three-person negotiation as either a high power monopolist or as one of two low power players. To examine negotiation outcomes, we analyzed both the payoffs to individuals in the negotiation as well as negotiation time. Analysis shows positive impact of need for cognition and extraversion, varying by negotiation position, and that need for cognition positively impacts length of negotiation. Additionally, our individualistic priming resulted in more competitive negotiations. Future research should seek to replicate the experiment with a larger sample size, stronger incentives, and a more diverse subject pool so as to increase the significance of our results.

Personality and Cognitive Differences Affecting Three Person Negotiations

What personality traits are the key determinants of negotiation outcomes? How much does intelligence determine these bargaining ability? What framework should managers use when determining how to build their negotiating teams? What traits should you most fear from across the negotiating table?

This paper seeks to understand the give and take that often exists in business between the negotiator with more power, and the parties without power due to competition. This power difference is present, for instance, in situations where there may be a single seller of a good and many buyers when negotiating price. The opposite may exist if there is only a single buyer of a good, and many sellers. This type of negotiation can also occur in monopoly situations, such as those created by patents. While many game theorists have attempted to model such negotiation outcomes mathematically, we recognize that there may be other factors about the negotiator or the situation that could cause deviation from theoretical outcomes. We are studying what personality and cognitive traits might lead someone to refuse a broader coalition that could distribute value more evenly, choosing instead to capture as much value as possible for themselves; or on the other hand, what internal or external factors may cause someone to, despite being in a power position, leave value on the table for the sake of cooperation.

Research done on human tendencies towards egalitarianism suggests that evolution over millions of years dictated that humans are by necessity communal, working together to develop from uncivilized creatures to build great societies (Boehm 1999). Boehm suggests in his work that humans are “innately disposed to form social dominance hierarchies” but that those communities were defeated on the African plain by more communal hunter-gather societies.

Does this evolution dictate that we humans have now become naturally disposed to benevolence and sharing what we have with the complete strangers that we negotiate with in daily life?

Past research has long overlooked the impact of personality and cognitive characteristics on negotiation outcomes, especially in n-person games. Given that many real-life negotiation scenarios fall under complex, non-symmetrical scenarios, our research will expand research into these more complex games. Because context also matters, we will test whether people negotiate differently depending on how they are primed before a negotiation. Building on empirical literature in a laboratory setting, our work will study the impact of personality and cognitive traits in asymmetric power situations and evaluate how differences in individual traits as well as external priming can cause deviation from or conformity to expected outcomes.

Literature Review

Our research specifically seeks to build on the work of Kalisch, Milnor, Nash, and Nering (1952), a group of mathematicians who were the first researchers to empirically study games in characteristic function form in laboratory experiments. They sought to find evidence that certain game theoretic solution concepts were valid. Instead, they found systematic, “fairly cooperative” deviations from these concepts, which they believed were likely a result of concern from players not wanting to be left out of a coalition. The authors furthermore noted that personality differences played a large role in these negotiations. More “talkative” individuals were more likely to enter into a coalition and more “aggressive” individuals tended to take charge of the bargaining within the coalition.

Dating from roughly the same time period, social psychologists began examining correlations between a range of individual difference measures and simple choices in two person

non-cooperative games like the Prisoner's Dilemma. In a highly influential narrative literature review, Rubin and Brown (1975) promoted what became a consensus view that personality and cognitive ability had limited relevance to bargaining behavior and outcomes. These strongly worded claims from well-respected psychologists effectively discouraged much further research in this space. More recently, however, personality measurement has improved with focus on the broad predictive power of a small group of traits – the so-called Big Five: openness, conscientiousness, extraversion, agreeableness, and neuroticism. These variables have been found to predict workplace and career success in a range of settings (Barrick and Mount 1991).

Economists and psychologists have only recently begun to reevaluate the merits of the irrelevance consensus with respect to bargaining. Changes in experimental design and alternative perspectives on both personality and cognitive differences suggest outcomes that more directly support common intuition that these factors likely do matter.

From the cognitive capacity perspective, Barry and Friedman (1998) have shown that high general intelligence predicted success in integrative bargaining between two negotiators. For this study, Barry and Friedman measured intellect with subjects' GMAT scores, a link to intelligence that was justified by Frey and Detterman (2004). Beyond cognitive ability, however, psychologists like Cacioppo and Petty (1980) have suggested a related but distinct measure of cognitive processing based on individuals' tendencies to engage in and enjoy thinking which they called the "need for cognition". Perhaps due to the influence of Rubin and Brown's (1975) argument, insufficient research has been done to understand the relationship between these cognitive styles and negotiation outcomes.

Offermann et. al (2004) found that although high IQ can strongly predict performance in individual tasks, EQ more strongly influences team contribution. These conclusions have

motivated us to study personality traits and predispositions, exploring their impact at the bargaining table. The development of the Big Five model (Costa & McCrae, 1992) has been a useful tool for studying the impact of individual dispositions. In particular, each of the Big Five traits except conscientiousness has been shown to have predictive impact on negotiation outcomes (Sharma, Bottom, & Elfenbein, 2013). Beyond innate negotiation abilities, however, Burnham, McCabe, and Smith (2000) have also found that priming individuals to view another player as either a friend or opponent can produce significant differences in trust and trustworthiness behavior in a two-person game. Thus, we are interested in not only the individual characteristics of a negotiator, but also in how priming to promote cooperative or competitive behaviors might impact negotiation performance in spite of predispositions.

Most of the recent laboratory experiments on this subject have studied the comparatively simple and unrepresentative context of one on one negotiations. Because markets generally afford alternative options for negotiating with other counterparts, the focus of our research is on more complex, n-person experiments. For purposes of simplicity we focus on the most basic form as a starting point for investigation: the three-person game. Most business negotiations involve, at least potentially, the participation of more than two actors. Facility at playing one party off against another or uniting parties in a common coalition may be essential to securing interests in a given strategic situation. Dyadic bargaining research ignores these important features which may heighten the importance of personality and cognitive processing. Von Neumann and Morgenstern (1947) were the first to formalize a cooperative theory for n-person games, describing the games in superadditive characteristic function form: with individual players, possible coalitions of two or more players, and the payoff values of each coalition.

Under this model, the values of the function reveal the payoffs of the optimal solution; consequently, solving for these values can reveal the optimal strategy for a given scenario.

As the field of game theory has evolved, it has incorporated more complex scenarios to more accurately account for contextual features of real-world business or political problems. Our paper seeks to continue this trend by analyzing the impact of individual characteristics on bargaining outcomes in three-person (complex) negotiations. Game theory has been historically divided into two distinct game types: cooperative, in which players may enter into mutually binding agreements, and non-cooperative, in which binding agreements prior to decisions by the players are not permitted (Kahan & Rapoport 1984). The focus of our work is on cooperative games modeled by the characteristic function form.

Key to our analysis is the prediction of a player's range of possible equilibrium payoffs, which is fundamental to the a priori analysis of the game that the Shapley value (Shapley 1953) solution concept attempts to define. Though we recognize the range of existing solution concepts, our work focuses on two of the more widely used ones: the core and the Shapley value. Murnighan and Roth (1977) observed the conformity of an experimental three-person characteristic function game with various theoretical solutions, including von Neumann-Morgenstern solutions, the core, general sub-solutions, and the Shapley value, all of which we analyze in the following section. Their experiment yielded results that closely approximated the Shapley value.

Our study uses this experiment as a baseline to evaluate the linkage between individual traits and negotiation outcomes in the same game. Opposing the theoretical equilibrium outcomes for groups of players engaging in the negotiation is what Roch, Samuelson, Allison, and Dent (2000) identified as a small group's tendency towards an "equal-division" heuristic

given scarce resources. The authors found that “when faced with a common resource pool, almost all group members expressed thoughts regarding equality” initially, and players with sufficient levels of cognitive capacity would later request more from the pool (Roch et al. 2000).

Given these existing findings, we are interested in how individuals’ cognitive and personality differences may impact the way they behave in a negotiation and which force – the Shapley value or the equality heuristic – ultimately has more impact on the value they claim. We will then explore how the priming of individuals can change those behaviors.

The Game

We utilized the characteristic function and explanatory model first examined by Murnighan and Roth (1977). The game featured three players, each of which was the owner of one shoe. Specifically, player A was the owner of a right shoe while players B and C owned left shoes. Single shoes had no value, but a pair of shoes (consisting of one right shoe and one left shoe) had a value of 100 points. Thus, players could only earn points by forming a coalition that could assemble a pair of shoes.

This game can be modeled in characteristic function form where $N = (A, B, C)$ and $v(A) = v(B) = v(C) = v(BC) = 0$ and $v(AB) = v(AC) = v(ABC) = 100$. The set of outcomes of this game is the set X of all possible distributions of 100 points among the players. An outcome $x = (x_A, x_B, x_C)$ dominates another outcome $y = (y_A, y_B, y_C)$ if there exists a coalition $I \subset N$ of players which prefers the outcome x to the outcome y and has sufficient power to assure to its members the distribution of wealth they receive at x . Referencing the characteristic function of the game, it is clear that all domination must be by the coalitions (A, B) , (A, C) , or (A, B, C) since these are the only coalitions whose characteristic functions are not equal to zero.

Though Murnighan and Roth analyze extensively in their paper how this game aligns with various proposed stable sets, we will outline the various theoretical solutions here for better explanation of the game.

One such set that can be considered stable with respect to domination is the set of outcomes undominated by any other outcome. This set is known as the core; it can be denoted by the set of outcomes $C = U(X)$ (Scarf 1967). In many games that have been empirically studied, the core has been empty. However, for this specific game design, the nonempty core consists of the single outcome $C = (100, 0, 0)$, at which player A receives 100 points, and players B and C receive zero. Any outcome y outside of the core is unstable because it can be dominated by some other outcome x . A shrewd, very competitive player A should be able to continue sequentially proposing alternative coalitions that induce B and C to keep making concessions ultimately up to a point approximating the core.

An additional and arguably more comprehensive stable set is a vN-M (Von Neumann and Morgenstern) solution which is defined to be any set of outcomes $S \subset X$ such that:

(1) no x in S dominates any y in S ; and

(2) every z outside of S is dominated by some x in S .

A solution is thus a set S such that $S = U(S)$. Every solution of a game contains the core, and for this game, every solution also contains a point at which player A receives zero. A vN-M solution of this game can be viewed as arising from bargaining by players B and C acting cooperatively against player A.

Another kind of stable set, which can be viewed as somewhat intermediate between the core and a vN-M solution, is the subsolution which can be defined to be a set of outcomes $S \subset X$ such that:

$$(1) S \subset U(S), \text{ and}$$

$$(2) S = U^2(S) \equiv U(U(S))$$

It can easily be shown that every solution is a maximal subsolution, and that every subsolution contains the core. The primary difference between solutions and subsolutions is that in order to be a vN-M solution, there must exist the possibility that player A will receive zero whereas the class of subsolutions includes scenarios in which player A is assured of receiving some strictly positive amount.

A final and different approach to the study of games involves assessing the worth of a game to a player before the game is played. It has been shown that the Shapley value represents a risk neutral player's utility function for playing the game, which in this case is (66.7, 16.7, 16.7). It is this solution that Murnighan and Roth find closest resemblance to when evaluating their experiment results; the monopolist's mean payoff overall all trials and conditions in their experiment was 64.8 points. Given this empirical precedent we focus most of our attention on observations of deviations from the Shapley Value. The experimental manipulation and the individual difference variables should predict the magnitude of these deviations.

Hypothesis

Our main hypothesis was that three individual characteristics (extraversion, agreeableness, and need for cognition) would have significant impact on the value that participants could extract from the negotiation. We expected that higher levels of extraversion

and need for cognition would result in higher outcomes in negotiation, while higher levels of agreeableness would result in lower payoffs. Extraverted people who tend to be more outgoing in negotiations can wield a greater influence over the unfolding discussions. In the same vein, the people with higher need for cognition will be less inclined to settle for payoffs without thinking through and exploring the best options for themselves. They are more likely than others to recognize the relative sources of bargaining power and their limitations. On the other hand, agreeableness will have the opposite effect, making highly agreeable negotiators more likely to settle for the initial offers or small adjustments to those anchors.

We further hypothesized that the composition of negotiation groups would influence the time taken to complete the negotiation as groups; those with higher need for cognition would take longer to come to an agreement, while groups that are more agreeable would take less time. We did not expect that all participants would extract value from the negotiations, especially those exhibiting lower levels in each of the three characteristics.

Finally, with respect to our manipulation, we hypothesized that sessions in which subjects were primed to encourage teamwork would yield more equal distribution of outcomes across negotiations, while sessions with priming for individualism would yield more variance in point distributions based on power in positions.

Method

Participants

The subjects of this study were undergraduate business students recruited from a subject pool at a small private University in the Midwestern United States. They were enrolled in a system that allowed them to participate in studies of their choosing to complete research hours

for credit in select courses. This study awarded them one credit hour for their time spent in the study. Our experiment included a total of 75 undergraduate business students with varying demographics who signed up and participated in the different sections of the study. There were five different experimental sessions held with two rounds of negotiations per section with different combinations of participants.

Procedure

Questionnaire: Upon arriving at the study subjects were told to sit down at any available seat. Each seat had a unique study ID number to identify each subject and also to separate into groups for the latter parts of the study. Once all subjects had been seated we distributed a questionnaire with 41 items (see Appendix 2) assessing the participants' levels of need for cognition and the Big Five personality traits (Goldberg 1999, Cacciopo 1982). The subjects were asked to rate themselves on a scale from 1 (least similar) to 9 (most similar). For conceptual reasons we focused attention primarily on extraversion, agreeableness, and need for cognition with 11, 9, and 18 items for each of those scales respectively. For completeness we included one item each measuring neuroticism, openness, and conscientiousness. Once finished, the questionnaires were collected and we proceeded to the next stage of the study.

Article Response: Once all of the agreements were completed, we proceeded to the next stage of the study. The content of this stage varied between the 6 sessions. The participants were to read an excerpt from an article from the Harvard Business Review and write a short response to it. Two of the sections were randomly selected to receive an excerpt that pointed out the benefits of working in teams (Ross 2008), one section received an excerpt that pointed out the flaws of teams (Coutu 2009), and finally the last two sections received an excerpt that focused on learning which was intended to induce neutral reactions on the subjects and create a control group

(Markman 2012). After 5 minutes, subjects were told to turn in their responses. Our expectation was that priming on the benefits of teams with these articles would sharpen the tendency to fairness that Kalisch et al. observed in their experiments. On the other hand, priming on the liabilities of teams would dampen that tendency, freeing up players to bargain more competitively.

Negotiation 1: The subjects were then split up into triplets by predetermined randomization of their study ID numbers. Once grouped, the negotiation was explained. The participants were also told of the potential monetary incentive available with more point accumulation as well as the importance of their engagement and full effort to the success of the negotiation. A significant effort was made to ensure full effort of participants. (See Appendix 1 for full instructions and more detail about motivation for engagement.) One participant (A) had a right shoe, and two participants (B and C) had left shoes. Together, a right and a left shoe could be “sold” for 100 points with proceeds to be distributed however the members so wished. There was a time limit of 10 minutes, after which each individual in a group that did not reach an agreement received 0 points. To encourage full effort of participants, no electronic devices were allowed during the study, and participants who finished early could not leave or work on other material. Additionally, the participants were rewarded \$0.05 per point as an incentive to maximize motivation in the study. The subjects reported their agreements and the duration of their negotiation on a post-negotiation form. A separate form was completed by participants asking how well they knew their negotiation partners as well as how participants felt about the negotiation after the fact.

Negotiation 2: After all of the responses are collected, we asked the subjects to rearrange themselves into new triplets based on a randomization that we had done earlier, ensuring the

partners were different than the first negotiation. This negotiation proceeded exactly the same as the first, including the same monetary incentives. At the end of the 10 minutes allotted for this negotiation, the groups handed in their agreements on a post-negotiation form that also indicated again how well they knew their negotiation partners. At the conclusion of the second negotiation, subjects were debriefed and paid in cash for the points they earned during the two negotiations. This concluded the study and participants were free to leave after collecting their monetary compensation.

Results

Measurement

Before estimating complex models from the observed data collected from our experiments, we first assessed the quality of the measurement of latent psychological traits. We tested the internal consistency of the questionnaire items to confirm that, taken together, the appropriate items were returning reliable measures of the three individual traits that we tested (extraversion, agreeableness, and need for cognition). Figure 1 displays the outputs of a scale reliability coefficient alpha test. Since all of our measures were at or above the conventional 0.85 level (as indicated by the red line), we conclude that our questionnaire items were reliable indicators for the traits we wanted to measure.

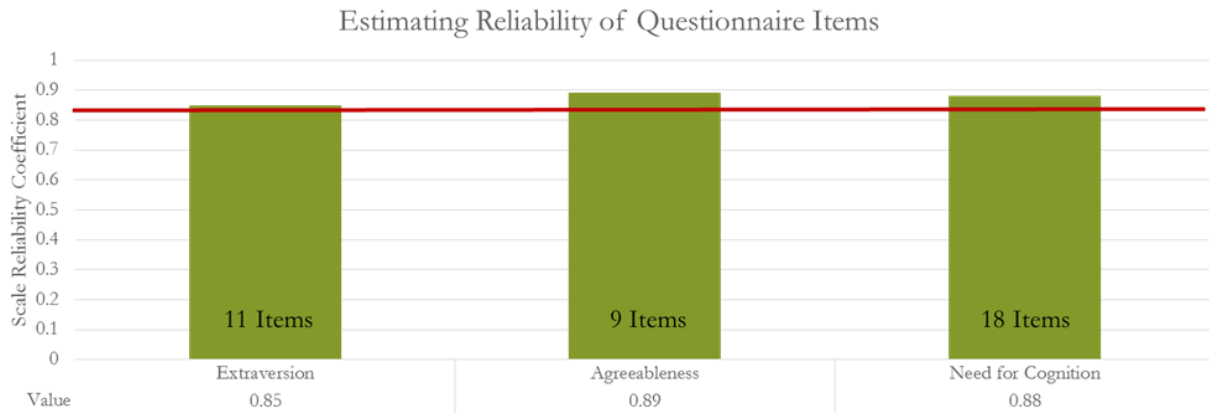


Figure 1: Scale Reliability Estimation

Next, we wanted to gauge the pattern of intercorrelations of personality traits in our sample. A very strong indication of correlation between the personality traits could limit our analysis since we would expect inherent collinearity in our regressions necessitating adjustments to model estimation to avoid bias stemming from multicollinearity. Figure 2 is a scatterplot matrix with our three personality and cognitive traits. The matrix depicts the agreeableness variable in the first row and first column, the extraversion in the second row and second column, and the need for cognition variable in the third row and third column. Though we see positive correlation between agreeableness and the two other traits, the correlation coefficients are both below the accepted 0.25 threshold (Forrester 2015) so we can conclude that the three traits regressed together would not exhibit significant multicollinearity bias in our results.

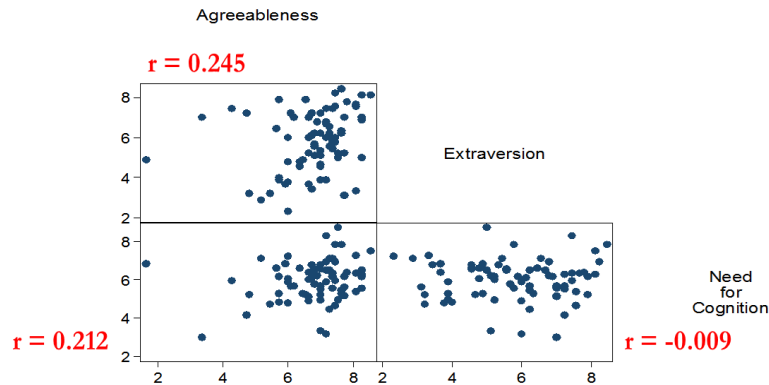


Figure 2: Correlation Matrix for Individual Characteristics

Because our critical latent variables appear to be reliably measured, we will now move to a discussion of all the variables in our analysis. Table 1 below shows the summary statistics of the key variables referenced in this paper.

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Points	150	31.25	16.55	0	99
Age	75	19.27	1.04	18	23
Male	150	0.61	0.49	0	1
Teamwork	150	0.20	0.40	0	1
Individual	150	0.44	0.50	0	1
Extraversion	150	5.78	1.50	2.33	8.44
Agreeableness	150	6.79	1.13	1.64	8.54
Need for Cognition	150	5.99	1.06	3	8.72
Time	141	242.28	156.80	9	586

Table 1: Data Summary Statistics

Our main method of analysis was to look at the 150 individual negotiation results we observed. In other words, each observation is one negotiation result. In total, we had 75 participants who each engaged in two negotiations in the session they attended. Because the participants in our negotiation earn 100 total points in every case that an agreement is reached,

we would expect the average number of points to be 33.33, as participants should look to extract as much of the 100 point value as they can from the negotiations. In contrast, we found the mean points to be 31.25. This is partly due to the three negotiations that ended without an agreement where all participants received zero (also limiting our analysis of the time variable by 9 observations), but also to some agreements that reported a total distribution less than 100 points. Figure 3 shows the distribution of the total points across all experiments.

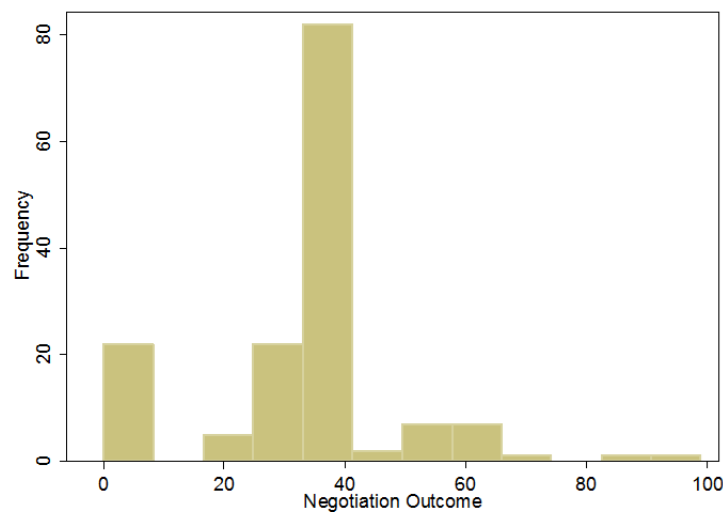


Figure 3: Negotiation Points Distribution

Of the 50 negotiations recorded, 23 ended in a split of points that was roughly equal (34, 33, 33), and three ended in no agreement being reached. As posited by the theory behind the Shapley value, we observed considerable difference between the mean points of position A and mean points of positions B and C. Position A participants scored on average 15 points higher, a statistically significant difference ($p < 0.01$). Figure 4 shows the points distribution between the different positions.

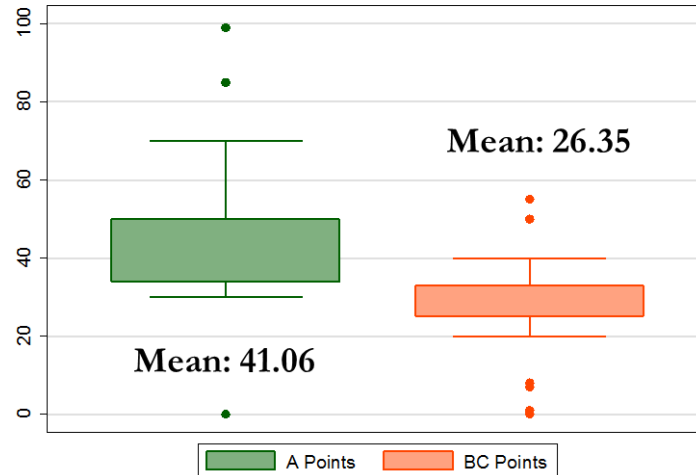


Figure 4: Comparison of Outcomes by Position

Speaking to the makeup of the participants themselves, we saw that the average participant was 19 years old with 61% of the participants being male. Relative to their personality traits, subjects' scores in agreeableness demonstrated the least variation. Figure 5 shows the distribution of our three key personality and cognitive traits.

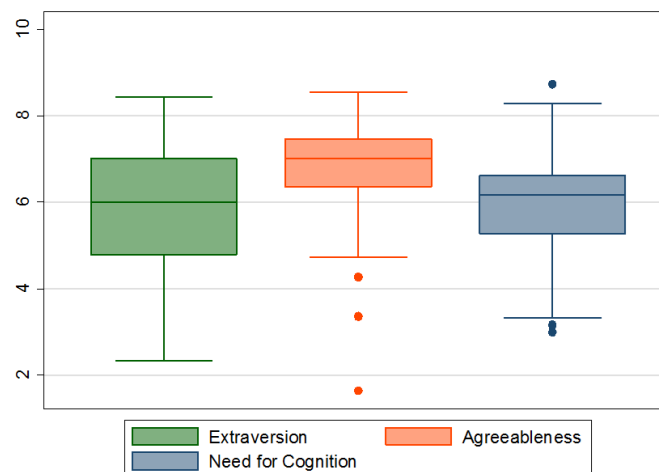


Figure 5: Comparison of Scores on Individual Traits

The time taken to complete the negotiations showed considerable variability from the 4 minute (240 second) average with a standard deviation of 1.5 minutes. Upon closer observation, the first negotiations were close to normally distributed while there was a clear skewness to the right in the second negotiations, likely due to learning effects or participant indifference. Figure 6 shows the contrast in time between the two negotiations.

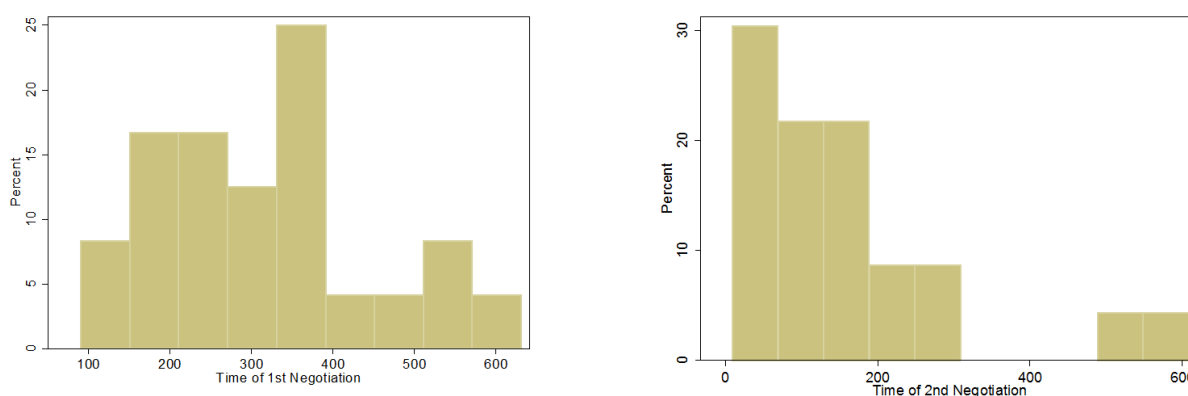


Figure 6: Comparison of Lengths Between Negotiation Rounds

Finally, our manipulations had unequal distribution among our sessions because only one session was exposed to individual priming and each session had different numbers of participants who showed up. 20% of our participants exposed to teamwork priming, 44% exposed to individual priming, and the remaining 36% being under the control condition. We explore the significance of this difference in the following section.

Model Estimation

In total, we oversaw 50 negotiations between permutations of 75 players; of the 50 negotiations, 48 of them resulted in successful agreements between two or three players, and three negotiations failed to result in an agreement. As previously stated, we sought to test for a relationship between negotiation outcome and an individual's personality and cognitive ability.

However, given the varying power dynamics provided by the game design, it was necessary to separate the analysis of the different roles (A, B, and C). Role B and C were combined given that each possessed the same bargaining power.

Correlates of Success for a Negotiator in Power: In order to test for a relationship in regard to player A, the following regression model was estimated using STATA version 13.1:

$$(1) \text{ "A" Outcome} = B_0 + B_1 * \text{"A" Extraversion} + B_2 * \text{"A" Agreeableness} + \\ B_3 * \text{"A" Need for Cognition} + B_4 * \text{"B\&C" Extraversion}$$

Understanding that group dynamics play a key role in the outcomes, the average extraversion of the B and C players was included as a control for the impact that those individuals had on the outcome of player A. It was determined that for players B and C, extraversion was the significant predictor for their respective outcomes (see Table 3), hence its inclusion in the model while other characteristics such as need for cognition and agreeableness were not included. The results of regression (1) are shown in Table 2. Player A's need for cognition score had a notably positive coefficient and was statistically significant at $p < .10$. Although an alpha level of 0.05 is more standard, due to subject pool constraints that left us with a smaller than ideal sample size, we have used 0.10 throughout the paper to draw conclusions from the data. For purposes of this thesis investigation, we accept a slightly higher risk of false positive errors in order to reduce the considerable chance of a false negative error. For player A, an individual in a bargaining position of power, higher need for cognition predicts a higher (better) negotiation outcome.

A Points	Coefficients	Standard Error	t Stat	P-value
Intercept	16.06	23.78	0.68	0.50
Extraversion	2.76	1.85	1.49	0.14
Agreeableness	1.01	2.07	0.49	0.63
Need for Cognition	4.44	2.66	1.67	0.10
B+C's Average Extraversion	-4.37	2.84	-1.54	0.13

Table 2: Factors Impacting Payoffs for A

The outcome experienced by A players was separated into roughly equally sized categories and plotted against outcomes to show relatively higher concentration (especially at levels above 50) of the negotiation outcome of players at the highest level of need for cognition.

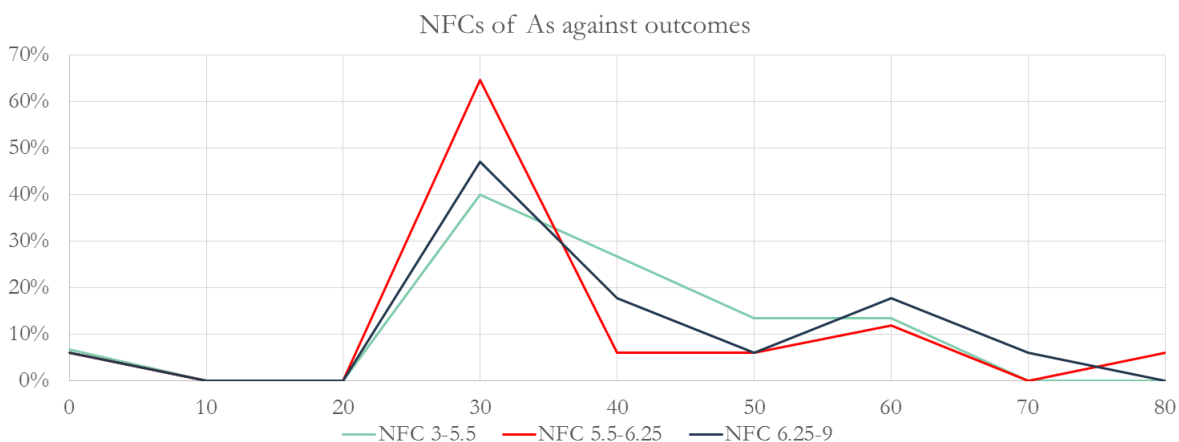


Figure 7: NFCs of As Against Negotiation Outcomes

Correlates of Success for Low Power Negotiators: In order to test for a relationship between negotiation outcome and individual characteristics for players B and C, the following regression was run:

$$(2) \text{ "B+C" Outcome} = B_0 + B_1 * \text{"B\&C" Extraversion} + B_2 * \text{"B\&C" Agreeableness} +$$

$$B_3 * \text{"B\&C" Need for Cognition} + B_4 * \text{"A" Need for Cognition}$$

Here, the need for cognition of player A was included as a control for the overall group dynamic, given that as shown in Table 2, need for cognition was the significant driving factor of player A's outcome. The results of regression (2) are shown in Table 3. Player B's and C's extraversion was shown to have a positive and statistically significant impact on negotiation outcome, meaning greater extraversion predicts a higher outcome.

B and C Points	Coefficients	Standard Error	t Stat	P-value
Intercept	29.01	14.38	2.02	0.05
Extraversion	1.59	0.92	1.73	0.09
Agreeableness	-1.60	1.37	-1.17	0.25
Need for Cognition	-0.23	1.26	-0.18	0.85
A's Need for Cognition	0.10	1.38	0.07	0.94

Table 3: Factors Impacting Payoffs for B and C

As with the analysis of players in power, B and C players were separated into buckets by extraversion and the results were plotted, as shown below in Figure 8. This demonstrates a similar distribution of players who are in the top two buckets, but noticeably lower scores for the players who were in the lowest part of the distribution.

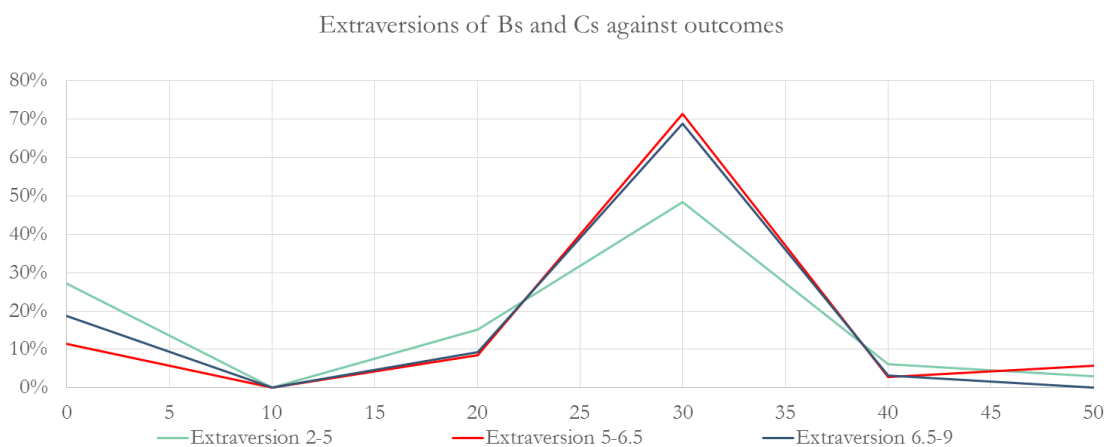


Figure 8: Extraversion of Bs and Cs Against Outcomes

Correlates of Time Spent Negotiating: While the analysis thus far has centered on the factors that affect a given player's negotiation outcome, we also sought to analyze the notion of time and how long it took a group to reach an agreement. To do so, we compared the negotiation length to the average personality score of each member of the group. This is expressed in the following regression:

$$(3) \text{ Negotiation Length} = B_0 + B_1 * \text{Average NFC} + B_2 * \text{Average Extraversion} + B_3 * \text{Average Agreeableness}$$

The results of this regression are shown below in Table 4. The average need for cognition score of the group was shown to be a key driver for the time it took the group to come to a consensus and enter into an agreement.

Time to Reach Agreement	Coefficients	Standard Error	t Stat	P-value
Intercept	-560.34	334.64	-1.67	0.10
All Average NFC	91.26	37.33	2.44	0.02
All Average Extraversion	-12.30	26.13	-0.47	0.64
All Average Agreeableness	48.22	35.87	1.34	0.19

Table 4: Factors Impacting Negotiation Length

This trend is evident in Figure 9 below, showing Need for Cognition against Time to Agreement.

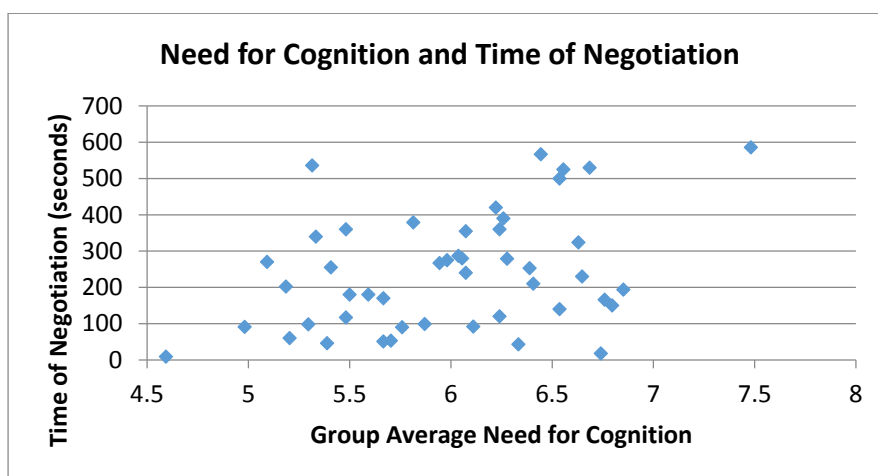


Figure 9: Relationship Between NFC and Negotiation Length

The characteristics of the individuals who failed to reach agreements (9 total participating in 3 negotiations) are listed below.

Table 5a: Experiment 3, Round 1, Table 6

Manipulation:		Control		
	Gender	Need for Cognition	Extraversion	Agreeableness
A	M	5.67	6.22	7.00
B	M	6.50	6.67	7.18
C	M	7.28	8.09	3.33

Table 5b: Experiment 3, Round 2, Table 3

Manipulation:		Individual		
	Gender	Need for Cognition	Extraversion	Agreeableness
A	F	6.61	4.56	6.36
B	M	6.22	6.78	6.91
C	M	5.67	7.00	6.22

Table 5c: Experiment 4, Round 2, Table 2

Manipulation:		Individual		
	Gender	Need for Cognition	Extraversion	Agreeableness
A	M	3.00	7.00	3.36
B	F	6.50	5.00	8.27
C	M	6.17	7.73	5.22

Table 5: Characteristics of Individuals Who Did Not Reach Agreements

All three relevant personality and cognitive characteristics we have studied throughout this paper seem to be high for the individuals in this sample. There are not many strong observations to be drawn from these nine individuals. In experiment 42b, it's worth noticing that the A of the group had the lowest need for cognition of anybody in our sample size.

Finally, we analyzed the negotiations by type of priming to observe differences, if any, in points acquired by the participants based on whether they were exposed to a teamwork or individualistic writing prompt. Surveying the data in histogram form, it seems only 10% of negotiators cooperated to split the points evenly after being primed on the value of individualism

whereas in the control group, 56% of negotiations resulted in even splits. It is notable that teamwork priming didn't seem to have an impact; 55% of negotiations in sessions with positive teamwork priming resulted in an even split. Figure 10 compares the point distributions below:

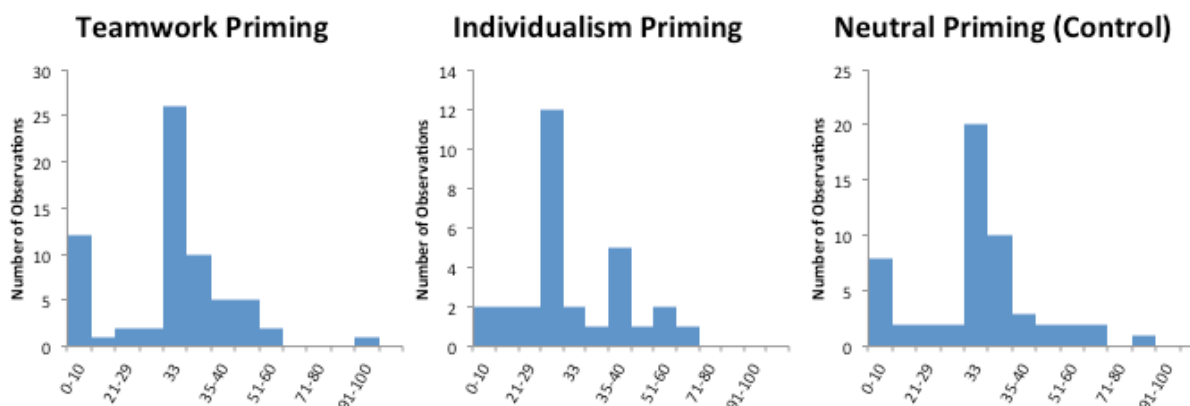


Figure 10: Comparison of Points Distribution by Manipulations

While the teamwork priming and control groups look similar in terms of distribution of outcomes, there seems to be more of a bimodal distribution in outcomes for the group with individualism priming. Tables 6 and 7 below compare the number of cooperative agreements that resulted under teamwork and individualism priming to the number of equal splits under neutral conditions. The chi-square result is also displayed:

	# of Equal Agreements	# Non-equal	Total Negotiations	% Equal
Positive (Teamwork)	12	10	22	54.55%
Neutral	10	8	18	55.56%
chi²	0.3428			

Table 6: Cooperative Agreements Under Teamwork Priming

	# of Equal Agreements	# Non-equal	Total Negotiations	% Equal
Negative (Individual)	1	9	10	10.00%
Neutral	10	8	18	55.56%
chi²	0.0041			

Table 7: Cooperative Agreements Under Individualistic Priming

After running a chi-square goodness of fit test to identify differences in the means of these manipulations independent of position, we observed that priming for individualism produced a statistically significant ($p < 0.01$) effect on players' tendencies towards even splits. On the other hand, priming for teamwork did not produce any more cooperation among subjects compared to the control group. It seems that individuals will claim more values for themselves when reminded or encouraged to do so.

Discussion

Our results suggest that when in a position of power need for cognition has a significant and positive impact on your negotiating outcome. Average need for cognition was also found to have a positive impact on length of negotiation. Extraversion was found to drive success for players not in power, while agreeableness was not found to have a statistically significant impact on any of the outcomes that we studied. The manipulation that we conducted to prime individuals against teamwork increased the variance of payoffs and encouraged individuals to deviate from default egalitarian behaviors. These findings together provide significant insight on the forces that impact negotiation outcomes and explain some of the reasons behind the empirical deviation from theoretical solution concepts to the game we evaluated.

Comparing our results to the theoretical expectations, the data points resemble the Shapley value (67.7, 16.7, 16.7) much more closely than the core (100, 0, 0), although our results differ significantly from both. Our means (44, 31, 25) when excluding negotiations that did not reach an agreement or (41, 29, 24) when counting such negotiations as all "0"s were not well predicted by either the Shapley or core values (shown in Figure 11 below). However, our results are consistent with the findings of Murnighan and Roth in that they more closely align with the Shapley value. Only one player A received a payoff close to 100 (99 points) as the core would

predict, though the outcome was largely the result of a prior familiar relationship existing between the two players in the coalition.

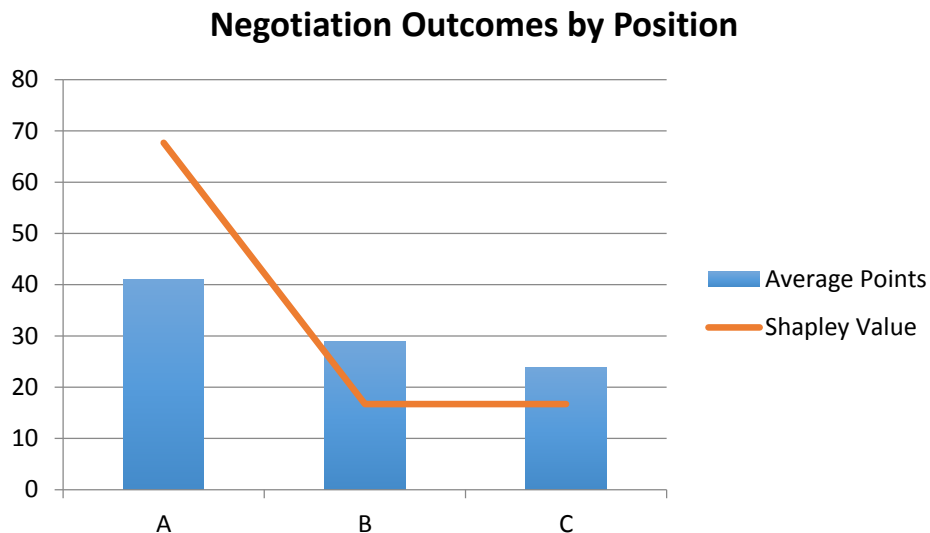


Figure 11: Comparison of Position Outcome Means

Our observation of significant deviance Shapley value and towards a more even distribution of payoffs suggests some combination of those in power demonstrating a lack of willingness to exercise the power provided to them by random chance – consistent with the equality heuristic – and those not in power being extremely effective at convincing the monopolist (player A) to treat them benevolently. Our incorporation of the need for cognition trait as a predictor of negotiation success seems to align with Roch et al.’s findings that “those with higher cognitive capacity are able to consider other situational cues that encourage adjustments from the equality heuristic” and thereby claim more value for themselves. Indeed, our finding that A’s need for cognition is a significant predictor of point accumulation confirms that cognitive capacity can impact whether an individual in the right situation (in this case, a powerful monopolist position) seeks deviation from the egalitarian outcome.

The phenomenon of player A generally being unwilling to wield the power that he or she was given, may be the result of the first-stage decision-making heuristic that cause small groups to split resources equally as reported by Roch et al. We believe that this observation is also exaggerated within our sample given the undergraduate context, in which there exists high pressure to cooperate and form coalitions. In fact, only three negotiations of the 50 total resulted in two as opposed to three person coalitions. Given that the subjects were all part of the same small business program within the university, we believe there was disincentive for participants to act aggressively given the potential for preexisting relationships or concern for maintaining a positive reputation. The unwillingness of position A players to claim more value could also reflect the emphasis of today's business programs on the importance of teamwork and cooperation. In fact, based on our observations of the responses to the reading passage, many subjects disagreed with the article that promoted individualistic behaviors during their responses (though as the previous section showed, the individualistic priming still produced more variance in outcomes). This observation on the tendency towards cooperation could also explain why agreeableness as a personality factor had no statistical significance in determining player outcomes. All players generally maintained an agreeable disposition throughout the negotiations.

A caveat to this general agreeableness, however, is that the behavior of subjects seemed to be greatly impacted by the atmosphere of the entire group participating in each section. While we did our best to control for variation and separate negotiations, it was clear that group consensus could sway individuals to be either more cooperative or more competitive. Two of the three no-negotiation occurrences were in the same groups of negotiations. This makes the analysis of our manipulation groups more complicated as some players may have been behaving based on the behaviors of others in their session or the previous round's outcome.

Still, when splitting up our analysis of average negotiation outcomes based on the manipulation groups, it's clear that those primed to appreciate individualism saw negotiation outcomes that more closely resembled Shapley value predictions. Figure 12 below compares mean outcomes of each experimental group against the control group.

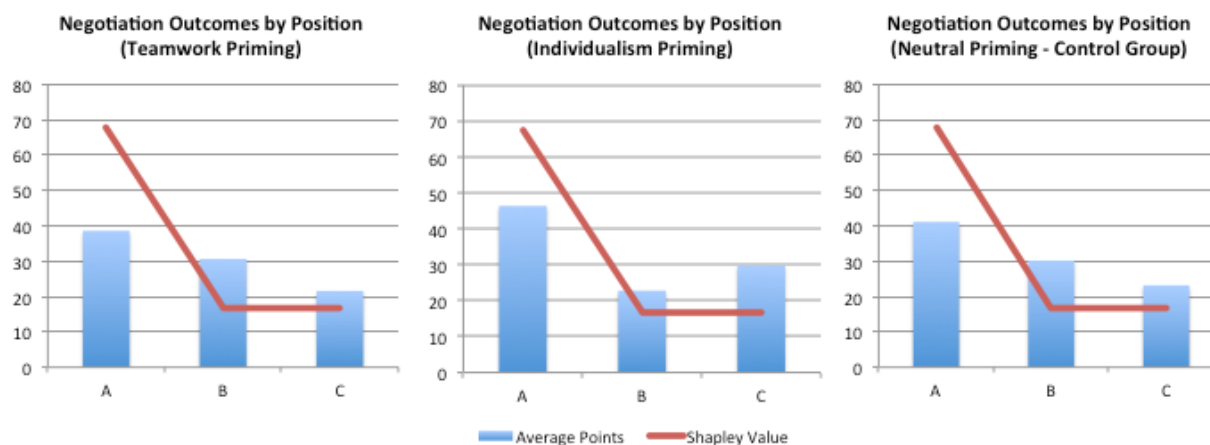


Figure 12: Comparison of Mean Negotiation Outcomes by Manipulation Group

The results of the individualism-primed group, which exhibited the most variance (46.4, 22.8, 29.8), still do not match the Shapley value as well as the results of Murnighan and Roth's experiments do (Player A claimed 64.8 points on average). Nevertheless, the results confirm Burnham et al.'s research on the significance of intentionality priming on negotiation behaviors. By default, subjects tended to engage in cooperative negotiations, but with some encouragement to be individualistic, players can become more competitive.

Studying our results under the concept of power, it is clear that Player A is in the power position as a monopolist, though his power was curtailed by the need to cooperate with at least one partner. Our analysis would imply that individuals in power positions can collect more for themselves when they have higher need for cognition, perhaps to help them overcome the

equality heuristic present in small group environments. On the other hand, the less powerful players needed to rely on their own extraversion to build consensus and convince others to include them in the coalition.

Limitations and Future Research

We acknowledge that our study has a number of key limitations, which are in large part a result of the experimental environment. Our study features undergraduate business students from a single highly-selective, four-year university, and thus it is reasonable to expect some level of homogeneity across subjects, particularly in regard to cognitive metrics such as need for cognition. The lab environment also yields several other notable limitations, relating to sample size, financial incentives, and experiment length. While our total sample size included 150 data points, given pairing into triads, our sample was limited to 50 unique negotiations. Our power analyses, detailed in Appendix 6, revealed that a greater sample size of 280-450 negotiations could have reduced the chances for a Type II error. Financial incentives were tied directly to negotiation performance, but were capped at a maximum of \$10. There is reasonable concern that such an incentive would not be sufficient in all cases to induce real-life behavior, such as that one would exhibit when negotiating an outcome of greater importance (i.e. starting salary for a job). Finally, our experiment featured only two rounds of negotiations. In order to more accurately measure any sort of effect over time (i.e. a “learning effect”), more rounds would likely be needed. One last additional limitation is a result of a deliberate experimental design choice to have participants engage in face-to-face negotiations. While we believe this more closely mimics common real-world scenarios, we acknowledge that it could have also led to a greater social pressure to more evenly distributed outcomes, a topic that has been thoroughly discussed throughout the paper.

Our research suggests significance in the impact of individual personality and cognitive traits on negotiation outcomes, which warrants further study in the field. The results corroborate the observations of Kalisch et al. that “personality differences between the players were everywhere in evidence.” Given the limitations of our work, however, we recommend that future work in this space increase the robustness in experimental design and execution in order to produce more statistically sound results. As the power analysis in Appendix 6 demonstrates, sample size is perhaps our greatest concern; we needed approximately six times more negotiations than we had in order to increase the power of the test to the 0.8 level. A larger pool can also allow for better discernment of any significant differences between priming manipulations. Corroboration by future research of a significant impact of friend or foe priming on negotiation outcomes would help better predict individuals’ negotiation performance by taking into account both inherent and environmental factors.

Given the tendency to cooperate that we observed among our subjects, it would also be interesting to observe whether a larger and more diverse sample size would lead to results that more closely resembled the Shapley value. Murnighan and Roth’s experiments on a similar population to ours yielded significantly more variance in their results. We wonder whether it’s the population from which our sample was selected or a procedural issue with the experiment that resulted in the low variance across outcomes that we observed in our results. Better incentives, for example, or perhaps even no incentives at all may have motivated the subjects to take the experiment more seriously and bargain harder for themselves. Alternatively, because the subjects were all from a small Midwest business school, there was high likelihood that they knew each other and didn’t want to take advantage of the power positions they had.

With a more diverse subject pool, it would also be possible to study other individual characteristics that could impact negotiation behaviors and performance. For example, the other three personality factors of the Big Five – neuroticism, conscientiousness, and openness – could impact outcomes, and subjects outside of a top undergraduate university may exhibit greater variance in terms of conscientiousness. Similarly, because measures of intellect such as SAT scores are incorporated into undergraduate placement, our study could not use this as a proxy for general intelligence. A larger subject pool from a variety of educational backgrounds would have a wider range of intellect scores and could provide the right conditions to study what was originally our topic of interest: the impact of intelligence on negotiation ability.

Conclusion

Past research noted the potential for but failed to fully examine the effect of individual characteristics on complex multi-party negotiations. Enhancements in metrics relating to personality and cognitive ability provide a unique opportunity to reevaluate this subject. Our initial hypothesis laid the claim that need for cognition, and both the extraversion and agreeableness personality metrics, would have an impact on the value an individual was able to capture within a negotiation. In setting out to determine if such factors could predict negotiation performance, we ultimately found that results varied greatly according the power dynamics at play. For those who assumed the role of Player A, which had a definitively stronger bargaining position, need for cognition proved to be the sole statistically significant factor. For those who assumed the role of either Player B or C, extraversion proved to be the sole statistically significant factor. These results have a number of important implications. They first suggest that indeed certain individuals will perform best under specific negotiation scenarios. For roles where there exists a clear position of power, examples being managers or executives, our results

revealed that need for cognition should be valued. Individuals with higher cognitive ability are more likely to be able to translate bargaining power into key strategic advantages. On the flip side, in roles where there is some form of a power deficit, examples being salesmen and students, extraversion should be valued. In such situations, being forthcoming, comfortable, and confident in your communication could serve as a means by which to overcome the power deficits.

Secondly, our research demonstrates that negotiating groups with higher average need for cognition tend to take more time before reaching an agreement in negotiations. This has significant ramifications when thinking about negotiations that are occurring with time pressure – perhaps opposing parties’ own need for cognition can be to their disadvantage if a time limit is imposed upon them. Also, when time is a scarce resource, predicting the length of time it will take for a negotiation to be reached can be valuable for managers.

Thirdly, our research found an impact of manipulation on negotiators in their likelihood to evenly distribute points despite a significant power difference. When participants in our study were given a passage discouraging teamwork, we found them far less likely to benevolently distribute points evenly amongst negotiation participants. This suggests that despite what appeared to be a disposition towards egalitarianism in our study, when primed in the proper way, people will be more likely to claim more value for themselves.

Finally, we believe that above all, our results merit further research. In confirming Kalisch et al.’s initial observations of the importance of individual characteristics, but also noting the limitations of our study and subsequent data set, we offer justification for further research efforts with larger sample sizes, more variable populations, and higher incentives.

Appendices

Appendix 1: Script for Experimenter to Motivate Engagement

“As noted in the consent document, you will be paid for your participation in this study. Your points will be converted into monetary amounts at a rate of \$0.05 per point with a maximum of \$10. The more points you can collect from the negotiation, the more money you will earn at the end of the study. Your objective is to maximize your individual payoff. Are there any questions? Finally, we’d like to remind you that your fully engaged participation is absolutely critical to the success of this study. Please approach this negotiation as though you are in a class or professional setting. Independent of the actual monetary payoff, we encourage you to imagine that you to put your best effort forward and take your time negotiating, imagining that you are in a scenario in which each point represents \$500. You may begin negotiating now.”

Appendix 2: Personality and Cognition Questionnaire

1	I tend to set goals that can be accomplished only by expending considerable mental effort
2	I like tasks that require little thought once I’ve learned them
3	I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.
4	I only think as hard as I have to.
5	I prefer to think about small, daily projects to long-term ones.
6	I don't talk a lot.
7	I would rather do something that requires little thought than something that is sure to challenge my thinking abilities
8	I am interested in people.
9	I feel others' emotions.
10	I am relaxed most of the time.
11	I find little satisfaction in deliberating hard and for long hours.
12	I make people feel at ease.
13	I talk to a lot of different people at parties.
14	I prefer my life to be filled with puzzles that I must solve.
15	I appreciate opportunities to discover the strengths and weaknesses of my own reasoning.
16	I keep in the background.
17	Thinking is not my idea of fun.
18	I have difficulty understanding abstract ideas.

19	I am quiet around strangers.
20	I would prefer complex to simple problems
21	I really enjoy a task that involves coming up with new solutions to problems.
22	I feel comfortable around people.
23	I am not really interested in others.
24	I try to anticipate and avoid situations where there is likely chance I will have to think in depth about something
25	I am not interested in other people's problems.
26	I have little to say.
27	I don't mind being the center of attention.
28	I am the life of the party.
29	I feel little concern for others.
30	I start conversations.
31	Simply knowing the answer rather than understanding the reasons for the answer to a problem is fine with me
32	Learning new ways to think doesn't excite me very much
33	I take time out for others.
34	I insult people.
35	I leave my belongings around.
36	I usually end up deliberating about issues even when they do not affect me personally
37	I don't like to draw attention to myself.
38	The idea of relying on thought to make my way to the top does not appeal to me
39	I have a soft heart.
40	I sympathize with others' feelings.
41	I prefer just to let things happen rather than try to understand why they turned that way.

Appendix 3: Neutral Reflection Passage

Please read and then using the space below reflect on the passage. Does it make sense? Do you agree with author?

You probably don't know as much as you think you do. When put to the test, most people find they can't explain the workings of everyday things they think they understand.

Don't believe me? Find an object you use daily (a zipper, a toilet, a stereo speaker) and try to describe the particulars of how it works. You're likely to discover unexpected gaps in your knowledge. In psychology, we call this cognitive barrier the illusion of explanatory depth. It means you think you fully understand something that you actually don't.

We see this every day in buzz words. Though we often use these words, their meanings are usually unclear. They mask gaps in our knowledge, serving as placeholders that gloss concepts we don't fully understand.

(Markman, 2012)

Appendix 4: Teamwork Priming Reflection Passage

Please read and then using the space below reflect on the passage. Does it make sense? Do you agree with author?

High-functioning teams are what make high-performing companies click. Whether the task is to create an innovative service or implement a new system, groups rather than individuals are shouldering more of the burden than ever before. The ideal team merges individual talents and skills into one super-performing whole with capabilities that surpass those of even its most talented member.

What distinguishes top teams from the rest? High-performing teams aren't the result of happy accident, research shows. They achieve superior levels of participation, cooperation, and collaboration because their members trust one another, share a strong sense of group identity, and have confidence in their effectiveness as a team.

"When you create a climate of trust and the sense that 'We are better together than we are apart,'" says Druskat, "it leads to greater effectiveness."

(Ross, 2008)

Appendix 5: Competition Priming Reflection Passage

Please read and then using the space below reflect on the passage. Does it make sense? Do you agree with author?

Over the past couple of decades, a cult has grown up around teams. Even in a society as fiercely independent as America, teams are considered almost sacrosanct. The belief that working in teams makes us more creative and productive is so widespread that when faced with a challenging new task, leaders are quick to assume that teams are the best way to get the job done.

Not so fast, says J. Richard Hackman, the Edgar Pierce Professor of Social and Organizational Psychology at Harvard University and a leading expert on teams.

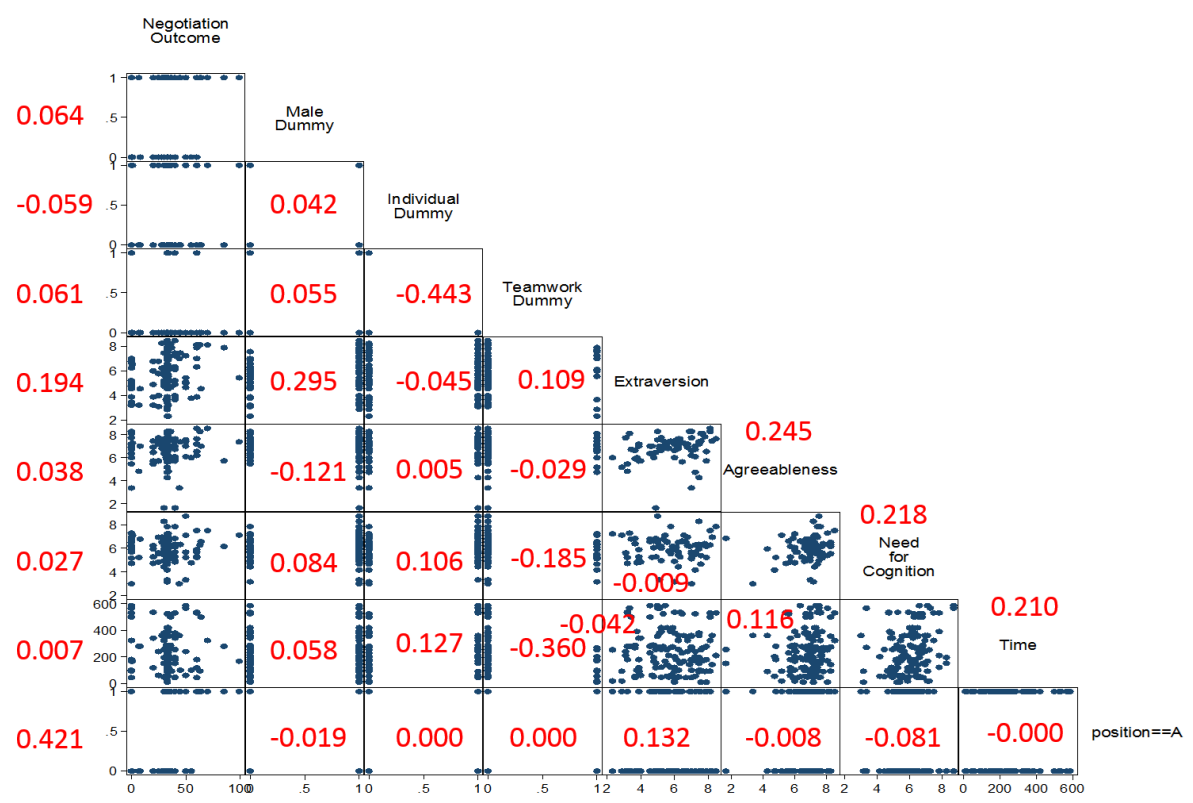
Research consistently shows that teams underperform, despite all the extra resources they have. That's because problems with coordination and motivation typically chip away at the benefits of collaboration. And even when you have a strong and cohesive team, it's often in competition with other teams, and that dynamic can also get in the way of real progress. So you have two strikes against you right from the start, which is one reason why having a team is often worse than having no team at all.

(Coutu, 2009)

Appendix 6: Power Analyses for Significant Results

Test	Power	Sample Size Needed for Power = 0.8
A's Need for Cognition	0.38	453
B+C Extraversion	0.40	303
Time Average NFC	0.68	284

Appendix 7: All Variable Correlation Matrix



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