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SOCIAL DECISION-MAKING IN INDIVIDUALS WITH AUTISM SPECTRUM DISORDER: EXAMINING THE EFFECT OF FACIAL EXPRESSION ON ULTIMATUM GAME DECISIONS

A Dissertation

Submitted to the School of Graduate Studies and Research

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Requirement for the Degree

Doctor of Psychology

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Title: Social Decision-Making in Individuals With Autism Spectrum Disorder: Examining the Effect of Facial Expression on Ultimatum Game Decisions

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Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that presents early in development. Social communication and social interaction deficits are required to make a diagnosis. These deficits make it difficult for individuals with ASD to perceive and/or utilize social cues from an interpersonal exchange when compared to their neurotypical counterparts. Bargaining is a type of interpersonal exchange that requires anticipating the actions of others (Nash, 1950). The current study compared bargaining behaviors in individuals with ASD to typically-developing (TD) individuals by having both groups act as responders to 40 trials of the Ultimatum Game. The Ultimatum Game is an economic game in which a proposer offers a certain number of tokens to the participant, requiring them to accept or reject the offer (Güth, Schmittberger, & Schwarze, 1982).

A total of 33 participants played against eight images of four different faces that they were told were their opponents. Each participant was presented with images of both a happy and angry face at different token offers (one through five out of ten) to see the effect facial expression had on acceptance rates at each offer level. No differences in game behavior, measured by acceptance rates between groups were found between the ASD and TD groups. However, results did support an effect of offer and facial expression on response rates in both groups. Specifically, both groups were more likely to accept higher offers and offers from proposers with happy faces. Additionally, contrary to hypotheses, results show that participants

with ASD were not significantly more likely to accept unfair offers when compared to TD participants. Possible explanations for these results, along with limitations, implications, and future directions are discussed.

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CHAPTER 1

INTRODUCTION

Fiske (2010) suggested that people are motivated to belong to a group and have stable relationships with others. To form strong bonds with others, we must be motivated to get along with others and interact appropriately. It has been proposed that, evolutionarily, we need others for basic survival (Fiske, 2010). Individuals have evolved to understand each other and their environment; shared understanding is adaptive and engenders a feeling of belonging in a group. The capacity to make sense of social situations and interact socially in an efficient manner facilitates the ability to function as is socially expected in a group (Fiske, 2010). However, there are some individuals who struggle to read and interpret social cues (Durand, 2014), and thus, do not always react in accordance with social norms.

Autism spectrum disorder (ASD) is a pervasive neurodevelopmental disorder, symptoms of which are present in the early developmental period, usually evident by around 12 to 18 months of age. Difficulties with social communication and social interaction across a variety of situations and contexts are required for diagnosis (American Psychiatric Association, 2013). To perform well in social interactions, individuals must infer their partner's intentions, as well as modify behavior in a strategic way to successfully obtain their goals (Billeke et al., 2014). The difficulties associated with ASD make it harder for individuals with this disorder to perceive and/or utilize social cues from an interpersonal exchange compared to their neurotypical counterparts. If an individual is unable to identify or utilize cues taken from social interactions, they may be unaware of the need to adjust their behavior to the expectations and needs of the other person involved in the interaction (Plumet & Veneziano, 2015). There are several forms of

social interaction, but bargaining is the focus of this study due to its strong ties to cooperative behaviors and anticipation of action (Nash, 1950).

Bargaining is the process that occurs when two people attempt to come to a decision with which both are comfortable, and that mutually benefits both parties (Nash, 1950). Research shows that bargaining is a skill that is acquired during childhood along with prosocial and cooperative behavior, and it develops over time. The age at which bargaining begins to develop varies. Advances in bargaining are the result of increased cognitive capacity needed to make decisions about what is fair or unfair, which increases with age (Harbaugh, Krause, & Liday, 2002). Bargaining is a social behavior that takes into account one's own wants and needs, along with expectation and anticipation of others' actions. To anticipate another's actions, a person must be able to deduce the intentions of others (Nash, 1950).

The Ultimatum Game is a bargaining game in which one player decides on the bargaining process in a "take it or leave it" situation (Camerer, 2003). The Ultimatum Game (Güth, Schmittberger, & Schwarze, 1982) can be useful for determining how well an individual can infer their partner's intentions and modify their behavior accordingly (Csukly, Polgár, Tombor, Réthelyi, & Kéri, 2011) although research suggests that the external validity of the game may be low (Galizzi & Navarro-Martinez, 2015). A proposer makes an initial proposition on how to divide a sum of money (or other goods) and a responder makes the final decision whether to accept or reject the offer. If the responder accepts the offer, the agreed-upon split is made. However, if the responder rejects the offer, neither the proposer nor responder receives any payment (Camerer & Thaler, 1995). The responder will usually reject an offer from the proposer if they think the offer is unfair in order to "punish" the proposer for the unfair treatment (Camerer, 2003).

Many studies have utilized the Ultimatum Game to study bargaining behavior in typical populations. Besides the perception of fairness, several other factors influence the acceptance and rejection rates of the responder, such as facial expression, age, and sex (Bailey, Ruffman, & Rendell, 2013; Ma & Hu, 2015; Mussel, Patrick, Göritz, Anja S., & Hewig, Johannes, 2013; Solnick, 2001). The Ultimatum Game is a representation of interpersonal interactions, and since deficits in interpersonal interaction are a defining characteristic of ASD, it is possible that Ultimatum Game behavior is significantly different in the ASD population compared to a neurotypical population.

While facial expression is a moderating factor in acceptance and rejection rates in the Ultimatum Game in the neurotypical population (Mussel, Patrick et al., 2013), no research has examined the role of facial expression on acceptance and rejection rates for individuals with ASD. However, it has been documented that children with ASD interact differently than typically-developing (TD) children when playing virtual trust games using facial images as social cues. For example, children with ASD are less likely than their neurotypical counterparts to modify their behavior when playing against an opponent with a face that had been previously determined as untrustworthy by neurotypical adults (Ewing, Caulfield, Read, & Rhodes, 2015).

The ability to cooperate with others is essential to the context of bargaining because one must attempt to meet one's own needs while also considering what the other party wants (Nash, 1950), yet differences in cooperation do not seem to be the main cause of the differences in behavior between individuals with ASD and neurotypical individuals in a bargaining situation or economic game play(Ewing et al., 2015; Sally & Hill, 2006). Specifically, studies of cooperative behavior using the Ultimatum Game find little difference in cooperation between ASD and neurotypical populations (Sally & Hill, 2006). However, individuals with ASD do not utilize

social cues, such as facial expression or social distance, to navigate social interactions (Plumet & Veneziano, 2015). Individuals with ASD do not utilize facial cues, and thus, do not change their behavior based on provided facial information in another type of economic trust game in which they were asked to invest tokens in various opponents (Ewing et al., 2015). Due to the identified lack of impact of facial information on this population, examining the effect of facial expression on behavior in another economic game may show additional significant differences in game behavior between ASD and neurotypical populations. This could be useful in learning more about cooperative or bargaining behaviors in the ASD population, providing more information about social behavioral differences between the two populations. Studying strategic behavior and bargaining in the ASD population may add to the current literature on other types of social behavior differences in the ASD population and provide more insight into the strategic and cooperative behaviors of children with ASD. Specifically, this study sought to determine whether facial expression influences acceptance and rejection rates in the Ultimatum Game for individuals with ASD.

CHAPTER 2

LITERATURE REVIEW

Cooperation

Norms are unwritten rules and values of a certain social group that can shape the behavior and attitudes of individual group members (Fiske, 2010). Every group of people has a set of norms that group members are expected to follow. Human societies as a whole embrace the norm of cooperation (Fehr & Fischbacher, 2004). Cooperation occurs when individuals help each other at an apparent cost to themselves to achieve mutual goals (Buston & Balshine, 2007). Human cooperation in a group is based on expectations and norms; individuals know to cooperate when others are cooperating but also know that it is acceptable to desert this norm if others are not reciprocating (Fehr & Fischbacher, 2004).

Research demonstrates the importance of cooperation. Rustagi, Engel, and Kosfeld (2010) studied cooperation and its effects on forest management. Cooperation was measured with a cooperation game, in which adult participants were paired together and provided with 6 bills of Ethiopian money. They were asked to contribute some amount of this money to a public good (no specific examples were provided), and the total amount of money contributed between both players was multiplied by 1.5, then split and distributed equally between both players regardless of the players' individual contribution. This demonstrates a cooperation dilemma because both players are best off when they contribute all of their money to the public good to receive maximum benefit. However, if player 1 decides to keep all their money and just take half of what was contributed by player 2, player 2 suffers while player 1 reaps the benefits. Rustagi et al. (2010) grouped participants who engaged similarly together, and found that the largest group (34% of participants) behaved as "conditional cooperators," meaning players contributed more

money when they saw their opponent was doing the same. This was compared to individuals in forest management groups, though these were not the individuals that were involved in the game. They found that forest groups with more conditional cooperators demonstrated better outcomes and were more successful in forest conservation, indicating that behavioral norms (such as conditional cooperation) are large motivators. Rustagi et al. (2010) used results from this experimental game to explain the success and prevalence of forest groups with more conditional cooperators. This same finding was demonstrated by Carpenter & Seki (2005), when they determined that measures of social preference are directly linked to fishing productivity; the fishing crews that exhibited higher levels of conditional cooperation were more productive.

The human inclination to construct norms and the desire to enforce these norms is the reason that cooperation in human societies is possible (Fiske, 2010). The evolutionary need to belong to a group is an important factor for norm following (Fiske, 2010). As long as individuals continue to follow norms, it is speculated that they will stay an imperative aspect of human behavior (Fehr & Fischbacher, 2004). Cooperation is needed for several types of human social interaction, including bargaining (Nash, 1950).

Bargaining

Successful bargaining requires a subset of skills related to cooperation. Cooperation is integral in the bargaining process because in order to come to a mutually beneficial trade, the individual must take into consideration the wants and needs of the other person involved in the interaction, even though they may have conflicting interests (Nash, 1950). For example, if person A wants to sell their house at a high price, and person B wants to buy that house at a low price, both have interests to trade money or goods for a gain, but have conflicting interests over the price to trade (Muthoo, 1999). For individuals to mutually benefit, there must be some level of

cooperation between the two. In addition to cooperation, anticipation of action is an important variable in bargaining. Neurotypical individuals in a bargaining situation often possess an expectation of a future outcome that drives the way they interact with one another (Nash, 1950; Rubin & Brown, 2013). Along with anticipation of action, there is evidence of social referencing in good bargaining behavior as well (Harbaugh, Krause, & Vesterlund, 2007). Harbaugh et al. (2007) found that children as young as 8 years adjusted their bargaining attempts to more closely match what they saw in others, and this effect increases with age.

The Ultimatum Game

A bargaining game is one that is played to solve a distribution problem, or a problem in which two parties have to decide how to share or dispense a sum total (Güth et al., 1982). There are several ways that bargaining behavior has been measured in the past, including the Ultimatum Game (Güth et al., 1982), the Prisoner's Dilemma Game (Flood & Desher, 1950), and the Dictator Game (Kahneman, Knetsch, & Thaler, 1986). In the Ultimatum Game, one player must decide on the outcome when it is restricted to two predetermined results; it is the simplest kind of bargaining (Camerer, 2003). It has been described as one player making a "take-it-or-leave-it" (Camerer, 2003) offer of how to divide a quantity. The structure of Ultimatum Game bargaining includes one player making the initial decision and another player making the final decision regarding the distribution of a certain sum of money.

In the Ultimatum Game, two players are allocated a sum of money that is to be divided between them. The first player is often called the proposer. The proposer offers a portion of the sum to the second player, who is the responder. If the responder accepts the proposer's offer, they get the proposed fraction of the total and the proposer receives the rest of the money. However, if the responder rejects the offer given by the proposer, neither of the players receives

anything (Camerer & Thaler, 1995). In this way, the responder has some control over the outcome of the game. For the proposer, the game is over as soon as they make an offer to the responder because they can no longer influence the outcome of the game. The most that the proposer can do is to make a choice that is good for themselves and what they see as benefiting them in the game (Güth et al., 1982).

Rejection rates across the range of possible offers remains relatively stable through different studies. The most common division of the sum is a fifty-fifty split. Many experiments have replicated this finding; proposers typically offer 40-50% of the total to the responder (Camerer, 2003). Offers that split the total 70% and 30% and lower are pretty consistently deemed unfair by responders, and are rejected at a higher rate (Hack & Lammers, 2008). The responders consistently reject unfair offers to 'punish' the proposer who acted unfairly towards them; this has been shown through dozens of experiments (Camerer, 2003). As a result of the sequential nature of the game, acceptance and rejection rates fluctuate. Proposers tend to increase the percentage they offer to responders as trials progress in reaction to rejection rates of 30% or less of the total amoutn. Responders become angry when presented with lower offers, and proposers modify their behavior in reaction to that anger (Camerer & Thaler 1995).

Game theory predicts what players engaging in games might do based on examination of all possible outcomes (Camerer, 2003). According to game theory, players engage in games in ways that maximize their gains (Camerer, 2003). In an ideal situation, individuals would bargain in a completely "rational" or strategic way, meaning they would be able to objectively compare wants and needs while being aware of all alternatives (Nash, 1950). However, this is not always how players behave, due to the emotional impact of several factors, such as perception of

fairness and anger, or lack thereof, in response to unfair offers (Camerer, 2003). Game theory predicts behaviors, but players do not always behave according to theory.

Camerer (2003) attempted to understand and explain behavior and how people actually interact in different bargaining games, turning theory into application. From this work, behavioral game theory was developed. Behavioral game theory extends beyond classical game theory and adds in other important factors, such as emotion, to investigate how players perform (Camerer, 2003). According to game theory, the "rational" or strategic solution would be for the proposer to offer the smallest share possible and for the responder to accept. This way, both parties are always making at least some money, which is more than zero, the outcome if the responder rejects (Nowak, Page, & Sigmund, 2000). However, previous research supports the rejection of unfair offers (Hack & Lammers, 2008). Thus, classical game theory cannot fully explain observations of the Ultimatum Game behaviors (Schuster, 2017).

Conditional cooperation drives an individual to reject unfair offers. Conditional cooperation stipulates that individuals will cooperate with one another as long as other members of the group cooperate. Deviation from cooperation results in punishment in whatever form the situation warrants (Fehr & Fischbacher, 2004). The tendency to punish unfair offers in the Ultimatum Game is related to the theory that individuals value prosocial behavior, according to Kaltwasser, Hildebrant, Wilhelm, and Sommer (2016). That is, individuals who reject unfair offers do so because they value fair treatment and do not want to support instances of unfair treatment (Kaltwasser et al., 2016).

"Negative reciprocity" is proposed as a reason why responders reject unfair offers. This means that responders return the unfair behavior they perceive that the proposer imparts on them, even at a cost to themselves, since they are losing money in this exchange (either hypothetically

or literally) (Camerer, 2003). Negative reciprocity is evident in other social domains as well, for example, going through an unpleasant divorce at the cost of large sums of money for both parties involved (Camerer, 2003). Punishing unfair behavior requires possession of the cognitive capacity, or intelligence, to understand what is fair versus unfair (Harbaugh et al., 2002), and then deciding to punish the proposer, rather than acting in what may seem like a completely "rational" way by taking any sum of money. However, responding to unfair offers by punishing the proposer may in fact be rational if it halts further unfair treatment, resulting in better treatment and an increase in cooperative behaviors (Polgár, Fogd, Unoka, Sirály, & Csukly, 2014).

Guth et al. (1982) was one of the first to investigate bargaining behavior in the Ultimatum Game. Their 'easy game' layout is the basis for the current study. In the easy games, a specific amount of money was to be distributed between two players. In the first round, there were twenty-one trials of the easy game and the experiment was repeated after one week. The results of the first round of the Ultimatum Game were referred to as the 'unexperienced decision behavior' since it was the first time any of the participants had partaken in this economic game. Conversely, the results when the experiment was repeated a week later were referred to as the 'experienced decision behavior.' The results of the study showed greater frequency of rejections from the responder in the experienced decision behavior group and this was theorized to be a result of the increase in the average demand of the proposer the second time around. This study was one of the first to show that participants frequently rely on what they consider to be a fair proposal when considering ultimatum decisions (Güth et al., 1982).

Although most studies use hypothetical money, a review of several studies showed that there were no differences when tangible or hypothetical payments were used in experiments

(Thaler & Thaler, 1987). Thus, it is likely that bargaining interactions that utilize hypothetical rewards are a good estimation of how an individual would act if provided with tangible incentives at the end of the bargaining interaction.

Other Economic Games

There are several variations of social decision-making or bargaining games. The Prisoner's Dilemma is described as a "social dilemma" game (Reed, Zeglen, & Schmidt, 2012). It was initially developed by Flood and Desher in 1950 to describe situations in which individuals would not cooperate in a manner that would logically benefit both parties or be described as "rational" in classical game theory (Tomochi, 2004). During the Prisoner's Dilemma, two people choose whether or not to cooperate. If the players choose to cooperate, they both receive the predetermined reward. If both choose not to cooperate, neither receives the reward. However, if one chooses to cooperate and one chooses not to, the individual who chooses not to cooperate receives a larger reward than the individual who decides to cooperate. Game theory would predict a high rate of defection in order to receive the highest reward. However, a meta analysis of 130 studies indicated a total cooperation rate of 47.4% (Sally, 1995). This layout impacts participants' strategy by requiring them to have more insight into their opponent's behavior, and whether or not the participant believes their opponent will choose to cooperate with them or not (Rapoport, 1967). The Ultimatum Game and the Prisoner's Dilemma differ in that the Prisoner's Dilemma requires both parties to make a choice about the same aspect of the game (whether or not to cooperate) and participants in the Ultimatum Game are making choices affecting different aspects of the bargaining process (what to offer and whether to accept).

The Dictator Game is closely related to the Ultimatum Game; however, in this game, the responder does not have a choice of whether to accept or reject the offer. Thus, it is not measuring bargaining behavior, but instead the willingness to cooperate with an opponent and act in a generous manner instead of maximizing personal gain. Kahneman, Knetsch, and Thaler (1986) performed the first Dictator Game experiment, in which the proposer offers a division of money, just as in the Ultimatum Game, but rejection is not possible here, so the outcome is based solely on the proposer's actions. This is to determine whether the proposer will exploit the situation since they have all the bargaining power. Thus, the responder plays a passive role in the game, contrary to the Ultimatum Game. According to game theory, the proposer should offer the smallest amount in order to maximize their gains (Fehr & Fischbacher, 2003). However, according to a meta analysis, dictators on average give 28.35% of the total (Engel, 2010), again proving that game theory does not adequately predict behavior in these games.

For the purpose of this study, the Ultimatum Game will be used due to its prevalent use in different populations. This game also gave rise to a number of studies examining the effects of manipulating various factors in the game. The study of the Ultimatum Game has resulted in much research using participants in atypical populations, which is the aim of this study.

Factors Affecting Ultimatum Game Outcomes

Although perceived fairness is the variable that is most consistently correlated with outcome (Camerer & Thaler, 1995), there are many other factors that can affect decision-making behavior in the Ultimatum Game. Research has demonstrated that the identity characteristics of the participants have an effect on the results of the game. Since first developed by Guth et al. (1982), the Ultimatum Game experiment has been employed many times to examine different variables.

Age

There are several ways in which age can affect outcomes, which will be discussed below.

Age of responder on responder behavior. Responder behavior can be affected by several identity characteristics, including the responder's age. Research examining the effect of the responder's age on behavior is in its early stages. Risk attitudes have been measured using the Ultimatum Game to observe how often one accepts or rejects offers that were deemed as fair or unfair by the researchers (Beadle et al., 2012). They determined that $1-$4 out of $10 was unfair while $5-$9 was fair. According to previous research, older adults try to avoid risky decision-making when solving social problems (Blanchard-Fields, Mienaltowski, & Seay, 2007). This aversion to risk could affect choices made in the Ultimatum Game if the player determines the outcome to be ambiguous in terms of fairness. The first experiment to test economic decision making in older adults found that as responders, older adults ages 65-85 were more likely to reject unfair offers from proposers when compared to younger adults ages 21-45 (Roalf, Mitchell, Harbaugh, & Janowsky, 2011). Another study also showed that as responders, older adults reject more offers that they deem unfair than younger responders do (Beadle et al., 2012).

Thus, this research demonstrates that older adults are more likely than younger adults to reject offers they deem as unfair. This is theorized to be the result of older adults being less likely to take the risk of accepting a seemingly unfair offer. When the situation is ambiguous (e.g. not receiving a clearly fair offer of at least $5) they may be more likely to reject.

Age of proposer on responder behavior. Bailey et al. (2013) conducted the first and only study manipulating the age of the proposer and examining its effects on decision-making in the Ultimatum Game. In this study, there were two groups of participants. The young group consisted of thirty-five participants ages 18 to 33. The older group consisted of thirty-four adults

ages 65 to 92. The participants were told to split a total sum of $10 between themselves and a future responder. They were not shown pictures of the potential responders, just told that they would be splitting the money with "one young man, one young woman, one older man, and one older woman" (Bailey et al., 2013). The participants were told that they would also be receiving offers from past participants. A computerized version of the Ultimatum Game with predetermined offers was used with each, unbeknownst to the participants. The offers they received were randomized: half of the proposers were older and half of them were younger. The game included, "10 fair ($5), two slightly unfair ($3), four moderately unfair ($2), and four very unfair offers ($1)" (Bailey et al., 2013).

According to research, Americans stereotype elderly adults as "incompetent," but also "warm" as a result of the perception of them being noncompetitive, but also in low status in society (Cuddy & Fiske, 2005). According to Cuddy and Fiske (2005), this perception of warmth but incompetence elicits pity and compassion, which suggests that responders to elderly adults would be less likely to reject offers, even unfair ones (Bailey et al., 2013). This reaction was proposed to be the result of sympathy felt when interacting with older adults versus younger adults. Results of this experiment demonstrated that responders did in fact reject more offers overall from younger proposers when compared to older proposers. Both fair and unfair offers were rejected at a higher frequency from young proposers when compared to older proposers. The reasoning behind a lower rejection rate of fair offers from older proposers was argued to be a result of the aforementioned sympathy felt towards older proposers. Increased rejection of unfair offers was argues to be a result of anger towards younger proposers (associated with unfair offers). Bailey et al. (2013) argued that the reasoning behind more anger and rejections toward younger proposers who proposed unfair offers comparative to elder proposers was

explained by the tendency to educe compassion toward elder adults (Bailey et al., 2013). Anger felt in response to an unfair offer was measured by asking the participants to rate their anger from 1-7 while viewing a picture of the proposer after the Ultimatum Game was played. Unfair offers constructed by young adults elicited more anger in respondents than those unfair offers proposed by an older adult (Bailey et al., 2013). This supports the hypothesis that age of proposer can be a factor that influences responder behavior in adults in the Ultimatum Game.

Age of proposer on proposer behavior. Just as it affects responder behavior, age affects proposer behavior as well. Older adults are more likely to make fair offers when compared to younger adults (Bailey et al., 2013; Roalf et al., 2011). According to Gruenewald, Lioa, and Seeman (2012), this is attributed to the idea that contributing to the welfare of younger generations is an important goal in older generations. Older adults also tend to take fewer risks, which contributes to their fairer proposal rate compared to their younger counterparts (Roalf et al., 2011).

Children as responders. The literature on the Ultimatum Game with younger participants is more limited than the adult literature that investigates various factors and their effects on game outcomes. Findings show that children under the age of 5 are egocentric and self-interested (Damon, 1980); they are focused solely on their own gain and therefore, may not be able to appropriately engage in the ultimatum task. Research on the Ultimatum Game shows that there are many factors that can potentially change the outcomes of these studies with children (e.g. Bailey et al., 2013; Eckel & Grossman, 2001; Ma & Hu, 2015). There is a common finding among studies that younger children accept lower offers, and this tendency decreases as participants increased in age (e.g. Harbaugh, Krause, & Liday, 2002; Murnighan & Saxon, 1998). Murnighan and Saxon (1998) investigated Ultimatum Game behavior in children, using

money and candy. Results showed that kindergartners (between the ages of 5 and 6) accepted the lowest possible offers more often than older children (9- and 12-year-olds.) Mischel & Metzner (1962) argued that younger children find it more difficult to refuse reward (as cited in Murninghan & Saxon, 1998). These findings were mixed in the older groups. Sixth graders (aged 12 years) did accept less than older participants (ages 15 to 22), but only when the total dollar amount was small, not when it was an intangible large amount that was more difficult to conceptualize (e.g. $1 million) (Murnighan & Saxon, 1998). Harbaugh, Krause, and Liday (2002) found similar results, demonstrating that the trend of acceptance of low offers decreases as age increases. In participants ages 7 through 18, older children in this study were also more likely to reject unfair offers (Harbaugh et al., 2002). These findings overall do suggest that acceptance of unfair offers tends to decrease with age.

Delay of gratification is more difficult when children are actually faced with the rewarding stimuli versus when there is no rewarding stimuli in their attention field (Mischel & Ebbesen, 1970). In these studies, children are faced with the reward (offer) without the possibility of removing it from their attention since it is required to make their decision, thus adding to the likelihood of choosing the immediate reward. Maturity and mental age are directly related to the development of delay of gratification (Mischel, 1974). This is because children require certain abilities in order to delay, such as attention and time comprehension (Walter Mischel & Ebbesen, 1970; Zmyj, 2018). For example, in a study examining the development of delay strategies in children ages 3 to 5, Mischel and Ebbesen (1970) found that the most simple, yet effective, delay strategies were self-distraction including averting their attention from the rewarding stimuli by covering their eyes, inventing games with their hands and feet, or even falling asleep. Comprehension of time, which develops with age, is also a potential requisite of

delaying gratification (Zmyj, 2018). There was a direct correlation between 4-year-old children waiting in a delay of gratification task and time comprehension, as measured by understanding how much time was left in an hourglass (Zmyj, 2018). The Ultimatum Game requires delay of gratification in order to engage in the game efficiently and not accept every offer, so these abilities (such as self-distraction and time comprehension) must be developed.

Children as proposers. One study using the Ultimatum Game used stickers for goods because of their common use as reinforcement for children (Lucas, Wagner, & Chow, 2008). The authors' goal was to investigate whether children at the age of 4 possess the ability to perform strategically in economic games, including the Ultimatum Game and Dictator Game. On average, the participants offered more stickers to their opponents during the Ultimatum Game compared to the Dictator Game. These results arguably show that the participants were thinking strategically, since higher offers were made during the game in which rejection was a possibility (Lucas et al., 2008). However, children did not adjust proposal amount based on previous selfish or fair offers from their current opponent (Lucas et al., 2008). This detail demonstrates a potential lack of modification in behavior as a result of Ultimatum Game opponent behavior, or inability to hold this information in their memory from one trial to the next.

Harbaugh, Krause, and Liday (2002) investigated the game behavior of participants ages 7 through 18 years. The Ultimatum Game was modified here to make certain that all ages could grasp the concept: each round was played with a total of ten tokens that later could be exchanged for different reinforcements, like school supplies. As in Lucas et al. (2008), both the Ultimatum and Dictator Games were used, and as was found in that study even the youngest participants offered larger quantities of tokens during the Ultimatum Game in comparison to the Dictator Game (Harbaugh et al., 2002), showing strategic thinking. Although some studies show that

children at the age of 4 show the ability to play in a strategic way (Lucas et al., 2008), this is not a consistent finding. Children are able to appropriately and consistently engage in strategic bargaining behavior by the age of seven (Harbaugh et al., 2002).

Physical Attractiveness

Attractiveness is the second variable discussed that can affect outcomes.

Physical attractiveness of proposer on responder behavior. Physical appearance can sway behavior in a number of ways across contexts. There are numerous studies showing that physically attractive people are socioeconomically better off than those who are considered less physically attractive (e.g. Benzeval, Green, & Macintyre, 2013; Eagly, Makhijani, Ashmore, & Longo, 1991). Physical attractiveness facilitates more opportunity from others and prompts an instantaneous positive attitude from others when compared to unattractiveness (Fiske, 2010).

Several studies have investigated physical attractiveness of the proposer and how it affects the respondent's behavior. For those proposers who are considered attractive, there was a higher minimum acceptance level by respondents compared to those proposers who were considered unattractive. In other words, the lowest value at which a responder accepted an offer was higher for 'attractive' proposers (Solnick & Schweitzer, 1999). Participants demanded more of attractive people, evidenced by rejection of lower offers from attractive proposers, but also were more generous and offered more as proposers when faced with an opponent who was considered attractive as a result of a "beauty premium." The beauty premium is the assumption that physically attractive people have other socially desirable traits, so while they are typically offered more, they are also expected to provide more (Solnick & Schweitzer, 1999).

Physical attractiveness of responder on proposer behavior. Proposer behavior can also be influenced by the attractiveness of the responder. In an experiment using the Ultimatum

Game, it was hypothesized that attractive people would be offered more than unattractive people (Solnick & Schweitzer, 1999). Their earnings were up to twelve percent greater than the earnings of those participants considered unattractive. Thus, physical appearance of the responder does influence proposer behavior in Ultimatum Games (Solnick & Schweitzer, 1999). However, the proposer's own attractiveness had no effect on the offers that they made to their opponents (Solnick & Schweitzer, 1999).

Physical attractiveness of a third party on responder behavior. In a more recent study, the effects of attractiveness on responses in the Ultimatum Game were studied using three players (Ma & Hu, 2015), instead of the original two, because social exchanges are usually more complex than a two-person exchange. In the three-person Ultimatum Game, there is the usual proposer and responder, in addition to a powerless third person, who is part of the distribution of money that the proposer offers, (i.e. the proposer is to split the sum three ways). This study is unique in portraying social exchanges in which multiple people are present. The study investigated whether the facial attractiveness of this third player modified the behavioral responses of the responder (Ma & Hu, 2015).

In the study, the responder was shown a photograph of the powerless third player, which was then followed by the proposal from the proposer. If accepted, the sum was divided amongst all three players. If rejected, none of the players received any money (Ma & Hu, 2015). The acceptance rate was higher when responders were shown an attractive face versus an unattractive face before the offer because it was theorized that the responder preferred to share offers with attractive opponents (Ma & Hu, 2015). As suggested by Solnick and Schweitzer (1999), the behavior of the responder was influenced by the attractiveness of a face.

Sex

Eckel and Grossman (2001) investigated the effects of participants' sex on behavior in the Ultimatum Game. The study found that when females acted as the responder, they were significantly more cooperative, and their rate of acceptance was higher than males'. The rate of acceptance of offers made by female proposers was higher, as offers from females were less likely to be rejected than offers from males (Eckel & Grossman, 2001). This informs the research that sex could be an important factor in the eyes of the responder when considering whether to accept or reject an offer.

Solnick (2001) also investigated the effects of sex on Ultimatum Game behavior although this experiment focused on sex perception from a name. The participants played the Ultimatum Game two separate times. In the first round, a number identified the participants' opponent; the second round identified the participants' opponent with a gender-identifying name. It was found that male responders attracted higher offers on average, especially by female proposers. As proposers, males were also more likely to offer less to their female responders (Solnick, 2001). Solnick (2001) explained the lower offers for females by the expectation that female players would demand less.

Facial Expression

Facial expressions are an important part of interactions and convey emotional states and intentions (Mussel, Hewig, Allen, Coles, & Miltner, 2014). Judgments of facial expression are made even with very brief exposures to unfamiliar faces, because the human face is influential and informative in social interaction (Todorov, Mende-Siedlecki, & Dotsch, 2013). The face holds special importance as a perceptual cue at an early age, as newborns show a preference for face-like patterns over other patterns (Bond, 1972). A smile is a frequently observed facial

expression that can communicate trust or cooperation (Centorrino, Djemai, Hopfensitz, Milinski, & Seabright, 2015) and elicit it as well (Reed et al., 2012). A smile can increase helping behavior and monetary reward for the smiling person. For example, individuals who had smiling waitresses at a bar gave larger tips than those who were approached by a waitress whose smile was not as apparent (Tidd & Lockard, 1978). Research shows that being smiled at by a stranger increases later helping behavior towards another, unrelated individual. When confederates smiled at passersby, the passersby were more likely to help another confederate who later needed assistance, than were those bystanders who were not smiled at (Guéguen & De Gail, 2003).

Facial expressions also influence economic decision making (Mussel et al., 2014). Mussel et al. (2014) found a higher rejection rate for proposers who were not smiling versus those who were, even at offers of twenty-five percent (Mussel et al., 2014), which is below the average acceptance rate of 30 to 40 percent of the total (Camerer & Thaler, 1995). Mussel, Gortiz, and Hewig (2013) also investigated whether facial expression affects decision making in the Ultimatum Game. The facial expressions of the proposers were either happy, neutral, or angry. Each participant only received one of the three facial expressions, and each proposer always made the same offer regardless of their facial expression. There was a significant effect of facial expression; offers from proposers who were smiling were accepted more often compared to the other two expressions. This effect of facial expression on acceptance rate was larger at unfair offers from the proposer, 17% of the total offer (Mussel, Göritz, & Hewig, 2013). It was hypothesized that people consider other elements of the social interaction, such as facial expression, when the outcome of a situation is ambiguous or unexpected, such as receiving an unfair offer. On the other hand, situations that are more clear and straightforward, such as a fair offer, do not require the investigation of other explanations (Mussel, Göritz, & Hewig, 2013).

Increased acceptance of offers accompanied by positive facial expressions is seen in the Prisoner's Dilemma Game as well. In Reed et al. (2012), participants played against each other, deciding to divide up a sum of money equally or not. This decision was made after meeting their opponent for a short time before the trials. It was found that facial expression had an effect on behavior during the game. Specifically, when the sender of the deal was smiling during their initial interaction, the reciever increased cooperative behavior. On the other hand, when the sender had negative or aggressive facial expressions during their initial meeting, the receiver was more likely to be uncooperative towards their opponent (Reed et al., 2012). Thus, the effect of facial expression on game behavior has been established in two studies across two games; neurotypical adults are more likely to accept offers when they are presented with a smiling face.

Bargaining Behaviors in Atypical Populations

Disorders that cause difficulty in social interactions include schizophrenia and borderline personality disorder (American Psychiatric Association, 2013). Difficulty reading and understanding emotional expressions are characteristic traits of these disorders and often lead to differences in social behavior compared to neurotypical populations (Kalin et al., 2015; Polgár et al., 2014). Social decision making has been tested in these populations using the Ultimatum Game (Csukly et al., 2011; Polgár et al., 2014).

Schizophrenia

Impaired social cognition is a typical feature of individuals with schizophrenia (Csukly et al., 2011) that leads to social and interpersonal dysfunction in everyday interactions (Kalin et al., 2015). To receive a DSM-5 diagnosis of schizophrenia, interpersonal relationship functioning must be markedly below what it was prior to the onset of the disorder (American Psychiatric Association, 2013), suggesting that interpersonal dysfunction emerges as a result of other

symptoms. One of the factors associated with negative social outcomes and the characteristic decline in interpersonal relationship functioning in individuals with schizophrenia is deficits in perceiving emotional expression (Kalin et al., 2015). A meta-analysis of the literature from 1970-2007 found that individuals with schizophrenia showed a significant impairment in emotion perception compared to neurotypical populations (Kohler, Walker, Martin, Healey, & Moberg, 2010). When given a test of facial expression recognition, the Emotion Hexagon Task, those with schizophrenia recognized the basic emotions at a significantly lower rate than their neurotypical counterparts (Csukly et al., 2011).

Exchanges in the Ultimatum Game are different in these populations when facial expressions are involved in the decision-making (Csukly et al., 2011). Socioeconomic games allow participants to be directly involved in decision-making in real time while interacting interpersonally with an opponent, either real or computerized (Csukly et al., 2011). Since bargaining can be considered a type of social interaction or exchange in which one must anticipate another's actions (Nash, 1950), differences in bargaining behavior emerge as a result of atypical social skills (Kalin et al., 2015).

Bargaining behavior in schizophrenia. The first study that used the Ultimatum Game with a population of individuals with schizophrenia found that these participants did not engage in as much strategic thinking as did their neurotypical counterparts, leading to less efficient game behavior (Agay, Kron, Carmel, Mendlovic, & Levkovitz, 2008). This was evident by their pattern of responses showing misjudgment of the bargaining context and less strategic behavior. For example, the neurotypical group varied their offers to responders depending on the outcome of previous trials, but the schizophrenia group did not. The divergence in behavior between the schizophrenia population and neurotypical population was mostly evident in proposer behavior,

meaning that when acting as responders, their behavior did not differ significantly from their neurotypical counterparts.

Facial expression on bargaining behavior in schizophrenia. In the only study to examine the effect of facial expression on individuals with schizophrenia during bargaining games, 40 trials of the Ultimatum Game were played (Csukly et al., 2011). Responders were proposed an offer by a virtual proposer who exhibited either an angry or happy face. Acceptance rates were higher with the happy versus the angry face in the neurotypical control group, but not the group with schizophrenia. Although positive facial expressions increased cooperative behaviors in neurotypical populations, this was only evident at higher offers, not at offers that are considered unfair. However, the facial expression of the proposer did not affect the decision of responders in the schizophrenia group, even when factoring in decreased emotion recognition ability by adding scores on an emotion recognition task in the main analysis as a covariate (Csukly et al., 2011). These findings demonstrate that even though responder behavior between neurotypical and schizophrenia populations is similar when the proposer's facial expression is not shown (Agay et al., 2008), responder behavior differs in these two groups when the proposer's facial expression is shown. Specifically, the proposer's facial expression only factored into the decision-making behavior for neurotypical responders and not responders with schizophrenia (Csukly et al., 2011). Additionally, there was a higher rate of acceptance in the schizophrenia group at lower, unfair offers. This was theorized to be a result of decreased ability to engage in negative reciprocity by responding to unfair offers by rejection in this group (Csukly et al., 2011), which is different than the typical response to "punish" the proposer who is acting unfairly towards the responder (Camerer, 2003).

Borderline Personality Disorder

Individuals with borderline personality disorder (BPD) are characterized as having unstable interpersonal relationships (American Psychiatric Association, 2013). This may be due to deficits in taking in social information, and studies that focus solely on facial emotion recognition do suggest impairments (Polgár et al., 2014). Domes, Schulze, and Herpertz (2009) found subtle impairments in people with BPD in facial emotion recognition, such as heightened sensitivity to negative emotions, along with general recognition deficits. Research on the underlying processes of maladaptive interpersonal relationships in people with BPD focuses on altered emotion recognition (Domes, Schulze, & Herpertz, 2009).

Bargaining behavior in borderline personality disorder. Bargaining behavior in individuals with BPD has been studied using the Dictator Game (Thielmann, Hilbig, & Niedtfeld, 2014). These individuals were found to exhibit average willingness to cooperate in a hypothetical Dictator Game situation. For example, when playing as proposers in the Dictator Game, individuals with BPD refrained from exploiting their opponent by offering unfair sums of money. This shows that individuals with features of BPD were not impaired in their ability to cooperate during an economic game situation (Thielmann et al., 2014).

Facial expression on bargaining behavior in borderline personality disorder. There have been several studies in which the effects of facial expression were studied with a BPD population using various measures. In a study that used a virtual trust game, individuals with BPD were unaffected by their opponent's facial expressions during the game trials, unlike those without BPD (Franzen et al., 2011). In this study, a participant was given a set number of units to divide between themselves and four virtual opponents. The participant was provided with an image of each opponent's face with either an angry, neutral, or happy facial expression. After

receiving a portion of units from the participant, their virtual opponents were to repay a portion back to them. The participants were then asked to rate the fairness of each opponent. When assessing fairness, individuals with BPD only took into consideration the repayment amount, while those without BPD took into consideration both the repayment amount and the facial expression shown in the photo (Franzen et al., 2011). In other words, individuals with BPD did not factor in the social cues provided by the image when making their decision, while those without BPD used the facial expressions to help inform their decisions.

Similar results were found in individuals with BPD when investigating the effects of facial expression during the Ultimatum Game (Polgár et al., 2014). Throughout 40 trials of the game, the participants acted as responders while seeing images of a virtual proposer's face. The photo showed the virtual proposer with either an angry or happy facial expression. In the control group, acceptance was higher at both fair and unfair offers when responders were shown positive versus negative emotions. However, this difference was not significant in the BPD group. In other words, positive facial expressions boost cooperation in control participants but not in individuals with BPD (Polgár et al., 2014). Moreover, without taking facial expression into consideration, individuals in the BPD group accepted offers at a higher rate than the neurotypical group overall. In other words, collapsing across the IVs, the BPD group accepted more offers in total than the neurotypical group. This group, like the schizophrenia group (Csukly et al., 2011), failed to respond to unfair offers with punishment, which is typical for neurotypical individuals. The BPD group accepted unfair offers more often than the neurotypical group. In real interactions, this may lead to more unfair treatment and impair the cooperative relationship (Polgár et al., 2014).

Autism Spectrum Disorder: Diagnostic Criteria in DSM-5

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that is characterized by impaired social interaction and restricted or repetitive interests/behaviors (American Psychiatric Association, 2013). An individual diagnosed with ASD shows deficits in social communication and social interactions across settings, beginning early in the developmental period. These deficits are manifested as failure to engage in social emotional reciprocity, difficulties with nonverbal communication, and deficits in developing, maintaining, and understanding relationships (American Psychiatric Association, 2013). Social emotional reciprocity is the ability to appropriately initiate or respond to social interactions, including engaging in standard back-and-forth conversation, or sharing interests or emotions (American Psychiatric Association, 2013). In younger children, a lack of joint attention is a developmental indication of an impairment in social reciprocity (Durand, 2014).

For individuals with ASD, nonverbal behaviors are also impaired, including gestures, eye contact, and estimating appropriate social distances. These symptoms cause difficulty for individuals with ASD in creating and maintaining social relationships. Some individuals with ASD show little interest in others and do not seek social relationships. On the other hand, some individuals with ASD express interest in having relationships, but simply cannot navigate the social world (Durand, 2014). Individuals with ASD also display restricted, repetitive patterns of behavior, interests, or activities. These are manifested by stereotyped or repetitive motor patterns (such as hand flapping, lining up toys, or echolalia), inflexibility, restricted or fixated interests that are abnormal in intensity or focus, or hyper- or hypoactivity to sensory input (Durand, 2014).

Not all presentations of the disorder are the same; there is a range of difficulties that can present. To accommodate these varying levels of difficulties, the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) specifies three levels of severity: Level one is classified as "requiring support," Level two as "requiring substantial support," and Level three as "requiring very substantial support" (American Psychiatric Association, 2013). There are separate descriptions for social/communication interaction and restricted interests and behaviors (Durand, 2014). These levels are helpful in developing treatment plans and informing others of the individual's level of functioning (Durand, 2014).

Autism Spectrum Disorder and Social Cognition

Social cognition refers to the ability to perceive, remember, and analyze the behavior of other individuals (Adolphs, 2001). A fundamental aspect of ASD is poor social cognition which can result in a lack of reciprocal social skills and empathy (Downs & Smith, 2004). Symptoms of atypical social interactions are apparent from a very young age. These early deficits lead to deviations in more complex interactions down the road, such as deducing the intentions of others from various social interactions (South, Schultz, & Ozonoff, 2011). These social deficits may make it difficult for individuals with ASD to take into consideration social cues when engaging in bargaining behavior.

The cognitive basis for social deficits in individuals with ASD is widely described as 'mindblindness,' which is difficulty understanding and appreciating the mental states of others (Varga, 2011). According to researchers, mindblindness results from "theory of mind" impairment. Theory of mind was first coined by Premack and Woodruff (1978), and is the awareness that other individuals have differing thoughts and beliefs than one's own, and that actions are explained by individual mental states (Perlman, Wyk, & Pelphrey, 2010). Theory of

mind helps individuals to understand and explain the behaviors of others by attributing mental states of others to a specific reason or situation. For example, understanding why someone is shaking his or her head requires one to imagine and ascribe the mental state or emotion of that person. This then helps us to predict the next action (Varga, 2011). Theory of mind shortfalls result in an inability to attribute thoughts or beliefs to other people (Baron-Cohen, Leslie, & Frith, 1985).

Theory of mind is typically assessed in children using false beliefs tasks, in which children are asked to make predictions about the actions or thinking of people with incorrect beliefs about a certain situation. When those people experience an unexpected outcome, the child's ability to correctly predict their emotional reaction to that outcome demonstrates theory of mind understanding (De Rosnay, Fink, Begeer, Slaughter, & Peterson, 2014). In TD children, there is a developmental shift in early childhood in their ability to succeed in these tasks. Most 3-year-old children fail these, while most 5- to 6-year-olds succeed (De Rosnay et al., 2014). For example, in an experiment with children ages 3 to 7 in which characters were offered closed containers with or without a desired object, the accuracy of predictions of the character's emotion upon opening it improved with age: 7-year-olds were consistently more likely to correctly predict emotional outcomes compared to 3-year-olds (Harris, Johnson, Hutton, Andrews, & Cooke, 1989). This demonstrates a developmental shift in TD children in their ability to infer others' emotions that is not apparent in children with ASD (Harris et al., 1989).

Although social interactions in the form of bargaining behavior using social cues has not been studied in this population, other studies show alternate forms of impaired social cognition and decision-making in children with ASD. For example, young school-aged children with ASD are more trusting than TD children when interacting with an unfamiliar adult. This population

was more likely to trust information about the location of a hidden reward that was provided by an adult with whom they had no previous interaction (Yi et al., 2013). Trust is an important aspect of social interaction that occurs when an individual is able to effectively understand another's feelings or intentions (Lee, Jolles, & Krabbendam, 2016), and assume them to be benevolent. However, it should be noted that this study demonstrates individuals' with ASD's lack of ability to regulate or determine who should be trusted, which can result in safety concerns.

Perception of friendship quality is another aspect of social exchange that is impaired in individuals with ASD. Several studies have demonstrated a smaller number of reciprocated friendships in children with ASD, measured by determining the number of individuals nominating each other as good or best friends in a classroom (Kasari, Locke, Gulsrud, & Rotheram-Fuller, 2011; Rotheram-Fuller, Kasari, Chamberlain, & Locke, 2010). If individuals with ASD experience difficulty determining who to trust, as well as determining the quality of friendships, it is possible that other decisions made in a social context, such as bargaining, will be impaired as well.

Autism Spectrum Disorder and Facial Expressions

Many individuals with ASD struggle with facial identification. This is due to the individual's propensity to focus on individual features rather than the face as a whole (South et al., 2011). This deficit in facial identification also encompasses the comprehension of facial expressions. Individuals with ASD demonstrate difficulties in perceiving and understanding facial expressions, which leads to deficits in more complex social interactions. These struggles add to the difficulties in empathy and social reciprocity observed in individuals with ASD (South et al., 2011). Recognizing facial expression is an ability that is key to forming interpersonal ties

early in life (Rump, Minshew, Giovannelli, & Strauss, 2009). By the age of 4 years, neurotypical children are able to identify full expressions of happiness, anger, and sadness with a high level of precision (Widen & Russell, 2003).

One aspect of social interaction that has been studied in those with ASD is empathy and perspective taking. Individuals with ASD are less adept at labeling emotions. This was apparent during an empathy task in which participants were shown short clips of children experiencing different emotions in a predetermined scenario. In this experiment, those in the ASD group were less able to take the perspective of the individual in the video clip and report why they felt a certain emotion, and were also less likely to respond with empathy (Yirmiya, Sigman, Kasari, & Mundy, 1992). Facial expression identification difficulties, along with theory of mind deficits, are thought to underlie the lack of empathy and difficulties with reciprocal social interactions that are seen in this population (Sasson, 2006).

Rump et al. (2009) attempted to investigate the progress of emotion recognition skills in individuals with ASD at different ages. To do this, video clips of four emotions, happy, angry, sad, and afraid, were obtained. These clips were split into four different images that each expressed a different level of the emotion, from partial to full expression. Participants were asked to identify the emotion after each image at each level of emotion. Children with ASD at ages 5 to 7 years old were less proficient at accurately recognizing various emotions at partial levels when compared to their TD peers. In other words, they had trouble detecting more subtle expressions of emotion. However, the ASD group performed as well as neurotypical children when identifying happiness; there were no significant differences between the diagnostic groups in this category (Rump et al., 2009).

This study showed the groups did not differ in their abilities to recognize full emotions in an image when no time limit was placed on the participant (Rump et al., 2009). Looking further into the emotional expression identification deficit present in ASD, the amount of time a face is presented may have an effect on the accuracy of emotion identification (Clark, Winkielman, & McIntosh, 2008; Rump et al., 2009). The results of Clark et al. (2008) demonstrated that adolescents and adults with ASD are impaired in identifying emotional information from a brief image of a facial expression. In everyday social interactions, facial expressions are brief, so this deficit may help to explain difficulties in nonverbal communication in people with ASD.

Neurotypical adults in the Rump et al. (2009) study were more successful in their recognition of subtle facial expressions compared to the adult ASD group (Rump et al., 2009). In other words, a developmental progression is apparent in the neurotypical population from adolescence through adulthood, but this same progression is not evident in the ASD population. According to Rump et al. (2009), emotion recognition skills in children with ASD match their TD peers between ages 8 and 12 years old, and remain somewhat analogous throughout adolescence. At that point, TD children continue to refine their skills, whereas individuals with ASD no longer increase their proficiency for emotional recognition (Rump et al., 2009).

Neuroscientific research supports facial expression recognition differences between individuals with ASD and neurotypical individuals. Schultz, Romanski, and Tsatsanis (2002) studied face perception in ASD individuals via neuroimaging. The fusiform gyrus plays a large function in face perception and is most activated by human faces in neurotypical populations (Sasson, 2006). Fusiform gyrus activity was reduced in participants with ASD when compared to the neurotypical control group (Schultz, Romanski, & Tsatsanis, 2000), so its abnormal functioning in the ASD population is congruent with the difficulties in facial and emotional

expression identification that characterizes ASD. This hypoactivity of the fusiform gyrus has been established as a reliable marker of ASD (South et al., 2011).

The amygdala is also atypical in the brains of those with ASD, both structurally and functionally (Sasson, 2006). Children with ASD have larger amygdale volume compared to neurotypical children, and Bachevalier (1994) reported that a lesioned amygdala creates the best animal model for ASD. Abnormal amygdala functioning in ASD has been linked to impairments in affect recognition (Sasson, 2006). In a fMRI study, the amygdalas of participants with ASD were hypoactive in comparison to the control group when processing emotion surmising the mental state of a person in a photo (Baron-Cohen et al., 1999). This study supports the hypothesis that the amygdala plays a role in inferring mental states from a face (LaBar, LeDoux, Spencer, & Phelps, 1995) and these neurological markers of pragmatic behavior deficits support differences between the two populations (Bauman & Kemper, 1985).

Facial Expression and Cooperation in ASD

Knowing the etiology of these deficits and their effect on social interaction gives us a glimpse into what effect facial expression may have on cooperation and game behavior in individuals with ASD. Given that individuals with ASD lack empathy, reciprocal social skills, and ability to deduce intentions of others, it could be expected that this population would exhibit a low level of cooperation in social interactions as well. The ability to understand the emotions of others and high levels of social cognition are related to increased helping and cooperative behavior in children (Carlo, Knight, Eisenberg, & Rotenberg, 1991), though not specifically tied to bargaining in a gaming context. It is possible that the more adept an individual is at understanding the emotions of others, the more cooperatively and prosocially they will act (Downs & Smith, 2004). Facial expressions convey emotional states and intentions (Mussel et

al., 2014), which affects how neurotypical individuals interact with others (Mussel, Patrick et al., 2013). Individuals with ASD experience difficulty interpreting facial expressions and intentions (South et al., 2011), so differences in social exchanges or interactions would be expected as well.

Downs and Smith (2004) assessed cooperative social behavior in high-functioning children with ASD in comparison to several different populations, including neurotypical children and children who exhibited social problems due to externalizing behaviors, such as Attention-Deficit/Hyperactivity Disorder (ADHD) and Oppositional Defiant Disorder (ODD). The participant's cooperation in this study was measured using a simplified version of a Prisoner's Dilemma game, which was designed for use by children (Matsumoto, Haan, Yabrove, Theodorou, & Carney, 1986). Each participant received two tokens that they split with their opponent any way they chose. It was demonstrated that the ASD group did not differ significantly from the neurotypical group in cooperative behavior measured by the Prisoner's Dilemma game because most chose to share the tokens equally (Downs & Smith, 2004).

Sally and Hill (2006) investigated behavior in various strategic games in children with and without ASD. These studies did not take into account the facial expression of the opponent, but examined only their cooperative behaviors in several different strategic games. It was predicted that children with ASD would play in a less cooperative manner during all three games when playing against other children due to difficulty with social reciprocity. The children ranged in age from 6 to 10 years old in all games. In the Prisoner's Dilemma, both groups were found to be more competitive than what was predicted, but there was no significant difference in levels of cooperation between the group with and without ASD (Sally & Hill, 2006). This, along with the results found in Downs and Smith (2004), support the claim that individuals with ASD are able to cooperate with their TD peers in a strategic game context.

The Ultimatum Game and Dictator Game were also studied with the same population of children. The results of this study showed that there was a difference in behavior according to the age of the participants, as 6-year-olds were more likely to offer higher amounts of points compared to older children (Sally & Hill, 2006). The Dictator Game showed no significant differences between ASD and TD groups, showing that generosity did not vary between the groups. However, results from the Ultimatum Game show that children with ASD and TD children varied in their offers as proposers. The ASD group tended to either keep the entire sum of points for themselves or split it evenly in half. On the other hand, the group with TD children almost always split the total number of points in half (Sally & Hill, 2006). Responding varied slightly; overall, there were more parallel behaviors than differences, but those with ASD tended to accept lower offers as responders, whereas TD children were more likely to reject smaller offers (Sally & Hill, 2006). Although this was a significant finding, the differences in game strategy were not as apparent as the differences in behavior observed between the two groups in everyday life. Sally and Hill (2006) suggested that theory of mind skills are not necessary for strategy in these games, and that basic knowledge of behavior is enough. This is also supported by the findings in Lucas, Wagner, and Chow (2008). This study on TD children found that performance on theory of mind tests did not predict performance in various strategic games.

None of these studies included facial information from their opponents. Only minor differences in strategy during the economic games were found between the ASD and neurotypical population when there was no facial information provided. This suggests that any differences in behavior found between individuals with and without ASD in a strategic game is not caused by a lack of understanding of the game or any other extraneous variables, such as an overall decrease in cooperative behaviors. Individuals with ASD have difficulty with

presumption of traits and drawing out social information from faces (Webb, Faja, & Dawson, 2011). Thus, deviations in responder behavior between the two groups when facial images are added are likely due to the facial variations and not overall strategic behavior, especially when taking into account the parallels between the two groups in cooperative behavior (Downs & Smith, 2004; Sally & Hill, 2006) and emotion identification without a time limit (Rump et al., 2009).

Ewing, Caulfield, Read, and Rhodes (2015) considered the effect of the opponent's face on the participant. They investigated the cooperation of children ages 6through 9 with and without ASD using an economic trust game. During the trials of this game, an image of the participant's opponent appeared on the screen while the participants were making their decisions. Although the faces were not labeled distinctively as happy or angry, the images varied on perceived trustworthiness. The images were found on the internet and were judged by neurotypical adults as to whether they appeared trustworthy or not (Ewing et al., 2015). In the study, each participant played trials in which their opponent was represented as either a blank identity, an image of a trustworthy or untrustworthy person, or information about their reputation presenting them as either trustworthy or untrustworthy. In the token task, participants were to invest 6 tokens in different opponents who would then send an undisclosed amount back. The individuals were told that some investments may result in more or fewer token returns depending on the opponent (Ewing et al., 2015).

After the token task, participants were given a trust rating task to determine how trustworthy they believed each opponent's face looked, and then were provided with another trust rating task asking how trustworthy they believed the opponents were, based on a vignette providing information about their past behavior (Ewing et al., 2015). The results found that

children with ASD and TD children did not differ in their understanding on the concept of trustworthiness, as evidenced by the trust rating from the behavioral vignettes. Both groups of children were also able to read trustworthiness from facial images as shown in their trust ratings. . This finding has been supported in previous studies as well (Caulfield, Ewing, Burton, Avard, & Rhodes, 2014). However, when it came time to modulate behavior depending on the facial features, some discrepancy emerged. The amount of influence facial cues had on trust behavior was measured by the number of tokens individuals invested in their opponent. Facial trustworthiness was found to modulate trust behavior in TD children, whereas children with ASD did not choose to invest tokens in trustworthy- versus untrustworthy-looking opponents (Ewing et al., 2015). These same results were not significant when participants were given information about past behavior instead of facial images. In other words, there was a significant difference present between the groups only when facial cues had to be taken into consideration when dividing the tokens. This nonsignificant difference between the groups when using reputation information shows that these differences in strategic behavior did not mean that the two groups understood the task differently, but instead differed in their use of the facial cues (Ewing et al., 2015).

Although the ability to detect trustworthiness in faces was intact in the ASD group, they did not change their behavior during the token task. Ewing et al. (2015) gave two possible explanations for this. It was proposed that children with ASD may have trouble with spontaneously drawing conclusions from facial expression in an implicit manner, or that they do actually spontaneously infer trustworthiness but do not alter their behavior considering this information (Ewing et al., 2015). In other words, when explicitly prompted, children with ASD were able to exhibit knowledge and evaluation of trustworthiness, but failed to use the

information to direct their behavior during the token game (Ewing et al., 2015).Thus, the marked impairments in pragmatic social behavior seen in individuals with ASD may not necessarily be a result of not being able to engage in certain social acts, but rather a lack of spontaneous use of social cues. For example, children with ASD can gesture or maintain eye contact if prompted, but are unable to use these behaviors functionally during an interpersonal exchange (Plumet & Veneziano, 2015).

Downs and Smith (2004) also demonstrated that cooperative behavior is intact in individuals with ASD using the Prisoner's Dilemma Game. In this same study, emotion recognition was investigated by using a set of questions developed by Howlin, Baron-Cohen, and Hadwin (1999). This set of questions inquired how a character felt or what they thought based on background information and images. The results showed a trend of children with ASD correctly answering fewer of these questions than the nonclinical group, suggesting deficits in more complex emotion recognition.

The difficulties that individuals with ASD experience when perceiving and understanding emotion ultimately lead to atypical social interactions characterized by a lack of empathy and social reciprocity (South et al., 2011). Social reciprocity is important in a bargaining situation because individuals must be willing to work together for mutual benefit (Nash, 1950). If difficulties in understanding emotion can lead to a lack of social reciprocity, and it has been established that individuals with ASD struggle to acquire social information from faces (Webb et al., 2011), it is unlikely that individuals with ASD will implicitly use facial expression to guide their behavior in a bargaining situation. Just as children with ASD are able to perceive trustworthiness from faces (Caulfield et al., 2014; Ewing et al., 2015), they are also able to perceive emotions, like happiness, from faces when the emotion is fully expressed (Rump et al.,

2009). However, it is possible that just as they fail to use the facial information of trustworthiness to modulate their behavior, they may also not use facial expression information when engaging in an economic game, even though their cooperative behaviors are largely parallel to their TD peers.

The Current Study

Studies of the Ultimatum Game have demonstrated that several factors besides the perceived fairness of an offer can affect game behavior, such as age, sex, gender, physical attractiveness and facial expression (Bailey et al., 2013; Eckel & Grossman, 2001; Ma & Hu, 2015; Mussel, Patrick et al., 2013). A positive facial expression from the proposer led to higher acceptance rates in neurotypical participants (Mussel, Patrick et al., 2013), but not in individuals with schizophrenia or BPD (Csukly et al., 2011; Polgár et al., 2014). Individuals with ASD have not been investigated using the Ultimatum Game with facial cues. However, in studies with another economic game, individuals with ASD did not change their behavior based on the image of their opponent's face, which differed from the control group's behavior (Ewing et al., 2015). This suggests that individuals with ASD may not be affected by facial expression when making decisions in bargaining situations like their TD peers.

This study investigated whether children with ASD utilize facial expression when making decisions in the Ultimatum Game. Camerer's (2003) application of game theory and study of behavioral game theory set the predictions and hypotheses of this study. Previous studies show no significant difference between ASD populations and neurotypical populations in strategic game behavior (Downs & Smith, 2004; Sally & Hill, 2006). However, when the task includes the opponent's face, and facial cues may be added into the decision-making process, a significant difference in behavior is seen between individuals with ASD and neurotypical individuals

(Ewing et al., 2015). This could be due to the difficulties individuals with ASD experience in inferring social information from faces (Webb et al., 2011) and/or modulating behavior in light of the social information taken from facial expressions (Ewing et al., 2015).

Understanding how facial expression affects bargaining behavior in people with ASD may prove valuable because bargaining behavior is present in everyday interpersonal interactions for both children and adults, such as purchasing an automobile or setting a curfew time. Furthermore, the skills used in bargaining include skills used in other social interactions as well, such as inferring the intentions of others. Bargaining behavior using various facial expressions during the Ultimatum Game in individuals with ASD has not been studied. Studying this aspect of social interaction could demonstrate another form of social behavior that is different in this population and provide further information regarding how to approach interventions. If a significant difference is found, it will support already existing research that although individuals with ASD are able to engage in cooperative behavior (Downs & Smith, 2004; Sally & Hill, 2006) there are other factors that interfere with their ability to engage in typical social behavior. For example, as Ewing et al. (2015) proposed, they may have trouble spontaneously drawing conclusions from facial expression in an implicit manner and/or do not alter their behavior considering this information. Like Ewing et al. (2015) this study seeks to determine whether or not there is a significant difference found between the two groups in regards to economic game play.

Further, studying bargaining behavior in younger children could also help inform how and when these behaviors form, as not much work has been done in this area (Harbaugh et al., 2002). Utilizing faces to infer trustworthiness during an economic game produces significant differences between neurotypical and ASD populations in children ages six to nine (Ewing et al.,

2015). The effect of facial expressions on Ultimatum Game behavior also produces significant differences between neurotypical, schizophrenia, and BPD populations in ages 18 to 65 (Csukly et al., 2011; Polgár et al., 2014). The Ultimatum Game has not been used with facial information to study bargaining behavior in the ASD population at any age. Before the age of seven, there are still some inconsistencies when TD children act as responders, such as accepting unfair offers (Harbaugh et al., 2002) and failing to modulate behavior based on opponent behavior (Lucas et al., 2008). The focus of this study was to investigate the behavior of individuals who already have fully-developed bargaining behavior during the Ultimatum Game. Thus, the current study included children aged seven years and older and made the following hypotheses:

Hypotheses

1. It was hypothesized that facial expression would not influence the ASD group at fair or unfair offers.

2. It was hypothesized that the ASD group would be less likely to accept fair offers (offers greater than 30%) from proposers displaying positive emotions when compared to the typically developing group.

3. It was hypothesized that ASD participants would be more likely to accept unfair offers (offers equal to or less than 30%) when compared to typically developing children, regardless of facial expression.

CHAPTER 3

METHOD

Participants

To ensure that testable bargaining behavior would be fully present during the Ultimatum Game, individuals under the age of seven were excluded. As seen in previous studies (e.g., Harbaugh et al., 2002; Lucas et al., 2008) children over the age of seven are more likely to engage in appropriate bargaining behavior and modify behavior based on their opponent's behavior or characteristics. A total of 33 participants completed the current study, including 17 individuals with autism spectrum disorder (ASD) and 16 typically-developing (TD) individuals, ages 7 to 16.

Children with ASD were recruited from clients presenting at the Center for Applied Psychology (CAP) at Indiana University of Pennsylvania for ASD assessment and diagnosis, along with clients from a private practice in the surrounding community. Parents of children who were evaluated by the CAP for ASD were contacted by phone to request their participation in this study. This is consistent with the clinic's informed consent procedure, in which participants agreed to be contacted about research participation (Appendix A). The script for contacting participants is included in Appendix B. Additionally, some participants were recruited from the surrounding community. Recruitment letters were sent to surrounding schools to recruit both typically developing and children with ASD (Appendix C). The schools that allowed recruitment sent letters home with students (Appendix D). Recruitment letters were also sent to sites that offer ASD diagnosis and treatment in order to recruit participants with ASD (Appendix E). When the sites allowed recruitment, letters were sent home with clients (Appendix F) and flyers were placed at the site (Appendix G). Moreover, participants who were previously involved in

another study that took place in the summer of 2016 under the supervision of the same dissertation advisor were contacted. Requests were given out to request additional study participation and permission to share data (Appendix H).

All participants in the current study had their cognitive ability assessed with the *Stanford-Binet Intelligence Scales, Fifth Edition* (SB-5; Roid, 2003). Furthermore, those participants in the clinical group had their diagnosis of ASD confirmed using *the Autism Diagnostic Observation Schedule, Second Edition* (ADOS-2; Lord et al., 2012) when possible. To avoid retesting participants with the same measures within the same year, permission was sought from the caregivers to share confidential data. The groups were matched on IQ and there was an exclusionary criterion of an IQ below 80. Therefore, individuals who obtained an abbreviated IQ below an 80 (low average) were excluded. Two participants from the ASD group were removed from data analysis because they did not meet the abbreviated IQ cutoff. Exclusion criteria also included previous head trauma and a diagnosis of intellectual disability as reported by parents, consistent with previous studies (Csukly et al., 2011; Polgár et al., 2014). No participants were excluded for these reasons.

Participants in the control group did not exhibit clinically significant levels of ASD symptoms, and were administered the *Social Communication Questionnaire* (SCQ) and *the Autism Spectrum Screening Questionnaire* (ASSQ) to confirm this. If any participants in the control group received scores indicating clinically significant ASD symptoms, a referral sheet for further testing would have been provided to the family (Appendix I) and they would have been excluded from the remainder of the study. However, none of the participants in the control group exhibited clinically significant levels of ASD symptoms.

Measures and Procedure

Measures used throughout the project will be discussed, along with step-by-step procedures.

Stanford-Binet Intelligence Scales, Fifth Edition

The SB-5 assesses cognitive ability in individuals ages 2-85 (Roid, 2003). As previously discussed, groups were matched on IQ; some were recruited from a previous study in the summer of 2016 and some were new participants who were recruited from the CAP and the surrounding community. The measure of intelligence previously administered to participants in the summer of 2016 was the *Stanford-Binet Intelligence Scale, Fifth Edition* (SB-5; Roid, 2003). To ensure all participants were administered the same measure of cognitive ability, the SB-5 was used again. Abbreviated IQ from the SB-5 is taken from the routing subtests. These include both a verbal and a nonverbal task. The nonverbal assessment is a measure of fluid reasoning and the verbal task is a measure of verbal knowledge (Roid, 2003). Test retest reliability for SB-5 nonverbal fluid reasoning (r=.86) and verbal knowledge (r=.89) are both moderately high. The abbreviated IQ was found to have high average reliability coefficient (α=.91). The same measure was used with all participants. Consistent with previous studies, intact intellectual ability was an inclusion criterion.

Autism Diagnostic Observation Schedule-2

The *Autism Diagnostic Observation Schedule-2* (ADOS-2; Lord et al., 2012) is considered the "gold standard" (Kanne, Randolph, & Farmer, 2008) for observational assessment of ASD. This is supported by an investigation examining the predictive validity of the revised algorithms for total scores, which show substantial gains in sensitivity for individuals with an IQ above 70 (Kamp-Becker et al., 2013). The ADOS-2 is a semi-structured assessment that

investigates communication, social interaction, play, and restrictive/repetitive behaviors in individuals ranging from 12 months old to adults. Total score is compared to the cutoff scores, and then identified as one of three classifications: autism, autism spectrum, or non-spectrum (Catherine Lord et al., 1989). Diagnosis of ASD was to be confirmed with the ADOS-2 in individuals who were diagnosed outside of the CAP. However, due to recruiting difficulties, this was only possible for two of the new participants. Individuals who were diagnosed by clinicians in the CAP were not assessed again since the same clinicians would be assessing and diagnosing them for this study.

The Social Communication Questionnaire

The Social Communication Questionnaire (SCQ; Rutter, Bailey, & Lord, 2003) was given to the caregivers of all participants before the study as a screener for ASD. The SCQ can be administered to participants over the age of two (Rutter et al., 2003). Caregivers were asked to complete the questionnaire to ensure individuals in the control group did not display ASD symptomology, and that individuals in the experimental group continued to meet criteria. The Social Communication Questionnaire (SCQ) contains 40 yes or no questions and completion time is about ten minutes. Sample questions could not be provided in the appendices, as the SCQ is under copyright to Western Psychological Services. The information obtained from the SCQ includes use of language, gestures, and style of interacting. On the SCQ, there are *Lifetime* questions and *Current* questions, which address the participant's developmental history and recent behavior, respectively. The SCQ is used to identify individuals with symptomology of ASD, rather than to make a detailed diagnosis (Rutter, Bailey, & Lord, 2003). Higher scores on the SCQ are indicative of a higher number of ASD symptoms. The cutoff score for the SCQ is 15; scores higher than this suggest the presence of ASD (Rutter et al., 2003). Johnson et al.

(2011) found this cutoff to have 82% sensitivity and 88% specificity for identifying ASD. It was important for the control group of this study to be low in ASD symptomology to ensure the integrity of the control group. No participants from the control group were excluded from the study as a result of high ASD symptomology.

Autism Spectrum Screening Questionnaire

The high-functioning *Autism Spectrum Screening Questionnaire* (ASSQ; Ehlers, Gillberg, & Wing, 1999) was also given to caregivers to complete prior to the study to ensure that TD participants did not meet screening criteria for ASD, and that individuals with ASD continued to meet criteria (Appendix J). The ASSQ is a 27-item informant checklist of symptoms characteristic of high-functioning ASD. Caregivers assign an answer on a 3-point scale (no, somewhat, yes) to all 27 questions to yield a total score. The cutoff score for the ASSQ is 19, and this correctly identifies individuals with ASD 82% of the time. The ASSQ was designed to assess children from ages 7-16 (Ehlers et al., 1999).

Demographic Questionnaire

A self-report questionnaire was given to the participants' caregivers to complete for assessment of the participants (Appendix K). Demographics included gender, age, previous diagnoses, previous head trauma, and whether the participant wears corrective lenses.

The Ultimatum Game

The game was created using Qualtrics software and adapted from earlier studies investigating the effect of facial expressions on behavior in the Ultimatum Game (Csukly et al., 2011; Polgár et al., 2014). Based on previous studies, participants acted as responders to 40 trials of the Ultimatum Game. Virtual tokens were used for this version of the Ultimatum Game. Although tangible incentives were not used, a review of several studies showed that there were

no differences in acceptance rate or game behavior when tangible or hypothetical payments were used in experiments with TD individuals (Thaler & Thaler, 1987). Although this same research comparing tangible and intangible incentives has not been done with children with ASD, Sally and Hill (2006) used intangible points during the Ultimatum and Dictator Games when investigating cooperative behaviors in children with ASD and TD children. In past studies, when other objects of value were used, such as candy or large hypothetical amounts of money ($1 million), they were given different evaluations of value (Murnighan & Saxon, 1998). The participants differed on their perceptions of fair and unfair proposals when the hypothetical payment was difficult to conceptualize or did not have a standard value (candy). As a result, a finite number of tokens was split between the proposer and responder in the current study.

The participants were told that they were playing against an opponent online who was pictured in the corner of the screen. Since all the participants were children aged 7-16 years and previous research has demonstrated that age of proposer can affect response rates (Bailey et al., 2013), the proposer stimuli were adults to ensure that all proposers were older than participants. The pictures were retrieved from an online database (Langer et al., 2010) that featured photographs of adults making several different facial expressions. As previous research has demonstrated that attractiveness of proposer can influence responses in the Ultimatum Game (Solnick & Schweitzer, 1999), potential stimuli were rated on attractiveness on a scale of one through 10, with 10 being the most attractive. A total of 48 images from this database, 24 people each shown with a happy and an angry facial expression were rated by a sampling of 28 undergraduate students. Four people were selected, and their happy and angry images were shown in the game. Results from these ratings will be discussed in the Descriptive Statistics Section.

At the start of the Ultimatum Game, the outcome of choosing to accept or reject an offer was explained to the participants prior to the start of the trials, both verbally and with a screen with directions as seen in Figure 1. During each trial, the participant saw an image of their opponent with either an angry or happy emotional expression. The proposer's suggested split (out of the total of 10 tokens) was shown at the bottom of the screen, (e.g. "Your opponent keeps 8 tokens and gives you 2 tokens") as seen in Figure 2. The participant was then asked to accept or reject the offer. The outcome, based on the participant's response to accept or reject, was then displayed on the screen (e.g. "You receive 4 tokens.")

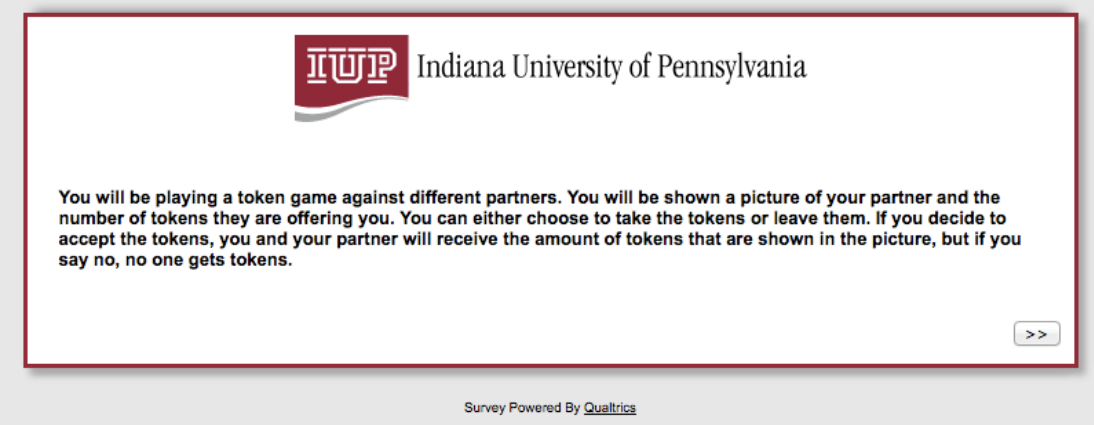

Figure 1. The first screen presented to each participant explaining the rules.

Figure 2. The Ultimatum Game decision-making screen.

In previous studies, the image of the participant's opponent was shown for a limited amount of time (Csukly et al., 2011; Polgár et al., 2014). However, Rump et al. (2009) showed that individuals with ASD have difficulty perceiving emotion when there is a time limit. This study sought to investigate whether individuals with ASD use the social information taken from a facial expression to modify their responder behavior. The goal was for participants to be able to identify the facial expression during each of the trials. Thus, the image of the participants' opponent was shown throughout the ultimatum decision-making process.

The trials of the game were not timed. Participants were in control in regards to moving from one trial to the next. An independent samples t-Test comparing the two groups' time of Ultimatum Game completion showed no significant difference in the amount of time the groups spent completing the task; $t(29)=-1.15$, $p>.1$.

During the 40 trials of the Ultimatum Game, participants received offers from 4 different proposers: two male and two female. Each proposer offered the participants 1,2,3,4, and 5 tokens while displaying either an angry or happy facial expression. The 5 offers were made twice by each proposer, once with a happy facial expression and once with an angry facial expression, resulting in 40 total trials. Based on previous research (Camerer, 2003), offers of 4 or 5 tokens were considered fair, and offers of 1, 2, or 3 tokens were considered unfair.

Procedure

Participants were invited to participate and were provided with the information that participation was voluntary, along with any benefits or risks associated with participation in the study. There were no known risks associated with participation in this study. Families received compensation in the form of a $10 gift card for participation in the study at the start of the appointment. All caregivers provided written informed consent at the beginning of the

appointment (Appendix L) prior to their children's participation in the study. All children gave verbal assent for their own participation in the study and were asked to sign a child assent form (Appendix M), unless they were old enough to sign their own informed consent form. This was true for 5 participants who were over the age of 14.

All participants in the ASD group had previously received a DSM-5 ASD diagnosis. All individuals were assessed with the *Social Communication Questionnaire* (SCQ; Rutter, Bailey, & Lord, 2003) and the *Autism Spectrum Screening Questionnaire* (ASSQ; Ehlers, Gillberg, & Wing, 1999*)* (Appendix J). Parents were given these measures at the beginning of the appointment when informed consent was provided, and asked to complete them while the participant engaged in the Ultimatum Game.

After informed consent and measures were provided to caregivers, data collection began in a room reserved specifically for the study, to avoid any potential distracters. All data collection occurred in Uhler Hall at Indiana University of Pennsylvania and took about thirty minutes total if the ADOS-2 was not administered, which was true for the majority of participants. The ADOS-2 and intelligence testing were administered first. Afterwards, participants were given oral instructions explaining how to play the Ultimatum Game (Appendix N) and to follow cues depicted on the computer screen. The evaluator waited in the room to make sure the participant was actively engaged in the activity and to help with any confusion or technical difficulties. After completing the Ultimatum Game, an assessment to ensure emotional recognition was administered. Participants were shown all variations of the two male and two female faces that were used throughout the trials. Participants were then asked to judge each one as either angry or happy. This was to ensure that all participants were able to judge the intended emotion displayed in the image. If any participants were unable to differentiate between a happy

and angry face, they were to be eliminated from the data interpretation. However, no participants' data needed to be eliminated from analysis.

After the experiment, participants were provided with an opportunity to ask questions about the experiment. Furthermore, all participants were debriefed in order to explain that the opponents they played against were computerized rather than a real person (Csukly et al., 2011; Polgár et al., 2014). Families were provided with this information in written form (Appendix O).

CHAPTER 4

RESULTS

The data were analyzed to evaluate whether facial expression, offer fairness, and/or sex of the stimulus face impacted acceptance of offers in the Ultimatum Game differently for the TD and ASD groups. The findings are organized and discussed in several sections.

Descriptive Statistics

Various statistics from the participant groups and the measure used will be discussed.

Participant Demographics

A total of 33 participants completed the study, including 17 individuals with autism spectrum disorder (ASD) and 16 typically-developing (TD) individuals. Of the 17 individuals with ASD, data from two participants were removed from analysis because their abbreviated IQ did not meet the minimum requirement of a standard score of 80. All participants were correctly able to identify and read the emotions on the 4 proposers' faces when provided with an emotion check on the computer. One TD participant accidentally moved on to the next proposer's face without answering a question. However, all seven of the other faces presented to this participant were correctly identified.

Data from a total of 31 participants, 15 individuals with ASD and 16 TD individuals, were included in the analysis. All participants were between 7 and 16 years old (mean age: 10.93 years). An independent samples t-test was conducted to test for group differences in age. The test revealed a significant difference in the mean ages of TD participants (M=8.93, SD=1.68) and participants with ASD (M=13.07, SD=2.59; $t(29)=-5.32$, $p<.05$. A correlation analysis was conducted to determine the relationship between age and acceptance rates. This concluded that there was no association between age and acceptance rates of fair, r (31)= -.10, $p > .1$, or unfair r

(31)= -.12, $p > .1$ offers. This was broken down further, and the correlation between age and acceptance rates of fair and unfair offers presented with either a happy or angry face was examined. These correlations were also not significant (*p*s >.1).

The group age discrepancy is due to the difficulty experienced during the recruitment phase. While TD participants were recruited from surrounding elementary schools, parents of children with ASD were less likely to respond to recruitment letters from the school. Thus, ASD participants involved in the study were recruited from a private practice that did not have a wide range of ages presenting for ASD treatment. Furthermore, overall, there was a smaller pool to draw from to recruit ASD participants when compared to TD participants as a result of lower prevalence rates for children with ASD when compared to TD children. More detailed demographics, including means and frequencies are included in Table 1.

Table 1

Participant Demographics

	All Participants	ASD Participants	TD Participants
Age			
Mean (SD)	10.93 (2.99)	13.07 (2.59)	8.93 (1.68)
Gender			
Male	17	11	6
Female	14	4	10
IQ			
Mean (SD)	97.97 (9.78)	95.2 (8.24)	100.56 (10.63)

Proposer Images

Proposer images were tested to determine whether they differed significantly in attractiveness. Results of a paired samples t-Test showed no significant differences in attractiveness between the two male and two female faces. Attractiveness scores for the two

males and two females were averaged to find an overall male and female attractiveness score for the proposers. A t-Test was run to compare the two means; t(111)=1.54, p>.1, and it showed that the male faces and female faces were rated as equally attractive.

Next, a repeated measures ANOVA was run to examine the effects of face and emotion on attractiveness scores. A main effect of face emerged Wilks' Lambda = .23, F(3, 25) = 28.73, p <.01, partial η^2= .78, indicating a significant difference in attractiveness ratings between the four faces. Follow up comparisons indicated that each pairwise difference was significant except for between one between one male (M=3.77) and one female (M=3.77) proposer. The other female (M=4.50) and male (M=4.98) proposers had significantly different attractiveness ratings from each other. A main effect of emotion also emerged, Wilks' Lambda = .70, F (3,25) = 11.55, p <.01, partial η^2= .30, indicating a significant difference in attractiveness ratings between happy (M=4.52) and angry (M=3.99) faces, with happy faces being rated as more attractive overall. Lastly, there was a significant interaction between face and emotion, Wilks' Lambda = .53, F(3, 25) = 7.44, p <.01, partial η^2= .47. Examination of the plotted means showed that three proposers were rated as more attractive with a happy expression than an angry expression, but one proposer was rated equally attractive with a happy expression and an angry expression.

Intelligence

Efforts were made to match participants by abbreviated intelligence test score to minimize differences between groups on this characteristic. Participants with ASD were matched as closely as possible to TD participants. An independent samples t-test was conducted to test for differences. The test showed no significant group differences in abbreviated IQ score, t(29)=1.56, p>.1. Abbreviated IQ scores ranged from standard scores of 82 to 115.

ASD Screeners

Of the 15 individuals with ASD, the results of the ADOS-2 were available for four. A member of the committee evaluated these individuals at the Center for Applied Psychology (CAP) and all met cut-offs for ASD on the ADOS-2. For the remainder of participants with ASD, although their diagnosis was not confirmed with the ADOS-2 in this study, they had been diagnosed elsewhere per caregiver report. Additionally, two screeners were provided to caregivers to confirm the ASD diagnosis. All ASD participants met the cutoff on at least one of the screeners provided (SCQ n=8, ASSQ n=14). Differences between scores on ASD screening measures (ASSQ and SCQ) were examined between clinical groups. As expected, there were significant group differences on the ASSQ; $t(29)=-8.99$, $p < .05$, and the SCQ; $t(29)=-6.98$, $p<.05$. Table 2 provides groups means of ASSQ and SCQ scores.

Table 2

Group Means (Standard Deviation) for ASSQ and SCQ Scores

Group	ASSQ (mean raw)	SCQ (mean raw)
All Participants	18.23(15.65)	9.65(8.73)
ASD Participants	31.87(11.02)	16.67(7.01)
TD Participants	5.44(4.00)	3.06(3.32)

Acceptance Rates in Ultimatum Game Trials

Acceptance rates among groups, and how they compare to one another will be discussed.

Main Effects and Interactions

A Repeated Measures ANOVA was conducted to assess the impact of Facial Expression, Sex of stimuli, Offer Fairness, and Clinical Group on acceptance rates in the Ultimatum Game. Offer, Facial Expression, and Sex of stimulus faces were used as the within-subjects factors and

diagnostic group (ASD versus TD) was used as the between-subjects factor. Offers of 1, 2, and 3 tokens (labeled "unfair") were collapsed and compared to 4 and 5 token offers, which were labeled as "fair," consistent with previous research (Camerer, 2003). Data were screened to ensure that the assumptions of two-way repeated measures ANOVA were fulfilled. Data screening led to the log transformation of the data, to minimize the impact of outliers. With this transformation, visual inspection of data indicates the number of outliers was decreased from six participants across conditions to two ASD participants in the happy/fair conditions. Although group distributions even after log transformations indicated skewedness in both directions depending on the variable, no further transformations were conducted because ANOVA is not highly sensitive to nonnormality (Mertler & Vannatta, 2013). Homogeneity of variance was tested within the ANOVA with the transformed data with Levene's test; this indicated that the data violated this assumption for half of the variables. However, nonsignificance is reportedly not fatal to the analysis, and is related to the assumption of normality (Mertler & Vannatta, 2013). Because the data is skewed (nonnormal), the data are not evenly distributed, resulting in differences in deviations from the mean acceptance rate. Thus, the violation of this assumption is likely due to the nonnormality of the variables (Mertler & Vannatta, 2013).

During data interpretation, 'reject' was coded as 1 and 'accept' was coded as 2; thus, higher numbers represent higher rates of acceptance. ANOVA results showed no main effect for Sex of the stimuli presented, Wilks' Lambda = .98, F (1, 28) = .50, $p > .1$, partial η^2=.017. As a result, in further analysis, Sex of stimuli was removed and only Offer Fairness and Facial Expression were used as within-subject factors. A main effect of Facial Expression emerged, Wilks' Lambda = .746, F(1, 29) = 9.868, $p < .05$, partial η^2= .254, indicating a significant difference in acceptance rates between happy (M=1.57) and angry (M=1.44) facial expressions,

with participants accepting more offers from happy facial expressions when compared to angry. There was a main effect of Offer Fairness, Wilks' Lambda = .134, $F(1.29) = 187.369$, $p < .05$, partial $\eta^2 = .866$, indicating a significant difference in response rates between fair (M=1.78) and unfair offers (M=1.23) with higher acceptance rates for fair offers. Overall, participants were more likely to accept higher offers than lower offers and were also more likely to accept offers from smiling proposers. Effect sizes for both main effects suggest large practical significance.

Neither the main effect of Clinical Group nor any of the interactions between Facial Expression, Offer, or Clinical Group were significant (*p*s >.1), contrary to expectations. As aforementioned, log transformed data of responses from fair (4 and 5 tokens) and unfair (1,2, or 3 tokens) offers were averaged to produce 2 variables, fair and unfair, for data analysis. Although data was log transformed, for ease of interpretation, Table 3 displays the raw data across Offer fairness, Facial Expression, and Group. Additionally, Table 4 presents the percentage of offers accepted across groups, fairness, and facial expression.

Furthermore, the ANOVA was run again, with age as a covariate, since the groups differed significantly in age. Results were consistent with those of the correlational analyses presented above; there was still no significant effect of group on acceptance after controlling for age, $F(1,1) = 2.42$, $p > .1$, and none of the interactions between group and the other factors were significant, p's > .1, indicating that both groups responded in similar ways even when the variable of age was held constant.

Table 3

Raw Score Mean (Standard Deviation) Response Across Offer, Facial Expression, and Group

Group	Fair Offers		Unfair Offers	
	Happy	Angry	Happy	Angry
Total	1.85 (.03)	1.70 (.04)	1.29 (.06)	1.17 (.04)
ASD Participants	1.87 (.05)	1.68 (.06)	1.37 (.08)	1.18 (.06)
TD Participants	1.84 (.05)	1.73 (.06)	1.20 (.08)	1.17 (.06)

Table 4

Percentage of Acceptance Across Offer, Facial Expression, and Group

Group	Fair Offers		Unfair Offers	
	Happy	Angry	Happy	Angry
Total	85.1%	70.1%	28%	16.9%
ASD Participants	86.7%	68.3%	37.2%	17.8%
TD Participants	83.6%	71.9%	19.3%	16.1%

Facial Expression on Acceptance Rates

The first hypothesis stated that there would be no effect of facial expression on the ASD group at fair or unfair offers, which is the opposite of what is seen with neurotypical populations (Mussel et al., 2013). This was supported by previous research displaying a pattern of not considering facial expression when making Ultimatum Game decisions at fair offers in other atypical populations (Csukly et al., 2011; Polgar et al., 2014). Paired sample t-tests were conducted to compare acceptance rates in the ASD group when the offer was presented with a happy face and an angry face, first for fair offers and then for unfair offers. Results showed that the ASD group did, in fact, show a significant difference in acceptance rates when presented with different emotions at fair offers, $t(14) = -2.73$, $p < .05$, as well as at unfair offers, $t(14) = 2.15$, $p < .05$. Participants with ASD were more likely to accept a fair offer when presented with

a proposer showing a happy face when compared to an angry face. This is also demonstrated at unfair offers, with a higher acceptance rate at a happy facial expression when compared to an angry one.

TD participants were also significantly more likely to accept proposals when presented with a positive emotion than a negative emotion at fair offers, $t(15) = -2.81$, $p < .05$. This is what was expected from this group as a result of past studies (Patrick et al., 2013). However, this finding was not significant at unfair offers, $t(15) = .77$, $p > .1$, indicating that TD responses were motivated by perception of fairness and not overshadowed by facial expression of proposer, contrary to what Mussel et al. (2013) found. Thus, this hypothesis was not supported, as the ASD group responded to the proposer's facial expression at both fair and unfair offers, similarly to the TD group.

The second hypothesis stated that the ASD group was less likely to accept fair offers with smiling faces when compared to the TD group because typically developing individuals are more likely to be influenced by facial expression. An independent samples t-test was conducted to examine differences in acceptance rates between the groups. Results indicated that there was no significant difference between groups in acceptance rates at fair offers when proposers were presented with a smiling face, $t(29) = .437$, $p > .1$, consistent with findings from the ANOVA showing no group differences and no interactions between any of the variables. Thus, this hypothesis was not supported.

Acceptance Rates at Unfair Offers

The last hypothesis stated that acceptance rates of unfair offers (1, 2, or 3 tokens) would be significantly higher for participants with ASD regardless of facial expression when compared to TD participants. An independent samples t-test was conducted to compare acceptance rates

between the two groups at unfair offers. There was no significant difference in acceptance rates of unfair offers between the two groups, $t(29) = 1.06$, $p > .1$. Thus, hypothesis 3 was not supported. Table 5 displays acceptance rates across fairness and clinical group.

Table 5

Percentage of Acceptance Across Fairness and Group

Group	Fair	Unfair
ASD Participants	77.5%	27.5%
TD Participants	77.7%	17.7%

CHAPTER 5

DISCUSSION

The purpose of this study was to examine bargaining game behavior in individuals with Autism Spectrum Disorder (ASD) by evaluating how these individuals respond to various offers and facial expressions during the Ultimatum Game. Bargaining utilizes an individual's expectation of future outcome (Nash, 1950). This skill is used in other social interactions as well, such as inferring the intentions of others. The impact of facial expression during the Ultimatum Game in individuals with ASD has not been studied. However, positive facial expression has been shown to have no effect in individuals with schizophrenia or BPD in the Ultimatum Game (Csukly et al., 2011; Polgár et al., 2014), unlike results found in TD samples (Mussel et al. 2014). In another study of economic game play with individuals with ASD, participants did not change their behavior based on the image of their opponent's face, suggesting that the group did not take facial information into consideration when making decisions in bargaining contexts (Ewing et al., 2015).

In this study, participants acted as the responder to 40 trials of the Ultimatum Game against computerized proposers who varied in sex, facial expression, and offer. In each trial, the proposer offered a different number of tokens (one through five) and displayed a different facial expression (happy or angry). There were four proposers total, two males and two females, who proposed each offer of one through five tokens, with either a happy and angry facial expression, resulting in a total of 40 trials. Bargaining behavior was examined by assessing which offers participants accepted and rejected. Different patterns of results were hypothesized depending on group (ASD versus TD), offer, and facial expression. Group differences were expected because previous research shows that individuals with ASD, unlike TD individuals, do not behave

differently in response to facial cues (Caulfield et al., 2014; Ewing et al., 2015) but are able to effectively engage in strategic behavior within a bargaining context (Downs & Smith, 2004; Sally & Hill, 2006). Thus, individuals with ASD were predicted to accept offers without regard to facial expression, in contrast to the TD group (Mussel et al., 2014).

Hypotheses and Ultimatum Game Responses

Description of the hypotheses and their findings will be summarized separately.

Hypothesis 1

The first hypothesis predicted that there would be no significant effect of facial expression on participants with ASD at fair or unfair offers, unlike what is seen in TD populations. Previous research suggests that atypical populations, including Schizophrenia and Borderline Personality Disorder (Csukly et al., 2011; Polgar et al., 2014), do not use facial expression when making Ultimatum Game decisions. Thus, because individuals with ASD experience difficulty perceiving and spontaneously using social cues to make decisions (Caulfield et al., 2014; Ewing et al., 2015; Plumet & Veneziano, 2015), it was expected that facial expression would not affect acceptance rates in the Ultimatum Game. However, results showed a significant difference in the ASD group in acceptance rates for both fair and unfair offers when comparing proposers displaying happy and angry facial expressions. Specifically, participants with ASD were less likely to accept offers (both fair and unfair) when presented by a proposer with an angry facial expression. Unexpectedly, the TD and ASD groups did not differ in their acceptance of fair or unfair offers, for either facial expression condition. As shown in Table 3, there is a trend of increased acceptance (higher mean) in the ASD group with happy versus angry faces at both fair offers, and unfair offers. TD participants were also more likely to

accept proposals when presented with a happy face at both fair and unfair offers, though this trend was not statistically significant for unfair offers.

A possible explanation for these results is that the image of the proposer's full and exaggerated facial expression was available on the screen for the entirety of the decision-making process. Rump et al. (2009) examined emotion recognition in TD individuals and individuals with ASD. The groups did not differ in their abilities to recognize the emotion in an image when no time limit was placed on the participant, as well as when the image showed a full emotional expression, rather than a subtle one (Rump et al., 2009), which is consistent with findings from this study. For this reason, and to ensure all participants understood the intended emotion of the stimuli, the image of the proposer's facial expression was kept on the screen for the entirety of the decision-making process during the trials of the Ultimatum Game. However, it is possible that because the proposer's face was available the whole time, rather than a limited amount of time as in other studies (Csukly et al., 2011; Polgár et al., 2014), the participants with ASD were not only able to identify the emotion of the proposer but also used it to inform their decisions, especially since the facial expression shown in the image was exaggerated as Rump et al. (2009) investigated. Although this may have mimicked the amount of time facial information is available during a real life interaction, facial expressions are typically subtler or more variable in everyday interactions. As a result, hypothesis one was not supported.

Hypothesis 2

The second hypothesis predicted significantly lower acceptance rates in the ASD group for fair offers (4 or 5 tokens) when proposers displayed positive emotions compared to the TD group. Previous research shows that facial expression has an influence on bargaining behavior and economic decision making in various games, such as the Ultimatum Game and Prisoner's

Dilemma Game. Specifically, in TD individuals, positive facial expressions are accompanied by increased acceptance of all offers when compared to angry facial expressions, both fair and unfair (Mussel, Göritz, & Hewig, 2013; Reed et al., 2012). Prior research has shown that, at fair offers of the Ultimatum Game, typically developing participants are more likely to accept offers from proposers with happy facial expressions compared to atypical populations (i.e. Schizophrenia and Borderline Personality Disorder; Csukly et al., 2011; Polgár et al., 2014). Furthermore, in an economic trust game, children with ASD experienced difficulty spontaneously drawing conclusions from facial expression in an implicit manner, and if they did, did not alter their behavior considering this information (Ewing et al., 2015). Thus, it was hypothesized that participants with ASD would not utilize the information from the facial expressions during the trials of the Ultimatum Game, leading to lower acceptance rates of fair offers by ASD participants compared to TD participants when proposers presented a happy facial expression. Unexpectedly, typically developing participants and participants with ASD responded similarly at fair offers with happy proposers. This again, could be explained by the amount of time the proposer's face was available to the participants as well as the ability for individuals with ASD to identify the "happy" emotion, since the full expression of that emotion is easily categorized by individuals on the spectrum (Rump et al., 2009). This is also supported by the correct answers provided in the emotion recognition task presented to all participants in both groups at the end of the Ultimatum Game.

Acceptance rates indicate that facial expressions had an effect on the ASD group at fair offers, although this was not the predicted trend. In the current study, participants with ASD utilized facial expressions when making economic decisions through the Ultimatum Game, so

hypothesis two was not supported. It is possible that like Rump et al. (2009) reports, at extremes of facial expression, there is no difference in the behavior shown by TD and ASD children.

Hypothesis 3

The third hypothesis predicted higher acceptance rates of unfair offers (1, 2, or 3 tokens) in the ASD group when compared to the TD group regardless of facial expression. Previous Ultimatum Game research indicates lower rejection/higher acceptance rates of unfair offers in atypical populations (Schizophrenia, Borderline Personality Disorder, and ASD) when compared to typically developing individuals (Csukly et al., 2011; Polgar et al., 2014, Sally & Hill, 2006). The typical response is to "punish" the proposer who is acting unfairly towards the responder by responding with a rejection (Camerer, 2003), which is not the case with atypical populations.

Results from the current study did not support this hypothesis, with no significant difference in acceptance rate at unfair offers between the ASD and TD groups. Although there were no significant group differences, visual inspection of mean group acceptance in Table 5 showed that participants with ASD did accept unfair offers at a slightly higher rate when compared to the TD group. As results were not significant, this trend should be interpreted cautiously. It is possible, however, that with a larger sample size, this trend may have reached significance.

Limitations and Future Directions

Further research needs to be conducted on the use of social cues to inform decisions in people with ASD. Past research shows individuals with ASD do not change their behavior based on the image of their opponent's face (Ewing et al., 2015), suggesting that individuals with ASD would not be affected by facial expression when making decisions in bargaining situations. However, this was not supported by the current study.

Other studies suggest that there are no differences in the ability of individuals with ASD to recognize and identify a full emotion when no time limit is placed on them, as compared to TD individuals (Clark, Winkielman, & McIntosh, 2008; Rump et al., 2009). Thus, keeping the image of the proposer on the screen throughout the decision making process, as well as showing an exaggerated expression, may have mitigated any potential differences in behavior between the two groups. The photos used in this version of the Ultimatum Game showed an exaggerated facial expression to portray emotion, which is not consistent with real life interactions. This was to ensure all participants understood the intended emotions. However, the obviousness of the expression and the length for which it was displayed could have impacted the results by encouraging participants to be influenced by it during the decision making process, rather than just correctly identifying the emotion. Future studies should examine whether variations of the proposer's image affects response rates. For example, varying the amount of time the proposer's image is visible to the participants or providing subtler expressions of the proposer's emotion may produce different results and provide more clarity in the role of facial expressions in making social judgments.

Varying proposer offers may also be an informative future direction for the study of the Ultimatum Game. Most Ultimatum Game studies have not provided the option to offer the responder more than half of the total. Research has shown that individuals become uncomfortable when they find themselves in unequal relationships, even if receiving more than they believe they should (Peters, 2005). Future studies may benefit from allowing responders to receive more than half of the total to examine the response rates of offers that can be considered overly fair.

Additionally, increasing the social interaction or even the prospect of interaction may offer more insight into any potential behavior differences. For example, providing the suggestion that the participant will meet the proposers after the game is played may provide a response pattern closer to what would be seen in real life. One limitation of lab studies examining social behaviors is that the stakes are different than in real life (Levitt & List, 2007), so this modification may help generalizability.

It is also possible that the severity of ASD symptomology the participants displayed impacted their likelihood to utilize facial expression to inform their decision. Future studies may benefit from examining differences in ASD symptomology and the likelihood to respond like neurotypical counterparts in economic games. It should ne noted that not all of the participants in the ASD group could be retested with the ADOS-2. Thus, ASD diagnosis was dependent upon parent report along with parent report measures of ASD symptoms, which may have resulted in a skewed perception of participants' ASD symptomology. This study was also limited by the relatively small sample size of individuals with an ASD diagnosis. Future studies should aim to increase the sample size to better represent the population of children with ASD and increase power.

Additionally, the ages of participants in the current study significantly differed between groups. Participants in the ASD group were significantly older than the participants in the TD group. Although age was not a significant covariate, it is possible that, developmentally, the ASD group was better able to delay gratification and not accept unfair offers due to their age. Because maturity is directly related to the development of delay of gratification (Mischel, 1974), this could have resulted in response patterns similar to their younger TD counterparts. Future studies may also benefit from studying whether age impacts the likelihood of acceptance.

Certain demographic characteristics (i.e., age and sex) were not matched between groups, thus future studies should address these issues. The influence of the sex of participants on the results of this study is unknown. For example, it is possible that, like Eckel and Grossman (2001) found, the female participants were more likely to accept offers in general.

As stated earlier, ANOVA results show a significant difference in attractiveness between the proposers, as well as higher attractiveness ratings overall for happy versus angry faces. It is possible that this had an effect on participant responses, and participants expected more and rejected low offers more from proposers considered to be more attractive as Solnick & Schweitzer (1999) found. Future studies would benefit from controlling for attractiveness level between proposers to see if this affects acceptance rates. Alternatively, investigating the role of attractiveness on acceptance rate in the ASD population may be another useful future direction.

The information from this study could be utilized to help inform social interventions with individuals with ASD. Because the ASD group did utilize the facial expressions while making their decisions, interventions should focus on explicitly identifying a social cue and following through with the interaction while the social cue is still readily available or visible to the individual. For example, when teaching social distancing it may be helpful to provide an explicit boundary, such as a hula hoop, and engage in a social interaction while the hula hoop is still around the individual. The current study's findings provide further support for clinicians to utilize visual and explicit strategies, such as social stories, to teach individuals with ASD appropriate social responses and behaviors. Social stories are short stories that provide information about a specific social situation and help children with ASD to predict social situations. With social stories, individuals with ASD are explicitly provided with a social situation in order to learn how to appropriately respond to the situation (Gray, 1995; Gray &

Garand, 1993). These social stories are provided to the individual repeatedly before and potentially during the intended social situation just as the images in this study were. The visual exposure to the social interaction helps individuals with ASD learn the appropriate social response (Gray, 1995).

Although investigators have succeeded in devising hypothetical situations in which the bargaining behavior of individuals is studied (e.g. Bailey et al., 2013; Csukly et al., 2011; Polgár et al., 2014; Sally & Hill, 2006; Solnick & Schweitzer, 1999), the ecological validity of such situations is unknown. The psychometric properties of the Ultimatum Game have not been widely studied, so its correlation to social decision making and bargaining outside of the game context should be interpreted with caution (Jackson, 2012). Most naturally occurring opportunities for bargaining involve social decision making in a non-laboratory setting, with tangible incentives, and a real life opponent, all of which this study lacked, so conclusions drawn from such studies, including this one, lack generalization. The parallels between experimental economic game behavior and real life behavior are speculative, and although experimental methods do add useful information, do not stand as evidence alone to life beyond the game context (Jackson, 2012).

There has been little work to systematically investigate the external validity of experimental games to real life social behavior, even though there is a major interest in the topic (Galizzi & Navarro-Martinez, 2015), and there are many studies that discuss the possible connection between the two discussed throughout the second chapter (e.g. Eckel & Grossman, 2001; Ma & Hu, 2015). However, there are various complications when social behavior experiments are generalized outside of the lab, such as participants in experiments potentially

acting differently when being watched by experimenters, stakes being different than in real life, and a lack of context in the experiments (Levitt & List, 2007).

Galizzi & Navarro-Martinez (2015) presented research looking at various social games and their correlation to social behaviors in the field and from the past, rather than the correlation between one game and one specific behavior. Overall, this study demonstrated that experimental social preference games do not adequately explain social behaviors in real life. Galizzi & Navarro-Martinez (2015) compared behavior in various games, including the Ultimatum Game and the Dictator Game to self-reported social behaviors and various situations created in the field. Adult participants were asked about their involvement in past altruistic behavior (e.g. "I have given money to charity"), participated in several different games, including the Ultimatum Game, and encountered a naturalistic field situation that was created for them on their way out of the laboratory. This field situation allowed them to act in a prosocial manner if they chose, such as explicitly asking participants for help carrying boxes to the lab or asking for a charitable donation. Galizzi & Navarro-Martinez (2015) found that the games did a poor job explaining both the self-reported measures and field behaviors measured by low correlation between scores on self-report measures, cooperative behaviors in games, and prosocial behaviors in the field. Results of this large lab/field experiment support Jackson's (2012) claim to interpret any correlations with caution when comparing experiment behavior to field behavior. The lack of external validity for economic games should be noted as a limitation when attempting to extrapolate any social information from them. Future studies may benefit from attempting to convey a more realistic interaction during the experimental game.

Conclusion

Overall, the results suggested that Ultimatum Game responses are affected by both offer and facial expression, which is consistent with prior research (Mussel et al., 2013; Mussel et al., 2014). Taken together, all participants were less likely to accept offers from a proposer displaying an angry facial expression when compared to a happy one. Participants were also overall more likely to accept fair offers when compared to unfair offers.

Cooperation and bargaining behavior are not impaired in individuals with ASD, as evidenced by several studies using another economic game, the Prisoner's Dilemma Game. Participants with ASD did not differ significantly from their typically developing counterparts in cooperative behavior during the Prisoner's Dilemma game, as results showed that most participants chose to share tokens equally with their opponent (Downs & Smith, 2004). Sally and Hill (2006) also investigated behavior in various strategic games in children with and without ASD. Although their studies did not take into account the facial expression of the opponent, there was no significant difference in levels of cooperation between the groups with and without ASD (Sally & Hill, 2006).

These studies suggest children with ASD are able to appropriately engage in strategic game behavior. However, in one research study, when the variable of trustworthiness of the opponent's face was factored in, a significant difference in behavior was seen between the two groups (Ewing et al., 2015), which was not found in this study. Ewing et al. (2015) suggested that results may be due to the difficulties that individuals with ASD experience in extracting social information from faces (Webb et al., 2011) and difficulties with altering behavior based on social information (Ewing et al., 2015). Children with ASD did not take facial trustworthiness into consideration when making a decision of how many tokens to invest in certain opponents,

while TD children did. Although all participants from both groups were able to read trustworthiness from facial images when asked separately, it only affected the game behavior and altered the number of tokens offered in the TD group. This supports the theories that children with ASD experience difficulty spontaneously drawing conclusions from facial information in an implicit manner and/or do not alter their behavior considering this information (Ewing et al., 2015). It is also possible that the participants believed that the nature of the task did not require judgments of trustworthiness.

Results from the current study did not show any differences in acceptance rates between the clinical and control groups, unlike previous studies (e.g. Ewing et al., 2015). Participants with ASD and TD participants responded with similar acceptance rates at both fair and unfair offers, in both facial expression conditions. Results also did not support higher acceptance rates at unfair offers for the ASD group. There was no significant difference in acceptance rate at unfair offers between the ASD and TD groups, indicating that this group had the capacity to evaluate fairness of offer and engage in negative reciprocity when presented with unfair offers. Overall, results show that ASD and TD participants responded similarly to facial expression and offer.

Furthermore, the results showed a significant difference in acceptance rates across facial expressions within the ASD group. Participants with ASD were more likely to accept offers when presented by a proposer with a happy facial expression when compared to an angry facial expression, again suggesting utilization of facial expressions when making Ultimatum Game decisions. In addition to ensuring that all participants could identify the intended emotion, it is possible that the prolonged image encouraged the participants with ASD to utilize that information when making their decision. Although facial expressions are brief or subtle in

everyday social interactions, the knowledge that individuals with ASD may be able to utilize facial information when provided with more time to process, or more extreme and explicit emotions, may prove useful when planning social interventions.

In conclusion, ASD and TD participants responded in similar ways overall during the Ultimatum Game. Data conveys that both the ASD and TD group used facial expression as well as offer fairness when making an Ultimatum Game decision. However, we must use caution when extrapolating social information from these economic game interactions.

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Appendix A

Center for Applied Psychology Informed Consent Form

Indiana University of Pennsylvania
www.iup.edu

Center for Applied Psychology
Uhler Hall, Room 210
1020 Oakland Avenue
Indiana, Pennsylvania 15705-1064

P 724-357-6228
F 724-357-7817
www.iup.edu/psychology

CENTER FOR APPLIED PSYCHOLOGY
Indiana University of Pennsylvania

Client Consent Form

Provision of services- The Assessment Clinic, Family Clinic, and Stress and Habit Disorders Clinic are housed within the Center for Applied Psychology (CAP) at Indiana University of Pennsylvania. The CAP offers psychological services provided by advanced psychology doctoral students with supervision by licensed clinical psychologists.

Observation, recording, clinical training and research- The CAP is the primary clinical training site for doctoral students. As such, observation of therapy/testing sessions by the supervisor and supporting clinical team through one-way mirrors and video-recording is an integral part of the clinical work. Without such recordings or observations, only verbal or written reports could be provided to the supervisor. As part of their training, graduate students are also required to present a sample of their clinical work before the Clinical Training Committee. This work sample may include video-taped and written material from various treatment or testing sessions. Thus, if you are receiving therapy either through the Family or Stress and Habit Disorders Clinics you may be asked to complete a brief set of questionnaires assessing your views about therapy and the therapist you are seeing. These questionnaires may be completed after each session and some time after your therapy has ended.

Confidentiality- The confidentiality of all materials related to your therapy and/or testing will be protected by the CAP. There is no confidentiality from referral sources during evaluations conducted for Children and Youth. All information gained during assessment will be put into a report that is sent to them. Clinical information will not be disclosed to anyone outside the Clinical Training Program without your written permission to release such information, except where required by law. It is important to understand that the law requires the CAP to release information when there is suspicion of child abuse or neglect, or when there is an actual threat of a physically violent act that would endanger you or others. Research data will only be reported in pooled form and will not present any information that would identify individual clients.

Agreement- By signing below I certify that I understand the information presented above and agree to: (1) receive psychological services from the CAP; (2) allow video-recording and observation of my sessions by a licensed psychologist and supporting clinical team; (3) allow the therapist to use information from my therapy and/or assessment for the clinical work sample; (4) participate in clinic research, and (5) pay a fee of $_____ per session/hour, due and payable at the time of each appointment unless otherwise arranged.

I further understand that my therapy and/or testing through the CAP does not depend on my participation in research or having my sessions recorded, and that at any time I may choose to withhold this information without jeopardy. The confidentiality of all materials related to my therapy and/or testing will be protected by the CAP.

This agreement will be constructed according to the laws of the State of Pennsylvania.

_____ _____
Signature of Client Date

_____ _____
Signature of Parent/Guardian Date

_____ _____
Signature of Witness Date

Inquiries or concerns should be addressed to Director, Center for Applied Psychology, Indiana University of Pennsylvania, Indiana, and PA 15701; telephone (724) 357-6228.

Appendix B

Script for Contacting CAP Participants by Phone

"Hello, is _____ available? This is Amanda Trovato from the Center of Applied Psychology at Indiana University of Pennsylvania. Your child, _____, previously had an evaluation completed by our clinic. During your evaluation, you consented to being contacted by the CAP about your child participating in research. I am currently conducting a study examining decision-making behavior using facial expressions in individuals who have been diagnosed with autism spectrum disorder. Our records indicate that your child was given this diagnosis during the evaluation completed by our clinic. Would you be willing to have your child participate in this study in order to potentially learn more about the different social behaviors present in individuals with autism spectrum disorder. If you are willing to allow your child to participate, you would receive and $10 gift card for compensation. Participation will take approximately an hour and a half and can be scheduled at your own convenience. If you would like to participate, please contact Amanda Trovato by email at a.n.trovato@iup.edu, or by phone at 724-357-6228. I appreciate you taking the time out to talk with me today"

Appendix C

School Recruitment Letter for Typically Developing Individuals and Individuals with Autism Spectrum Disorder

Recruitment Letter

Dear _____,

I am writing to ask if you would be willing to allow me to recruit children from your school for participation in a research study on the effect of facial expression on decision-making behavior. I am looking for children ages 7 and up to participate in a study asking them to play a computerized decision-making game.

I am studying the effect of facial expressions on decision-making behavior in children with and without autism spectrum disorder. Individuals with autism spectrum disorder often present with difficulties in social communication and social interaction across a variety of situations (American Psychiatric Association, 2013). These difficulties make it hard to perceive and use social cues from interactions. Facial expressions are a type of social behavior or cue that individuals use to help make decisions (Mussel et al., 2014). Due to the effect of facial expressions on social interactions, this study could be beneficial in learning more about the differences in social behavior present in children with autism spectrum disorder.

This study is looking for typically-developing children AND children diagnosed with autism spectrum disorder, ages 7 years and older, who would be willing to participate in this study. These individuals will be matched by age and intellectual ability. This will allow us to compare the usage of social cues (facial expression) in decision-making behaviors in typically developing children and children with autism spectrum disorder. This may advance our understanding of the differing social behaviors observed in autism spectrum disorders. Participation will involve one visit to Uhler Hall, at the Indiana University of Pennsylvania's campus, for approximately an hour and a half. Individuals who agree to participate in this study will be given a $10 gift card. Individuals are able to withdraw from the study at any time and all information will be kept confidential. This study has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects (Log no. 16-301; phone: 724-357-7730).

If you agree to allow me to recruit from your school, please contact the principal researcher, Amanda Trovato, at 724-357-6228 or a.n.trovato@iup.edu so arrangements to send out parent recruitment letters can be made. Do not hesitate to contact me or my faculty supervisor with any questions you may have. Participation is voluntary and can be scheduled at the family's convenience.

Sincerely,

Principle Investigator:
Amanda Trovato, M.A.
Doctoral Candidate
Psychology Department
1020 Oakland Ave
Indiana, PA 15705

Project Supervisor:
Dr. Lisa Newell
Associate Professor
Psychology Department
1020 Oakland Ave
Indiana, PA 15705
newell@iup.edu

Appendix D

School Parent Recruitment Letter

Recruitment Letter

Dear _____,

I am writing to ask if you would be willing to allow your child to participate in a study researching the effect of facial expression on decision-making behavior. I am looking for children ages 7 and up to participate in a study asking them to play a computerized decision-making game.

I am studying the effect of facial expressions on decision-making behavior in children with and without autism spectrum disorder. Individuals with autism spectrum disorder often struggle with social communication and social interactions. These difficulties make it hard to perceive and use social cues, like facial expressions, during social interactions. Due to the effect of facial expressions on social interactions, this study could be beneficial in learning more about the differences in social behavior present in children with autism spectrum disorder.

This study is looking for children, ages 7 years and older, who would be willing to participate in this study. Individuals will be matched by age and intellectual ability. This will allow us to compare how typically developing children and children with autism spectrum disorder use facial expression in decision-making. This may advance our understanding of the differing social behaviors in individuals with autism spectrum disorders. Participation will involve one visit to Uhler Hall, on Indiana University of Pennsylvania's campus, for approximately an hour and a half. There are no known risks for participating in this study. Individuals who agree to participate in this study will be given a $10 gift card. Individuals are able to withdraw from the study at any time and all information will be kept confidential. This study has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects (phone: 724-357-7730).

Please contact the principal researcher, Amanda Trovato, at 724-357-6228 or a.n.trovato@iup.edu if you would like to learn more about the study or would be willing to participate. Participation is voluntary and can be scheduled at your convenience.
Thank you in advance for considering participating in this study!

Sincerely,

Principle Investigator:
Amanda Trovato, M.A.
Doctoral Candidate
Psychology Department
1020 Oakland Ave
Indiana, PA 15705

Project Supervisor:
Dr. Lisa Newell
Associate Professor
Psychology Department
1020 Oakland Ave
Indiana, PA 15705
newell@iup.edu

Appendix E

Site Recruitment Letter for Individuals with Autism Spectrum Disorder

Recruitment Letter

Dear _____,

I am writing to ask if you would be willing to allow me to recruit children from your site for participation in a research study on the effect of facial expression on decision-making behavior. I am looking for children ages 7 and up to participate in a study asking them to play a computerized decision-making game.

I am studying the effect of facial expressions on decision-making behavior in children with and without autism spectrum disorder. Individuals with autism spectrum disorder often present with difficulties in social communication and social interaction across a variety of situations (American Psychiatric Association, 2013). These difficulties make it hard to perceive and use social cues from interactions. Facial expressions are a type of social behavior or cue that individuals use to help make decisions (Mussel et al., 2014). Due to the effect of facial expressions on social interactions, this study could be beneficial in learning more about the differences in social behavior present in children with autism spectrum disorder.

This study is looking for individuals 7 to 18 years of age, who were previously diagnosed with autism spectrum disorder. Participation will involve one visit to Uhler Hall, at the Indiana University of Pennsylvania's campus, for approximately an hour and a half. Individuals who agree to participate in this study will be given a $10 gift card. Individuals are able to withdraw from the study at any time and all information will be kept confidential. This study has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects (Log no. 16-301; phone: 724-357-7730).

If you agree to allow me to recruit from your site, please contact the principal researcher, Amanda Trovato, at 724-357-6228 or a.n.trovato@iup.edu so arrangements to send out recruitment letters can be made. Additionally, flyers are available to be posted at your site, although individual letter distribution is preferred. Do not hesitate to contact me or my faculty supervisor with any questions you may have. Participation is voluntary and can be scheduled at the family's convenience.

Sincerely,

Principle Investigator:
Amanda Trovato, M.A.
Doctoral Candidate
Psychology Department
1020 Oakland Ave
Indiana, PA 15705

Project Supervisor:
Dr. Lisa Newell
Associate Professor
Psychology Department
1020 Oakland Ave
Indiana, PA 15705
newell@iup.edu

Appendix F

Parent Recruitment Letter for Individuals with Autism Spectrum Disorder

Recruitment Letter

Dear _____,

I am writing to ask if you would willing to allow your child to participate in a study researching the effect of facial expression on decision-making behavior. I am looking for children ages 7 and up to participate in a study asking them to play a computerized decision-making game.

I am studying the effect of facial expressions on decision-making behavior in children with and without autism spectrum disorder. Individuals with autism spectrum disorder often struggle with social communication and social interactions. These difficulties make it hard to perceive and use social cues, like facial expressions, during social interactions. Due to the effect of facial expressions on social interactions, this study could be beneficial in learning more about the differences in social behavior present in children with autism spectrum disorder.

This study is looking for individuals ages 7 to 18 years of age, who were previously diagnosed with autism spectrum disorder. These individuals will be matched by age and intellectual ability with typically developing individuals. This will allow us to compare how typically developing children and children with autism spectrum disorder use facial expression in decision-making. This may advance our understanding of the differing social behaviors in individuals with autism spectrum disorders. Participation will involve one visit to Uhler Hall, on Indiana University of Pennsylvania's campus, for approximately an hour and a half. There are no known risks for participating in this study. Individuals who agree to participate in this study will be given a $10 gift card. Individuals are able to withdraw from the study at any time and all information will be kept confidential. This study has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects (phone: 724-357-7730).

Please contact the principal researcher, Amanda Trovato, at 724-357-6228 or a.n.trovato@iup.edu , or if you would like to learn more about the study or would be willing to participate. Participation is voluntary and can be scheduled at your convenience.
Thank you in advance for considering participating in this study!

Sincerely,

Principle Investigator:
Amanda Trovato, M.A.
Doctoral Candidate
Psychology Department
1020 Oakland Ave
Indiana, PA 15705

Project Supervisor:
Dr. Lisa Newell
Associate Professor
Psychology Department
1020 Oakland Ave
Indiana, PA 15705
newell@iup.edu

Appendix G

Recruitment Flyer

Has your child been diagnosed with autism spectrum disorder? Would you be willing to allow your child to participate in a study examining decision-making behavior in individuals with autism spectrum disorders?

Individuals with autism spectrum disorder often present with difficulties in social communication and social interaction across a variety of situations. These difficulties make it hard to perceive and use social cues from interactions. Facial expressions are a type of social behavior or cue that individuals use to help make decisions. Thus, impaired use of facial expressions during an interaction could lead to different responses. Due to the effect of facial expressions on social interactions, this study could be beneficial in learning more about the differences in social behavior present in children with autism spectrum disorder.

Individuals who participate will receive a $10 gift card!!!

If you are interested, please contact Amanda Trovato, M.A., a doctoral student at IUP.

Contact: Amanda Trovato a.n.trovato@iup.edu or 724-357-6228	Contact: Amanda Trovato a.n.trovato@iup.edu or 724-357-6228	Contact: Amanda Trovato a.n.trovato@iup.edu or 724-357-6228	Contact: Amanda Trovato a.n.trovato@iup.edu or 724-357-6228	Contact: Amanda Trovato a.n.trovato@iup.edu or 724-357-6228	Contact: Amanda Trovato a.n.trovato@iup.edu or 724-357-6228	Contact: Amanda Trovato a.n.trovato@iup.edu or 724-357-6228

Appendix H

Request for Future Participation

We would like to request you permission to be contacted again for future studies. Like in the previous study, individuals who agree to be contacted for future studies and choose to participate may be eligible for compensation. All information will still be kept confidential and you will be informed of any potential risks or benefits of each study you agree to participate in. After all identifying information is stripped from the data obtained from this current study, with your permission; the data may be accessed again.

If you are willing to be contacted for potential participation in future studies, please sign below. This indicates your consent to be contacted for participation in future studies and allows for the sharing of deidentified data obtained from the current one. If you do not sign this letter you will not be contacted for participation in another study and your data will not be accessed again. Thank you in advance for considering participation in future studies!

_____ _____

Parent Signature Date

_____ _____

Print Name Preferred Contact Number

Appendix I

Referral Sheet

Below are referral sources to obtain a thorough evaluation for Autism Spectrum Disorder:

Center for Applied Psychology
Room 210
1020 Oakland Avenue
Indiana, PA 15701
Phone: 724-357-6228

Family Behavioral Resources
1380 Route 286 East
Airport Professional Center, Suite 524
Indiana, PA 15701
Phone: 724-465-0369

Autism Education and Research Institute
313 W High St., Suite 209B
Ebensburg, PA 15931
Phone: 814-419-8046

Appendix J

Autism Spectrum Screening Questionnaire (ASSQ)

(Ehlers, Gillberg, & Wing, 1999)

Name of child_____ Date of birth_____

Name of rater_____ Date of rating_____

This child stands out as different from other children of his/her age in the following way:

Item	No	Somewhat	Yes
1. is old-fashioned or precocious	[ ]	[ ]	[ ]
2. is regarded as an "eccentric professor" by the other children	[ ]	[ ]	[ ]
3. lives somewhat in a world of his/her own with restricted idiosyncratic intellectual measures	[ ]	[ ]	[ ]
4. accumulates facts on certain subjects (good rote memory) but does not really understand the meaning.	[ ]	[ ]	[ ]
5. has a literal understanding of ambiguous and metaphorical language.	[ ]	[ ]	[ ]
6. has deviant style of communication with a formal, fussy, old-fashioned or "robotlike" language.	[ ]	[ ]	[ ]
7. invents idiosyncratic words and expressions	[ ]	[ ]	[ ]
8. has a different voice or speech	[ ]	[ ]	[ ]
9. expresses sounds involuntarily; clears, throat, grunts, smacks, cries or screams.	[ ]	[ ]	[ ]
10. is surprisingly good at some things and surprisingly poor at others.	[ ]	[ ]	[ ]
11. uses language freely but fails to make adjustment to fit social contexts or the needs of different listeners	[ ]	[ ]	[ ]
12. lacks empathy	[ ]	[ ]	[ ]
13. makes naive and embarrassing remarks	[ ]	[ ]	[ ]
14. has a deviant style of gaze	[ ]	[ ]	[ ]
15. wishes to be sociable but fails to make relationships with peers	[ ]	[ ]	[ ]
16. can be with other children but only on his/her terms	[ ]	[ ]	[ ]
17. lacks best friend	[ ]	[ ]	[ ]
18. lacks common sense	[ ]	[ ]	[ ]
19. is poor at games: no idea of cooperating	[ ]	[ ]	[ ]

in a team, scores "own goals"

Item	No	Somewhat	Yes
20. has clumsy, ill coordinated, ungainly, awkward movements or gestures	[ ]	[ ]	[ ]
21. has involuntary face or body movements	[ ]	[ ]	[ ]
22. has difficulties in completing simple daily activities because of compulsory repetition of certain actions or thoughts	[ ]	[ ]	[ ]
23. has special routines: insists on no change	[ ]	[ ]	[ ]
24. shows idiosyncratic attachment to objects	[ ]	[ ]	[ ]
25. is bullied by other children	[ ]	[ ]	[ ]
26. has markedly unusual facial expression	[ ]	[ ]	[ ]
27. has markedly unusual posture			

Specify reasons other than above:

Appendix K

Demographic Questionnaire

Demographic Information

Participant Number: _____ Age: _____

Sex: Male Female Prefer Not To Answer

Has the participant received any previous diagnoses? Y N

If yes, please specify: _____

Is the participant's vision impaired? Y N

If yes, do they wear glasses or contacts? _____

Is there history of a traumatic brain injury? Y N

If yes, please specify: _____

Appendix L

Informed Consent Form

Your child is invited to participate in this research study. The purpose of this study is to investigate the effect of facial expression on decision-making behavior in children with autism spectrum disorder and typically developing children. If you agree to participate in this study, your child will be asked to complete a series of tasks on the computer. Before completing these tasks, your child's intellectual abilities will be assessed in order to compare them to other participants with equal intellectual abilities. During this time, you will be asked to complete parent-report measures assessing past and current behaviors of your child. Overall, the procedure will take approximately an hour and a half.

If you choose to participate, all information will be kept confidential and will have no bearing on any other services you receive. The answers that your child provides in this study will be completely confidential. Additionally, performance on measures of intellectual abilities will only be used to match them to a child of a same age to make behavior comparisons. After completion of the study, the investigator will keep all data in a locked file for a period of at least 3 years.

There are no known risks associated with participating in this study. This study may help inform clinicians and researchers about the differences in social behaviors observed in individuals with autism spectrum disorder.

Your child's participation in this study is completely voluntary. You may choose to not allow your child to participate. If you do choose to allow your child to participate, you may withdraw your child from the study at any time by notifying the experimenter. Your child may also choose to not respond to any questions. For allowing your child to participate in this study, you will receive a $10 gift card. If you have any questions about this research, you may contact the principal researcher, Amanda Trovato, by email at a.n.trovato@iup.edu, or you may contact the project supervisor, Dr. Lisa Newell, by email at newell@iup.edu.

This study has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects (phone: 724-357-7730). After reading the information provided on this page, if you are willing to allow your child to participate in this study, please sign below to indicate your consent for your child to continue with the study. If you choose not to participate, please inform the researcher and return the form.

Project Supervisor:
Dr. Lisa Newell
Associate Professor
Psychology Department
1020 Oakland Ave
101 Uhler Hall
Indiana, PA 15705
Phone: 724/357-7849

Principle Investigator:
Amanda Trovato, M.A.
Doctoral Candidate
Psychology Department
1020 Oakland Ave
101 Uhler Hall
Indiana, PA 15705

VOLUNTARY CONSENT FORM:

I have read and understand the information on the form and I consent to volunteer my child to be a subject in this study. I understand that my child's data are completely confidential and that I have the right to withdraw at any time. I have received an unsigned copy of this informed Consent Form to keep in my possession.

Child's name (PLEASE PRINT) _____

Parent/Guardian's Name (PLEASE PRINT) _____

Parent/Guardian's Signature_____

Relationship to the child _____

Date_____ Phone number_____

I certify that I have explained to the above individual the nature and purpose, the potential benefits, and possible risks associated with participating in this research study, have answered any questions that have been raised, and have witnessed the above signature.

_____ _____

Date Investigator's Signature

Appendix M

Child Assent Form

Child Assent for Participation in Research

This project is looking at how individuals make certain decisions. If you help with this project, you will be asked to play a computer game with a partner. You will be shown different partners and asked to make different choices about the amount of tokens they give you. You can help with this project if you would like to. You do not have to help if you do not want to.

Your name will not be put on any of the papers; only your age will be recorded. Only individuals with correct codes have access to your information.

If you decide to help with this project, but then change your mind, you can stop helping at any time. If you do not understand the instructions, please ask the researcher, Amanda Trovato, any questions you may have. If you want to help with this project, please write you name on the line at the bottom of this page.
Thank you!

_____
Child's Name

_____ _____
Child's Signature Date:

_____ _____
Witness Signature Date:

Appendix N

Script Explaining the Ultimatum Game to Participants

"You will be playing a game in which you will get offers of different amounts of tokens to be split between you and your partner. The offers will come from the player that is shown on the computer screen. If you choose to accept their offer, you both will receive the amount of tokens shown on the screen. If you do not accept their offer, neither one of you receives any tokens."

Appendix O

Debriefing Form

Thank you for your and your child's participation in this study. The researchers are interested in learning how typically developing children and those with an autism spectrum disorder use facial expressions during bargaining situations. Investigating use of facial expressions during the game can help us determine how individuals use social cues in daily life. It has been proposed that individuals with ASD experience difficulty figuring out intentions from facial expressions and that they may not change their behavior based on this information (Ewing et al., 2015). Identifying these differences may help to further explain social difficulties present in this population. The opponents your child bargained against during the game were computerized, not a real person as originally stated. The use of deception during this study was to ensure that participants interacted with the game as they would with another real individual.

Thank you very much for your participation in this study!

If you have any further questions about this study, please contact Amanda Trovato at a.n.trovato@iup.edu or Dr. Lisa Newell at newell@iup.edu.

If you are interested in learning more about this topic, more information can be obtained through the following readings:

Downs & Smith. (2004). Emotional understanding, cooperation, and social behavior in high-functioning children with autism. Journal of Autism & Developmental Disorders, 34(6), 625–635 11p.

Ewing, L., Caulfield, F., Read, A., & Rhodes, G. (2015). Appearance-Based Trust Behaviour Is Reduced in Children with Autism Spectrum Disorder. Autism: The International Journal of Research and Practice, 19(8), 1002–1009.

Mussel, Patrick, Göritz, Anja S., & Hewig, Johannes. (2013). The Value of a Smile: Facial Expression Affects Ultimatum-game Responses. Judgment and Decision Making, (3), 381