Running Head: THEORY OF MIND AND AUTISM

Theory of Mind in Children and Adolescents on the Autism Spectrum: Comparison with Normative Individuals

By

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ABSTRACT

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Theory of Mind (ToM) is the ability to recognize mental states of oneself and that of other individuals (Parsons & Mitchell, 2002), which typically evolves with age in normative individuals (Hutchins et al., 2011). Research has shown that autistic (ASD) individuals lack a developed ToM and that this triggers social impairments (Rajendran, 2013; Mathersul et al., 2013). The developmental progress of ToM in children on the spectrum is unknown; therefore, this study analyzed normative individuals and those on the spectrum to discover how the development of ToM in these two groups may differ with age. This study hypothesized that normative individuals would have a more developed ToM than those on the spectrum, and thus score higher on the ToM Task Battery, and that the developmental trajectory of ToM would be slower for ASD individuals, but that the difference in ToM between ASD children and adolescents would be greater than that difference for the normative samples. Forty students participated in this study; 20 participants were ASD and 20 were normative. In addition, half were ages 6-10 and half were ages 11-15. Participants' guardian was sent the informed consent forms and the ToM Inventory to fill out at home. All participants completed the ToM Task Battery in their school environment. T-tests and ANOVAs revealed that normative students were found to have a more developed ToM than the ASD students, this difference persisted even when compared to only the higher functioning ASD students ($n = 14$; $p = .002$). In addition, the normative individuals' ToM (both guardian and student rated) was more advanced and was consistent with typical development across age, whereas ASD individuals' ToM was underdeveloped ($p<.001$), but showed significant gains when comparing the younger and older age groups ($p = .002$). Given these cross-sectional differences, it can be inferred that the ASD individuals' developmental trajectory is much slower than that of normative individuals; however, these results also indicate that ASD individuals may continue to develop their ToM with age.

Key words: Theory of Mind, autism, adolescents, and children.

TABLE OF CONTENTS

INTRODUCTION

According to Parsons & Mitchell (2002), Theory of Mind is the ability of an individual to recognize mental states, such as beliefs, ideas, and desires, of themselves and that of other individuals. Having a well-developed Theory of Mind is useful when trying to relate to and socialize with others. Autism is defined as a combination of social and communication deficits as well as restricted and repetitive behaviors (Rajendran, 2013). Autism is a disorder that ranges on a spectrum from severe to high functioning autism (HFA), with those at the severe level having significant learning disabilities, and those at the high functioning level having minimal learning disabilities. The Theory of Mind hypothesis states that autistic individuals struggle to assign mental states to themselves and to others (Rajendran, 2013). Likewise, a similarity between all individuals on the autistic spectrum is social interaction difficulties (Parsons & Mitchell, 2002); this is why looking at the relationship between Theory of Mind and autism is so important and thus forms the basis for this current study.

Theory of Mind:

Mathersul, McDonald, & Rushby (2013) explain that Theory of Mind, also known as social intelligence, mentalizing empathy, or cognitive empathy, is defined as the capability to understand mental states, and thereby inner feeling, intentions, desires, and behavioral reactions of others. Mathersul et al. believe that a lacking Theory of Mind, triggers social impairments in autistic spectrum disorder. In addition, this research found that higher functioning individuals on the autistic spectrum were able to understand simple Theory of Mind tasks. However, when questioned on more advanced Theory of Mind tasks, such as questions on second order false beliefs where the examinee must understand that a character has thought about another

character's thought, or situations involving expressions of sarcasm, irony, or bluffs, the higher functioning autistic individuals failed to understand these scenarios. Parsons & Mitchell (2002) explains that when children on the autistic spectrum were taught Theory of Mind principles by researchers, they were able to understand various mental states. In addition, it has been found that when autistic children are able to practice proper social behaviors and are given straightforward guidelines, they are more likely to improve and understand those task specific behaviors.

In Mathersul et al. (2013) study, 40 high functioning autistic adults as well as 33 normative, control group, adults were assessed on the Awareness of Social Inferences Test, in which videos that show conversations are used to evaluate the recognition of basic and subtle emotions. These conversations portrayed speakers that were either sincere or indirect. Sincere conversations were ones in which the actual meaning of the conversation was sincerely meant and consistent with the speaker's emotions, whereas indirect conversations were ones in which the actual meaning of the conversation does not match the speaker's demeanor (example: sarcasm). The participants were also assessed on 16 vignettes that depicted either sarcasm or lies / deception. In addition, participants filled out the Interpersonal Reactivity Index, which assesses cognitive and affective empathy. This questionnaire uses a Likert scale ranging from zero to four, zero indicating: *does not describe me well*, and four indicating: *describes me very well*. The four subscales of this assessment are: 1) perspective taking (imagining the thought process of others), 2) fantasy (identify emotionally with fictional character), 3) empathic concern (ability to have an emotional response), and 4) personal distress (having a self-centered emotional response to another individual's misfortune). Participants also filled out an Empathy Quotient, which was also on a Likert scale, a four-point scale ranging from strongly agree to strongly disagree.

The autistic individuals scored significantly higher on the AQ and the RAADS and significantly lower on all the measures of empathy. In regards to the Awareness of Social Inferences Test, the autistic individuals did not perform significantly different compared to the normative individuals in terms of the sincere interactions. However, the autistic individuals did significantly worse in the sarcastic interactions compared to the normative individuals. In regards to the sarcasm versus lies/ deception vignettes, the autistic spectrum individuals performed significantly worse than the normative individuals in both the sarcastic and deception scenarios. One possibility given these results, is that although individuals on the autistic spectrum are not able to understand lies in order to protect others, they may be able to impulsively lie in order to protect themselves. It was also found that the main problem with individuals on the autistic spectrum is that they do not understand the plethora of ways one can use information, such as knowing what people think or feel, while communicating. Finally, declines in cognitive as well as affective empathy in individuals with high functioning autism were found, but affective empathy was not determined to be related to advanced Theory of Mind tasks, at least using the Awareness of Social Inferences Test.

Theory of Mind and Ambiguous Visual Stimuli:

Klin (2000) studied Theory of Mind (ToM) in individuals with autism and Asperger's syndrome, but using a different angle. Klin's study looked at the ability of these individuals to identify social elements in a story and personality features in shapes. There was a total of sixty participants; twenty had autism, twenty had Asperger's, and twenty were normally developed individuals. The participants completed the Social Attribution Task (SAT), which tests whether the individual can identify visual stimuli as social phenomena and then extract visual signals to a create social setting. The Social Attribution Task, used for Klin's study, had six different indexes

which included: pertinence, salience, ToM Cognitive and ToM affective, animation, person, and problem solving. The social plots that autistic and Asperger's individuals created were much shorter than those that the normative, control, individuals made up. In addition, the meaning the autistic and Asperger's participants gave to the ambiguous stimuli did not relate to the geometric cartoons. These individuals were also unaware of the social meaning behind the shapes' movements and they used fewer Theory of Mind cognitive and affective terms than the normative individuals. In addition, the autistic and Asperger's individuals had a significantly decreased ability to originate personality characteristics from the characters' behaviors compared to the normative individuals. Finally, the autistic individuals showed very little, if no improvement, in the understanding of social situations whereas the Asperger's individuals did show some improvements.

Theory of Mind and Autistic Individuals

Papp (2006) discussed how, in order for children to successfully communicate, they must develop social language skills, also known as pragmatic skills. Among these social language skills is Theory of Mind, which plays a role in how an individual socially relates to another individual (Papp, 2006). Papp (2006) argued that there is a need for other aspects of mind reading abilities, in addition to the first-order (tracking others' intentions and expectations) and second-order (conscious manipulation of one's thoughts and beliefs by others) mind reading abilities, in order to account for the understanding of various communicative events. These other aspects include: hyperboles, litotes, speech acts, indirect answers, lies, deceits, jokes and irony (Papp, 2006). Papp (2006) explained how individuals on the autistic spectrum have reduced access to Theory of Mind abilities, particularly mind-reading abilities, and that this may explain why these individuals utilize literally interpretations and do not understand figurative

interpretations. Papp (2006) further argued that reasoning for autistic spectrum individuals' lack of pragmatic and mind-reading skills may be due to the fact that these individuals might lack the intrinsic desire to communicate that normative individuals have. Furthermore, the issues autistic individuals have with mind-reading abilities, central coherence, and executive control, can be explained by their lack of self-awareness or self-consciousness (Papp, 2006). Papp (2006) concluded by stating that individuals with Asperger's or high-functioning autistic individuals may be able to consciously achieve Theory of Mind skills, but that this understanding is far from normative individuals' unconscious and encapsulated capability to mind read.

Relatedly, Yirmiya, Erel, Shaked, & Solomonica-Levi (1998) utilized meta-analyses to compare Theory of Mind in autistic spectrum and mentally retarded individuals compared to normative individuals. This study used three meta analyses, the first compared Theory of Mind between autistic spectrum individuals to those with mental retardation, the second compared Theory of Mind between autistic spectrum and normative individuals, and the third compared Theory of Mind between individuals with mental retardation to normative individuals; the individuals from the mentally retarded and normative groups ranged from four to 17+ years old, and the autistic group ranged from less than or equal to 11 to 17+ years old (Yirmiya et al., 1998). The individuals on the autistic spectrum were separated into higher functioning and lower functioning, based on IQ (Yirmiya et al., 1998). The results discovered that individuals on the autistic spectrum (both high- and low- functioning) performed significantly worse on the Theory of Mind tasks compared to both the individuals with mental retardation and the normative individuals. Furthermore, individuals with mental retardation performed significantly worse than the normative individuals. These results indicate that not only do individuals on the autistic spectrum and those with mental retardation demonstrate little understanding of Theory of Mind,

but also that this lack of understanding is more severe in the autistic individuals (Yirmiya et al., 1998). Finally, this study concluded that Theory of Mind impairments are not unique to individuals with autism since those with mental retardation also experience a lack of understanding, but that the severity of Theory of Mind impairments may be unique to autistic spectrum individuals (Yirmiya et al., 1998).

Similarly, Fletcher-Watson, McConnell, Manola, & McConachie (2014) explain how autistic spectrum individuals have significant challenges in trying to understand the internal aspects of others, such as their thoughts, feelings, and beliefs, therefore these individuals have difficulties with Theory of Mind. Fletcher-Watson et al., (2014) utilized 22 randomized trials including 695 individuals in order to study possible interventions on Theory of Mind for autistic spectrum individuals. Based on intervention target and primary outcome measure, studies were divided into four main categories, including: emotion recognition studies, joint attention and social communication studies, imitation studies, and studies teaching Theory of Mind itself (Fletcher-Watson et al., 2014). Results found inconsistencies in findings and measurement means; therefore there is little evidence on the maintenance of Theory of Mind skills and its generalizability to various settings or developmental effects on related skills (Fletcher-Watson et al., 2014). However, there is some evidence that individuals on the autistic spectrum can be taught Theory of Mind skills, and thus it may be possible that if the Theory of Mind model continues to be refined it will lead to better interventions which as a result may have a greater influence on the development of autistic spectrum individuals (Fletcher-Watson et al., 2014).

False Beliefs:

Stephanie & Julie (2015) analyzed false beliefs tasks, one way of measuring one's theory of mind. False belief tasks are used to demonstrate the concept that individuals have the ability to

separate beliefs from reality. Stephanie & Julie's study utilized 17 autistic individuals between the ages of six and 16 years old as well as 17 normally developing control individuals between the ages of four and nine years old. In order to measure false beliefs, a verbal as well as a nonverbal task were used. Both of these tasks used the unforeseen relocation of an object from one area to another area.

In regards to the verbal false belief task, participants were read four different stories all of which involved protagonist B relocating an object from one area /setting / to another while protagonist A was absent. Upon the arrival of protagonist A, the participants were asked three questions, two control questions and one question that was asking about false beliefs. In regards to the nonverbal false belief task, a solid screen was placed between the participant and the two experimenters, A and B, so only the experimenters could see the boxes and what was in each box. Experimenter A showed the participant a piece of candy above the screen and then moved the candy below the screen and put it in one of the boxes. Experimenter B could see where the candy was placed. Experimenter B then left the room and experimenter A took the screen down so the participant could see the boxes. Experimenter A switched the two boxes in front of the participant and then experimenter B returned. Experimenter A then asked Experimenter B to point to the box containing the candy and experimenter B pointed to the box containing nothing since he / she was unaware that the boxes were switched. Afterwards, the participant was asked to point to the box containing the candy and if the participant had an understanding of false beliefs, and realized that experimenter B had a false belief due to the fact that he / she was not in the room when the boxes were switched, the participant would point to the correct box, the one containing the candy. However, if the participant lacked the understanding of false beliefs, and did not realize that experimenter B had a false belief, then s/he would point to the wrong box, the

same one as experimenter B and the one without the candy. The control condition was used to make sure that the child did not believe that when experimenter B left the room, experimenter B would always choose the incorrect box. Therefore, this condition was just like the false belief condition but the boxes were not switched, thus experimenter B had a correct belief, not a false belief (Stephanie & Julie, 2015).

Results found that in terms of the verbal false belief task, the autistic individuals had a much worse performance in the false belief condition compared to the reality and the memory condition, whereas the normally developing individuals had no significant difference in performance for the false belief condition compared to the reality condition. In terms of the nonverbal false belief task, results found that the autistic individuals had a slightly worse performance in the false belief condition than in the control condition. However, based on a comparison between the autistic individuals and the normally developing individuals, no statistically significant difference was found between the false belief condition versus the control condition (Stephanie & Julie, 2015).

Memory:

Bebko & Ricciuti (2000) investigated the executive functioning and memory in individuals on the autistic spectrum. Bebko & Ricciuti's first experiment used autistic children and adolescents that were high functioning or had lower functioning and a decreased verbal mental age as well as a group of normally functioning children and adolescents. Participants were shown 12 cards, each containing a picture of a common object, such as an apple or spoon. First, the participants were asked to label each picture, in order to ensure that they knew what the objects were. Participants were shown the pictures in a certain sequence and were asked to remember the pictures in the order in which they were shown. Each card, containing a picture,

was shown to the participants for approximately three seconds and then was put face down in front of the child from the left to the right side. In addition, Bebko & Ricciuti observed the participants' behavior and then recorded whether or not each participant was a "rehearser" or a "non-rehearser;" A rehearser was defined as a child who verbally rehearsed the order of the picture cards, or displayed mouth or body movements, such as finger pointing, rhythmic head or eye movement, directed to the pictures. If any of those behaviors were seen on two or more of the trials, the child was labeled as a rehearser, if those behaviors were not shown or were shown on only one trial, the child was labeled as a non-rehearser.

The results of Bebko & Ricciuti's (2000) first experiment found that the children who were labeled as rehearsers, remembered significantly more than those labeled as non-rehearsers. In addition, approximately 64% of the children in the high functioning autistic group were labeled as rehearsers and those that were not labeled as rehearsers tended to be the younger children in that group. In contrast, the majority of the group of autistic children and adolescents who were moderately functioning were labeled as non-rehearsers. It was found that only one child in this group was labeled as a stable rehearser. Therefore these results indicate that high functioning autistic children and adolescents have a better memory and recall ability than those who are moderately functioning. Furthermore, it was found that normally developing children use rehearsal and thus are rehearsers, much earlier than when individuals on the autistic spectrum become rehearsers.

Based on the results found by Bebko and Ricciuti's first experiment, this study hypothesized that both children and adolescents on the autistic spectrum will have a harder time remembering the information for each of the picture scenarios, in the Theory of Mind Task

Battery. Therefore these individuals will get more of the questions incorrect, possibly due to their inability to remember the information from the previous page.

Emotion Recognition:

Pelphrey, Sasson, Reznick, Paul, Goldman, & Piven (2002) observed the ability of individuals to recognize emotions through the visual scanning of faces. Pelphrey et al.'s study involved five autistic males aged 19 to 30 years old as well as five normally functioning males aged 25 to 32 years old. Participants were displayed 12 faces, from the Ekman and Friesen series, including one male and one female face to represent the six basic emotions. Each face was displayed for two seconds with a two second lapse period between each image. The eye movements of the participants were recorded. In addition, the participants were also shown 24 additional faces from the same Ekman and Friesen series; these 24 photos were balanced for gender and emotion. Participants were asked to identify the emotion displayed in each picture and each picture was shown for two seconds with a five second lapse period between each image.

Results found that the autistic individuals spent a shorter portion of time examining the core features of one's face, including the eyes, nose, and mouth, compared to the normative individuals. In addition, the autistic individuals spent a shorter portion of time fixating on the core facial features during phase I compared to the normative individuals. During phase II, the autistic individuals, again, spent less time examining the core features of the human face and had fewer fixations on the core features compared to the normative individuals. Furthermore, it was found that the autistic individuals correctly identified a smaller portion of emotions than the normative individuals and the autistic individuals had a tendency to confuse anger with fear (Pelphrey et al., 2002).

Alexithymia:

Milosavljevic, Leno, Simonoff, Baird, Pickles, Jones, Erskine, Charman, & Happe (2015) found that individuals with autism have been shown to have higher rights of alexithymia, a personality trait. An individual with alexithymia struggles to recognize and explain feelings, differentiate feelings from bodily sensations of emotional arousal, and a propensity to focus on external events as opposed to internal states. Although, in many individuals autism and alexithymia are co-occurring, Theory of Mind deficits have been speculated to be innate to autism spectrum disorder, not to alexithymia. Milosavljevic et al., discovered that adolescents with a higher incidence of alexithymia were on the autistic spectrum disorder more so than those not on the spectrum. This elevated alexithymia was not associated with personal differences in Theory of Mind ability. However, this study also found that alexithymia was not related to autism severity and therefore this personality trait is independent of autism and is seen in some autistic individuals as well as individuals not on the spectrum. Thus, the relationship between Theory of Mind and autism should be further explored, since Theory of Mind deficits have shown to be specifically related to autism.

Empathy:

Deschamps, Been, & Matthys (2014) differentiate cognitive empathy from affective empathy. Cognitive empathy is the capability to take another's perspective and understand emotions, and thus cognitive empathy is related to conjecturing about other's mental states, which is known as theory of mind. Conversely, affective empathy is when the observer experiences another individual's emotional state. Travis (2001, as cited in Deschamps et al., 2014), found that children on the autistic spectrum displayed less helping and sharing behavior than normative children.

Deschamps et al. (2014), used 22 autistic children ages six to seven years old. The participants' parents filled out the Griffith Empathy Measure (GEM) and the Social Responsiveness Scale (SRS) and the participants' teachers filled out the Griffith Empathy Measure, teacher's version, on behalf of each participant. The Social Responsiveness Scale is a 65-item assessment on a four-point scale ranging from "not true" to "almost always true;" the total score of this measure helps to explain the severity of social deficits for the individual examinee. The Griffith Empathy Measure is a 23-item questionnaire, which assess cognitive as well as affective empathy. A higher score indicates a higher empathy level. The participants completed the Interpersonal Response Task (IRT) and a story task. The story task is meant to assess both cognitive and affective empathy. It uses eight short stories where a character is in a situation that elicits angry, happy, sad, or fearful emotions. After the story is described, examiners assess if the child was able to distinguish and experience the same emotions within each story. The participants' amount of affect match was measured on a four-point scale from zero to three, 0 indicating the child did not report an affect match, 1 indicating the child's emotion was similar to his/her report of the character's emotion, 2 indicating the child's emotion was the same as the character's emotion but different in intensity, and 3 indicating that both the child's emotion and intensity were the same as the character's. The Interpersonal Response Task assesses prosocial behavior of the participants in response to an emotional stimulus in a social setting.

Deschamps et al. (2014) found that the autistic children scored significantly higher on the Social Responsiveness Scale compared to the normative children, indicating that individuals on the autistic spectrum had moderate to severe social deficits. In addition, on the Griffith Empathy Measure, the autistic children were rated, by parents and teachers, as less empathic on the

cognitive empathy scale, but not the affective empathy scale. In regards to the story task, there was only a significant difference in fear recognition between normative children versus severely affected autistic children. The Interpersonal Response Task found no significant difference in the amount of prosocial behavior between the autistic and normative children. Due to the lack of previous research in affective empathy and prosocial behavior in autistic individuals, especially in regards to their peers, as well as the small sample size in this study, Deschamps et al. indicate that further research should be done in these two areas.

Previous research has analyzed how individuals on the autism spectrum lack an understanding of aspects of Theory of Mind, such as emotion recognition, executive functioning, and memory. However, very few research studies have analyzed the entire concept of Theory of Mind, have compared individuals on the autism spectrum to normative individuals in regards to Theory of Mind, or looked at if and how Theory of Mind changes with age. Therefore, this study utilized the Theory of Mind Task Battery and Theory of Mind Inventory to compare normative and autism spectrum individuals, while also taking into account age as a factor.

Hypotheses:

It is expected that:

1. Individuals on the autistic spectrum will have a less advanced / developed Theory of Mind than normative individuals, and thus score lower on the Theory of Mind Task Battery.
2. High functioning autistic individuals will have a less advanced / developed Theory of Mind than normative individuals, and thus score lower on the Theory of Mind Task Battery and the Theory of Mind Inventory, in all three subscales (Early, Basic, and Advanced).

3. Individuals in the young age group will have a less developed Theory of Mind than the individuals in the older age group.
4. The developmental trajectory, shown through the interaction between the three subscales of the Theory of Mind Inventory and age (young group vs. old group), of Theory of Mind will be slower for autistic individuals, but the difference in Theory of Mind between autistic children and autistic adolescents will be greater than that difference in Theory of Mind between normative children and normative adolescents.

METHODS

Participants

The sample (n=40) consisted of children and adolescents from the mid-Atlantic region of the United States, who were students from two different public schools and one autistic spectrum disorder specialized school, and were aged 6-15 years (mean = 9.98; SD = 2.66). The sample was subdivided into two age groups, young versus old; the young age group included students aged 6-10, and the old age group included students aged 11-15. The mean years of education was 4.53 (SD=2.76; range=1-9). Twenty-six were male and 14 were female. Seventeen were Caucasian, 3 were African American, 14 were Hispanic-American, 2 were Asian-American, and 4 participants were either another ethnicity or a combination of two ethnicities. All participants were volunteers invited by their teacher, Principal, or Supervisor and kindly accepted to help out with this study. Each potential participant had parental consent to take part in this study, and individuals who were students from normative schools received permission from their respective school districts to take part in this study. Individuals who were students from the ASD school received permission from the Supervisor of Instruction/S.L.E Coordinator to take part in this

study. The students from the ASD school were subdivided into high functioning autistic (n = 14) students and low functioning autistic students (n =6). The low functioning autistic students were defined as the students who were one-on-one with an aid throughout the school day, whereas high functioning autistic students were those without constant aid assistance. Study risks and benefits were reviewed and all study participants and guardians signed an informed consent or assent document approved by the Institutional Review Board at Union College.

Procedures

Data collection commenced over about two months, during the end of June 2016 and then during the month of December 2016 to the beginning of January 2017. Participants' parents were sent the informed consent forms and the Theory of Mind Inventory to fill out before the evaluation was administered. Participants, both autistic and normative, were provided with the Theory of Mind Task Battery, and were asked to complete the measure, in approximately 10 minutes, but they were allowed to take as much time as they needed. The researcher, myself, administered the Theory of Mind Task Battery to each participant individually, in a quiet section of the classroom or out in the hallway. Participants from the ASD school were assessed under the supervision of the Supervisor of Instruction, and the student's aid (if needed). The participants' guardian was asked to fill out the Theory of Mind Inventory in approximately 10 minutes, but they also were allowed to take as much time as they needed. Participants' responses to the Theory of Mind Task Battery were noted on a record sheet (Appendix B). The guardians' responses to the Theory of Mind Inventory were indicated directly on the form itself. With the guardians' permission, for normative schools, the participant's teacher and principal helped filled out the Demographic Questionnaire after the other assessments were administered. With the

guardians' permission for the ASD school, the Supervisor of Instruction/S.L.E Coordinator filled out the Demographic Questionnaire for the participants. (Appendix C).

Measures

The Theory of Mind Task Battery (Hutchins, Prelock, & Bonazinga, 2011). This assessment consists of 15 questions within nine different tasks and each increases with difficulty. The first task assesses one's ability to identify emotions in facial expressions. The second task assesses whether the examinee can comprehend the visual perspective of the examiner, whereas tasks three through five assess the individual's capability to deduce desire-based emotions as well as perception based beliefs and actions, respectively. The last four tasks measure the individual's advanced capabilities, such as first order and second order false belief questions. The internal consistency for this assessment was measured using Cronbach's alpha which was found to be .91 which is excellent reliability since an alpha of .70 indicates adequate reliability, .80 represents good reliability, and .90 represents excellent reliability (Hutchins, Prelock, & Bonazinga, 2011). Theory of Mind Task Battery was found to have adequate validity as well (Hutchins, Prelock, & Bonazinga, 2014). The Theory of Mind Task Battery is public domain and was downloaded for free from the Internet.

The Theory of Mind Inventory (ToMI; Hutchins, Prelock, & Bonazinga, 2011). The Theory of Mind Inventory used in this study consists of 42 statements, within three subscales (Early, Basic, and Advanced), and was accompanied by a ruler on a 20 metric units scale that examiners are instructed to cut out. The participants' guardian was asked to carefully read each statement and specify their amount of confidence as to how true or untrue each statement is in regards to their child. They indicated this by placing a vertical hash mark at what they believe was the appropriate point on the designated scale, that ranges from "definitely not" to

"definitely," with the center point indicating "undecided." Each item was scored using a ruler and the possible range is zero to 20. Each score was rounded to the nearest tenths place. The higher the score, the more certain the guardian was that their child possesses Theory of Mind knowledge among the content surveyed. In prior research, test-retest reliability for the Theory of Mind Inventory had a strong, statistically significant positive correlation of r =.89 with a p-value of less than .001 (Hutchins, Prelock, & Bonazinga, 2014). The internal consistency reliability for this assessment was also excellent with a Cronbach's alpha level of .98. In addition, this assessment had a good validity with the criterion-related validity being r =.73 (Hutchins, Prelock, & Bonazinga, 2014). The Theory of Mind Inventory is public domain and was downloaded for free from the Internet.

Demographic Questionnaire (developed by researcher of this study). The demographic questionnaire used in this study recorded background information on each student. This information included: each participants' total years of education, their standardized test scores or placement on either the PARCC or MAP, whether or not they received special academic services, their first language, gender, ethnicity, and age. For the Forum School, the standardized test scores stated above were never conducted, but rather the students' academic placement was assessed in one of three ways. Their academic placement was determined from either their placement on educational testing from when they were in general academics, their score on the Full Scale Intelligence Quotient (FSIQ), or their placement on the Dynamic Learning Maps, DLM, (for math and English / language arts) and the Alternate Portfolio Assessment, APA, (for science). The scale for the educational testing ranged from very low to very superior. For the DLM and APA placement ranged from emerging to partially proficient to proficient. In order to

reconcile all these different tests for academic placement I used each student's percentile placement to judge academic placement.

Statistical Analysis

Data scored, cleaned, and analyzed using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS v. 12.0). **INDEPENDENT T-TESTS and ANOVAs were conducted to differences in the normative and autistic samples for the primary dependent variables specified in the hypotheses above.**

RESULTS

The analyses revealed that the normative individuals did score significantly higher on the Theory of Mind Task Battery than the autistic individuals, $t(38) = 5.22$, $p < .001$. Similarly, the test of between-subjects effects performed on the Theory of Mind Task Battery score, revealed a significant main effect of normative and autistic individuals, $F(1,33) = 22.63$, $p < .001$, and an univariate Analysis of Variance performed on the three subscales of the Theory of Mind Inventory scores, revealed a significant main effect of normative and autistic individuals, for the Early subscale $F(1,39) = 16.83$, $p = .000$, for the Basic subscale, $F(1,39) = 35.59$, $p = .000$, and for the Advanced subscale, $F(1,39) = 38.81$, $p = .000$. In addition, the normative individuals scored significantly higher on the Theory of Mind Task Battery than the high functioning autistic individuals, a subset of the individuals on the autistic spectrum, including 14 of the 20 autistic spectrum students, $t(32) = 3.91$, $p = .002$. A one-way analysis of variance (ANOVA) performed on the three subscales of the Theory of Mind Inventory (Early, Basic, and Advanced), revealed a significant difference on subscale scores for the normative individuals compared to the high functioning autistic individuals, on all three subscales: for the Theory of Mind Inventory Early

subscale, $F(1,32) = 7.24$, $p = .01$, for the Theory of Mind Inventory Basic subscale, $F(1,32) = 22.18$, $p < .001$, and for the Theory of Mind Inventory Advanced subscale, $F(1,32) = 18.76$, $p < .001$. The test of between-subjects effects performed on the Theory of Mind Task Battery score, revealed a significant main effect of age, $F(1,33) = 12.05$, $p = .002$, and an univariate Analysis of Variance performed on the three subscales of the Theory of Mind Inventory scores, revealed a significant main effect of age for all three subscales; for the Early subscale, $F(1,39) = 6.88$, $p = .01$, for the Basic subscale, $F(1,39) = 7.47$ $p = .01$, and for the Advanced subscale, $F(1,39) = 13.21$, $p = .001$. The test of between-subjects effects performed on the Theory of Mind Task Battery score, revealed no significant main effect of the interaction, $F(1,33) = .55$, $p = .46$. However, an univariate Analysis of Variance performed on the three subscales of the Theory of Mind Inventory scores, revealed a significant main effect of the interaction for two of the subscales, Early and Basic; for the Early subscale, $F(1,39) = 4.95$, $p = .03$, and for the Basic subscale, $F(1,39) = 4.24$, $p = .047$. No significant interaction for the Advanced subscale was revealed, $F(1,39) = 0.57$, $p = .45$ (see Figures 1 - 5).

DISCUSSION

This study assessed normative and autistic students on the Theory of Mind Task Battery and also their guardians' responses on the Theory of Mind Inventory, and consistent with hypotheses, this revealed the group of normative students were found to have a more developed Theory of Mind than the autistic students, as represented by their higher Task Battery scores as well as their higher scores on the three subscales of the Theory of Mind Inventory. These results support previous research which states that individuals on the autistic spectrum performed significantly worse on Theory of Mind tasks compared to normative individuals (Yirmiya et al., 1998). The normative students, both the young and older sample, were found to have a more

developed Theory of Mind than the higher functioning autistic students, as represented by their higher Task Battery scores, thus supporting hypothesis 3. This result supports previous research which states that high-functioning autistic spectrum individuals performed significantly worse than normative individuals on Theory of Mind tasks (Yirmiya et al., 1998). All of these results support previous research, which states that autistic individuals struggle to assign mental states to themselves and to others and have difficulties with mind-reading / pragmatic skills (Rajendran, 2013; Papp, 2006; Fletcher-Watson, et al., 2014), each indicators of challenges with Theory of Mind. The normative children and the normative adolescents were found to not greatly differ on their Theory of Mind Inventory scores for the three subscales, whereas the autistic children scored much lower on all three subscales than the autistic adolescents, thereby showing that the autistic individuals developmental trajectory is much slower than that of the normative individuals. This finding supports hypothesis 4. Interestingly, for the advanced subscale of the Theory of Mind Inventory, it appears that Theory of Mind in both the normative and autistic individuals is not fully developed. Additionally, for all three subscales of the Theory of Mind Inventory, it appears that there is great improvement in Theory of Mind development from childhood to adolescents, especially for those on the autistic spectrum. This finding may possibly indicate that autistic individuals could continue to develop their Theory of Mind with age.

Strengths

Participants in each of my age-categorized samples were recruited from the same school districts. The younger normative sample came from one school and the older normative sample came from a second. Except for one autistic student who came from a normative school, both the younger and older autistic samples came from ASD school, which was a part of the same

regional school district as one of the normative schools. This researcher administered the Theory of Mind Task Battery to all of the 40 participants and did so in a quiet well-lit area, whether it was in the hallway or in a quiet part of a classroom or office, therefore all participants had relatively similar environments during testing, a consistent administrator, and the individuals from the same school had the exact same environment. In addition, each sample had the same number of participants, there were 20 normative and 20 autistic students involved as well as the same number of individuals in each age group, child versus adolescent. Furthermore, each student's parent / guardian filled out the Theory of Mind Inventory at home and therefore they may have responded more accurately than if a researcher was watching them fill out the questionnaire.

Limitations

The biggest limitation of this study was the fairly small sample size. Only 40 students participated in this study, ideally it would be better if more students could have been assessed; however all of the hypotheses were supported so the sample size of this study could not have been a great detriment to this research study. Another possibly limitation is that over half of the participants were males; this may or may not have affected the data, but the sample was clearly not representative of the gender ratio typically found in schools and the United States. Furthermore, the distinction of high versus low functioning autistic spectrum students was not definite; low functioning autistic spectrum students were defined as those that needed to be one to one with an aid during the school day whereas high functioning autistic students were those that did not need to be one to one with an aid during the school day. Finally, the limitation to the parents / guardians filling out the Theory of Mind Inventory at home is that if they had an

questions or uncertainties about the questionnaire they could not easily ask for clarification since a researcher was not present during this process.

Future Research

Previous research performed an intervention on Theory of Mind with autistic spectrum individuals and found that the Theory of Mind intervention did not enhance autistic individuals' social or communication skills (Marraffa, 2016). However, that study did find positive effects for emotion recognition and joint attention skills and stated that research has not indicated how age affects the Theory of Mind intervention's effectiveness (Marraffa, 2016). Therefore, an interesting topic to focus on for future research would be to continue this study's research but with a larger sample size and follow the participants over time, thus conducting a longitudinal study. To further test the developmental trajectory in Theory of Mind in normative versus autistic individuals, researchers could test a sample of normative and autistic individuals not only between the ages of 6-10 and 11-15, but also at 16-20, and possibly even 21-25. If normative individuals' Theory of Mind remained relatively consistent once it was fully developed and if autistic individuals continued to develop their Theory of Mind through the later two age groups, until it was fully developed, this would support the current study's results. In addition, future research could conduct another Theory of Mind intervention and focus on age as a factor; if future research separated autistic spectrum individuals into different age groups, it may be able to determine if a Theory of Mind intervention would be effective in improving the social and communication skills of autistic spectrum individuals of an older age rather than autistic individuals of a younger age. For autistic individuals of an older age, their Theory of Mind may be more developed and more likely to be improved with intervention. This study's results add to

the body of knowledge and understanding we have of Theory of Mind in youth on the autism spectrum and provides hope that ToM may be malleable with time/aging, and perhaps future research can also find ways to further facilitate development with specialized ToM interventions.

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2. Thank you to my advisor, Cay Anderson-Hanley, PhD.
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REFERENCES

Bebko, J. M., & Ricciuti, C. (2000). Executive functioning and memory strategy use in children with autism: The influence of task constraints on spontaneous rehearsal. *Autism*, *4*(3), 299-320. doi:10.1177/1362361300004003006

Deschamps, P. H., Been, M., & Matthys, W. (2014). Empathy and empathy induced prosocial behavior in 6- and 7-year-olds with autism spectrum disorder. *Journal Of Autism And Developmental Disorders*, *44*(7), 1749-1758. doi:10.1007/s10803-014-2048-3

Fletcher-Watson, S., McConnell, F., Manola, E., & McConachie, H. (2014). Interventions based on the Theory of Mind cognitive model for autism spectrum disorder (ASD). The Cochrane Database Of Systematic Reviews, (3), CD008785. doi:10.1002/14651858.CD008785.pub2

Hutchins, T. L., Prelock, P. A., & Bonazinga, L. (2014). Technical manual for the theory of mind inventory and theory of mind task battery. 1-137. Retrieved from http://www.theoryofmindinventory.com/download-tests-test-materials/

Klin, A. (2000). Attributing social meaning to ambiguous visual stimuli in higher-functioning autism and Asperger syndrome: The Social Attribution Task. *Journal Of Child Psychology And Psychiatry*, *41*(7), 831-846. doi:10.1111/1469-7610.00671

Marraffa, C. (2016). Social communication in autism spectrum disorder not improved by Theory of Mind interventions. Journal Of Paediatrics And Child Health, 52(4), 461-463. doi:10.1111/jpc.13178

Mathersul, D., McDonald, S., & Rushby, J. A. (2013). Understanding advanced theory of mind and empathy in high-functioning adults with autism spectrum disorder. *Journal Of Clinical And Experimental Neuropsychology*, *35*(6), 655-668. doi:10.1080/13803395.2013.809700

Milosavljevic, B., Carter Leno, V., Simonoff, E., Baird, G., Pickles, A., Jones, C. G., & Happé, F. (2016). Alexithymia in adolescents with autism spectrum disorder: Its relationship to internalising difficulties, sensory modulation and social cognition. *Journal Of Autism And Developmental Disorders*,*46*(4), 1354-1367. doi:10.1007/s10803-015-2670-8

Papp, S. (2006). A Relevance-Theoretic Account of the Development and Deficits of Theory of Mind in Normally Developing Children and Individuals with Autism. Theory & Psychology, 16(2), 141-161. doi:10.1177/0959354306062532

Parsons, S., & Mitchell, P. (2002). The potential of virtual reality in social skills training for people with autistic spectrum disorders. *Journal Of Intellectual Disability Research*, *46*(5), 430-443. doi:10.1046/j.1365-2788.2002.00425.x

Pelphrey, K. A., Sasson, N. J., Reznick, J. S., Paul, G., Goldman, B. D., & Piven, J. (2002). Visual scanning of faces in autism. *Journal Of Autism And Developmental Disorders*, *32*(4), 249-261. doi:10.1023/A:1016374617369

Rajendran, G. (2013). Virtual environments and autism: A developmental psychopathological approach. *Journal Of Computer Assisted Learning*, *29*(4), 334-347. doi:10.1111/jcal.12006

Stephanie, D., & Julie, F. (2015). Exploring links between language and cognition in autism spectrum disorders: Complement sentences, false belief, and executive functioning. *Journal Of Communication Disorders*, *54*15-31. doi:10.1016/j.jcomdis.2014.12.001

Yirmiya, N., Erel, O., Shaked, M., & Solomonica-Levi, D. (1998). Meta-analyses comparing theory of mind abilities of individuals with autism, individuals with mental retardation, and normally developing individuals. Psychological Bulletin, 124(3), 283-307. doi:10.1037/0033-2909.124.3.283

Figure 1. Theory of Mind Task Battery of Normative Individuals Compared to Autistic Individuals.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ToMTB	Equal variances assumed	10.330	.003	5.223	38	.000	5.850	1.120	3.582	8.118
	Equal variances not assumed			5.223	27.781	.000	5.850	1.120	3.555	8.145

Figure 2. Theory of Mind Task Battery of Normative Individuals Compared to High-Functioning Autistic Individuals.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
ToMTB	Equal variances assumed	.646	.427	3.913	32	.000	3.900	.997	1.870	5.930
	Equal variances not assumed			3.606	19.908	.002	3.900	1.082	1.643	6.157

Figure 3. Theory of Mind Inventory Three Subscales' Mean Scores for Normative and High Functioning Autistic Individuals.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
ToMIEarly	Between Groups	26.897	1	26.897	7.241	.011
	Within Groups	118.870	32	3.715		
	Total	145.767	33			
ToMIBasic	Between Groups	157.860	1	157.860	22.175	.000
	Within Groups	227.802	32	7.119		
	Total	385.662	33			
ToMIAdvanced	Between Groups	277.670	1	277.670	18.759	.000
	Within Groups	473.653	32	14.802		
	Total	751.323	33			

Figure 4. Interaction of Age and the Type of Individual in regards to Theory of Mind Task Battery.

Tests of Between-Subjects Effects

Dependent Variable: ToMTB

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	208.725[a]	3	69.575	11.704	.000
Intercept	3842.748	1	3842.748	646.444	.000
ASD_norm	134.545	1	134.545	22.634	.000
young_old	71.602	1	71.602	12.045	.002
ASD_norm * young_old	3.263	1	3.263	.549	.465
Error	178.333	30	5.944		
Total	4724.000	34			
Corrected Total	387.059	33			

a. R Squared = .539 (Adjusted R Squared = .493)

Figure 5. Interaction of Age and the Type of Individual in regards to Theory of Mind Inventory's Three Subscales: Early, Basic, and Advanced.

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	ToMIEarly	172.518[a]	3	57.506	9.553	.000
	ToMIBasic	544.376[b]	3	181.459	15.765	.000
	ToMIAdvanced	704.911[c]	3	234.970	17.531	.000
Intercept	ToMIEarly	11431.161	1	11431.161	1899.056	.000
	ToMIBasic	9201.819	1	9201.819	799.424	.000
	ToMIAdvanced	5840.197	1	5840.197	435.725	.000
ASD_norm	ToMIEarly	101.315	1	101.315	16.831	.000
	ToMIBasic	409.664	1	409.664	35.590	.000
	ToMIAdvanced	520.202	1	520.202	38.811	.000
young_old	ToMIEarly	41.412	1	41.412	6.880	.013
	ToMIBasic	85.937	1	85.937	7.466	.010
	ToMIAdvanced	177.115	1	177.115	13.214	.001
ASD_norm * young_old	ToMIEarly	29.791	1	29.791	4.949	.032
	ToMIBasic	48.775	1	48.775	4.237	.047
	ToMIAdvanced	7.595	1	7.595	.567	.456
Error	ToMIEarly	216.698	36	6.019		
	ToMIBasic	414.380	36	11.511		
	ToMIAdvanced	482.523	36	13.403		
Total	ToMIEarly	11820.377	40			
	ToMIBasic	10160.575	40			
	ToMIAdvanced	7027.631	40			
Corrected Total	ToMIEarly	389.216	39			
	ToMIBasic	958.756	39			
	ToMIAdvanced	1187.434	39			

a. R Squared = .443 (Adjusted R Squared = .397)

b. R Squared = .568 (Adjusted R Squared = .532)

c. R Squared = .594 (Adjusted R Squared = .560)

Figure 6. Theory of Mind Task Battery Mean Score for Normative and Autistic Individuals.

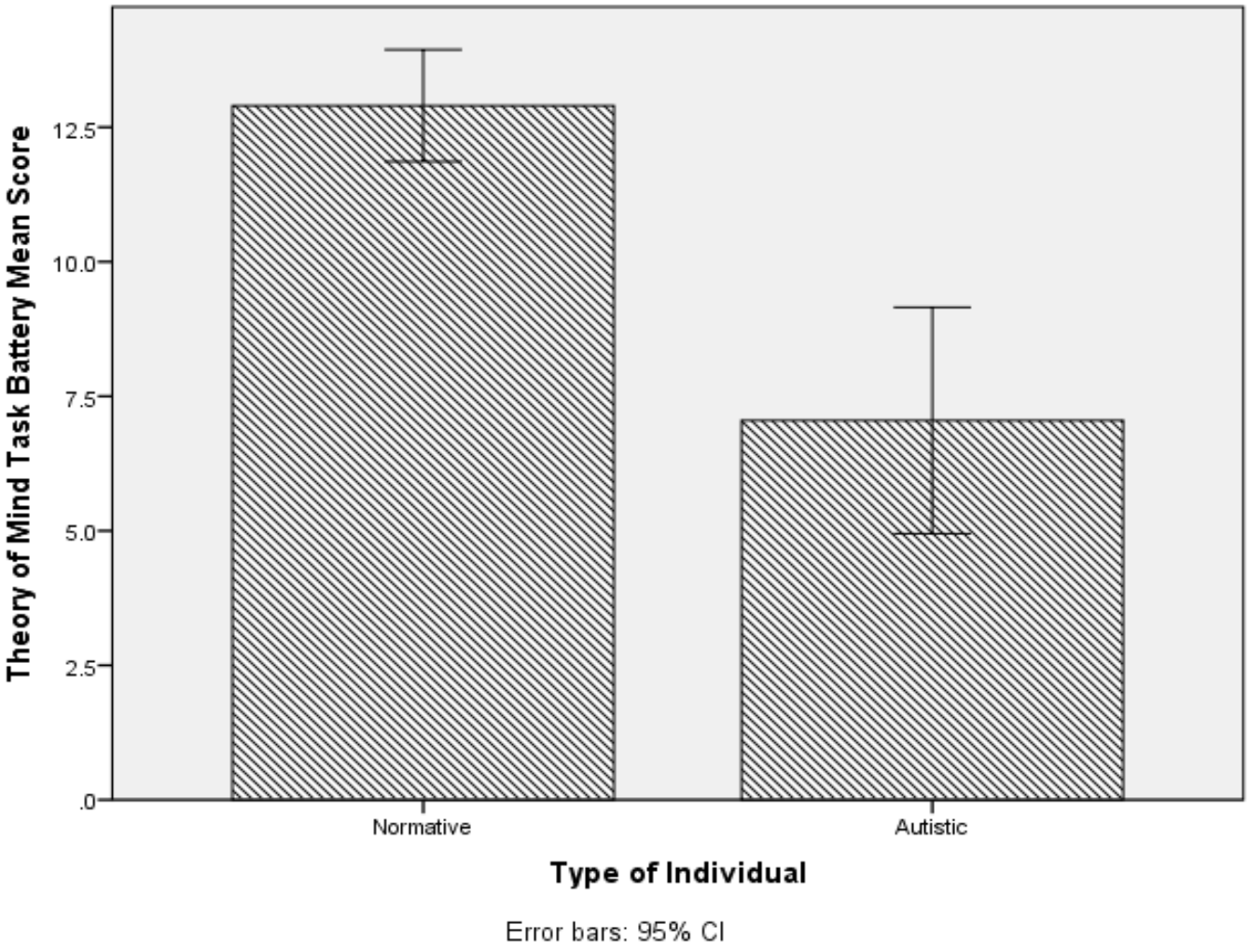


Figure 7. Theory of Mind Task Battery Mean Score for Normative and High- Functioning Autistic Individuals.

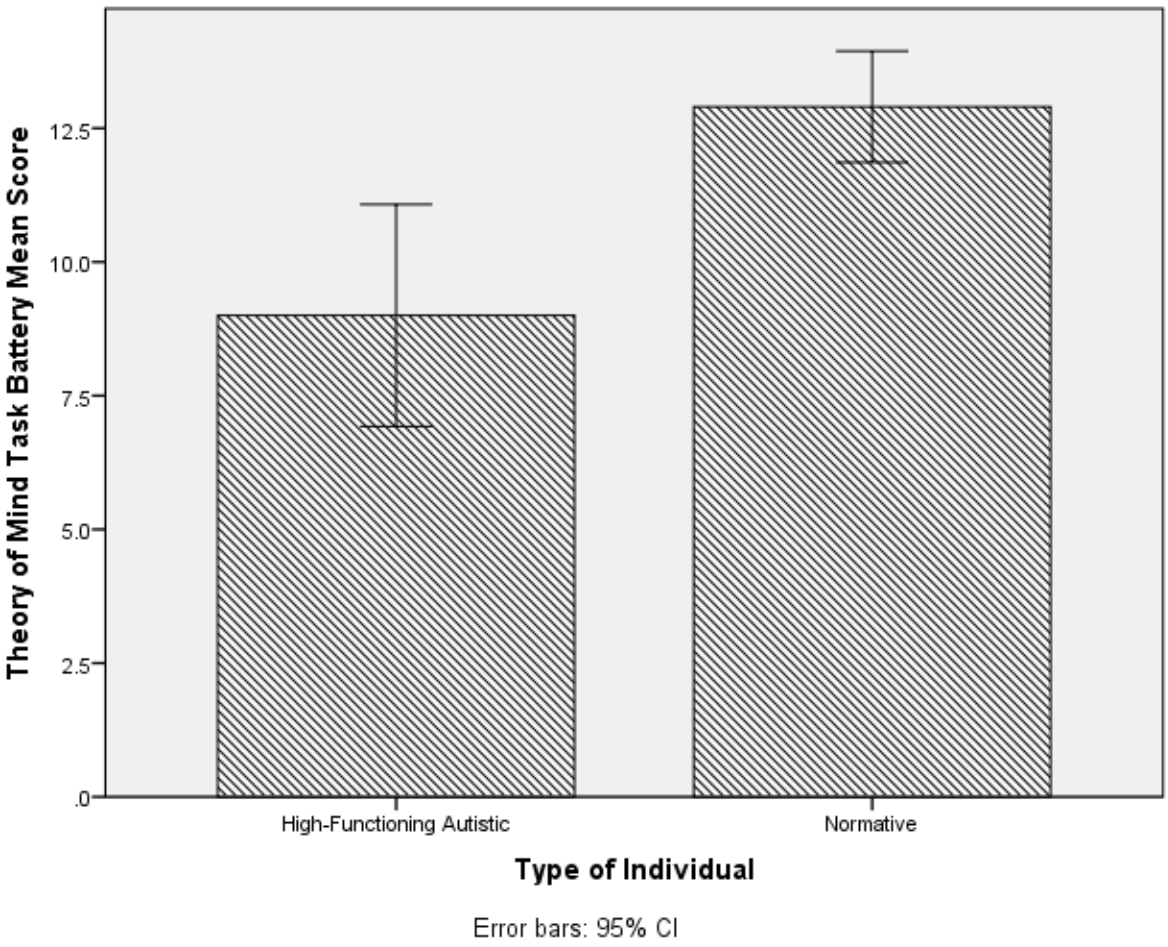


Figure 8. Theory of Mind Inventory Early Subscale Mean Scores for Normative and High-Functioning Autistic Individuals.

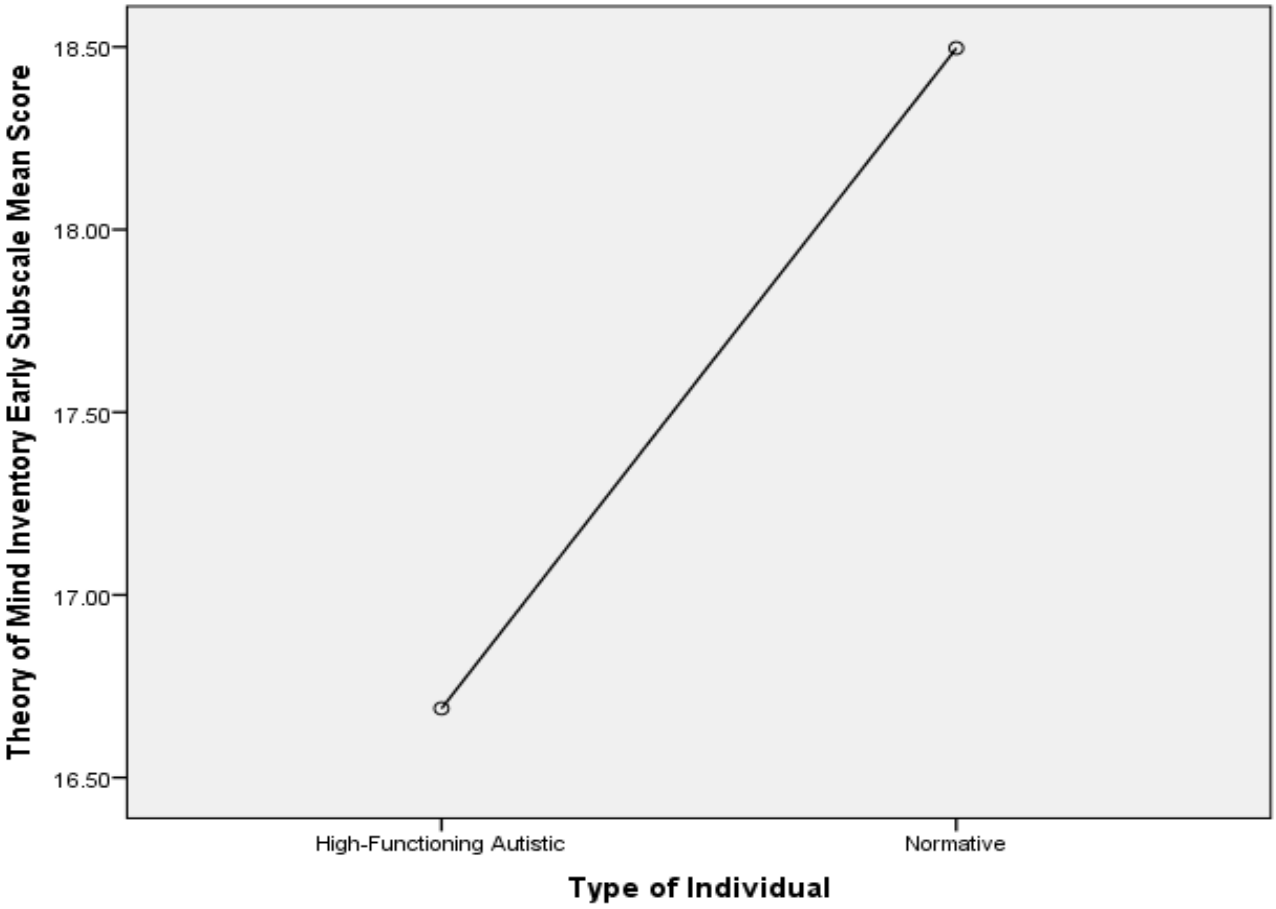


Figure 9. Theory of Mind Inventory Basic Subscale Mean Scores for Normative and High-Functioning Autistic Individuals.

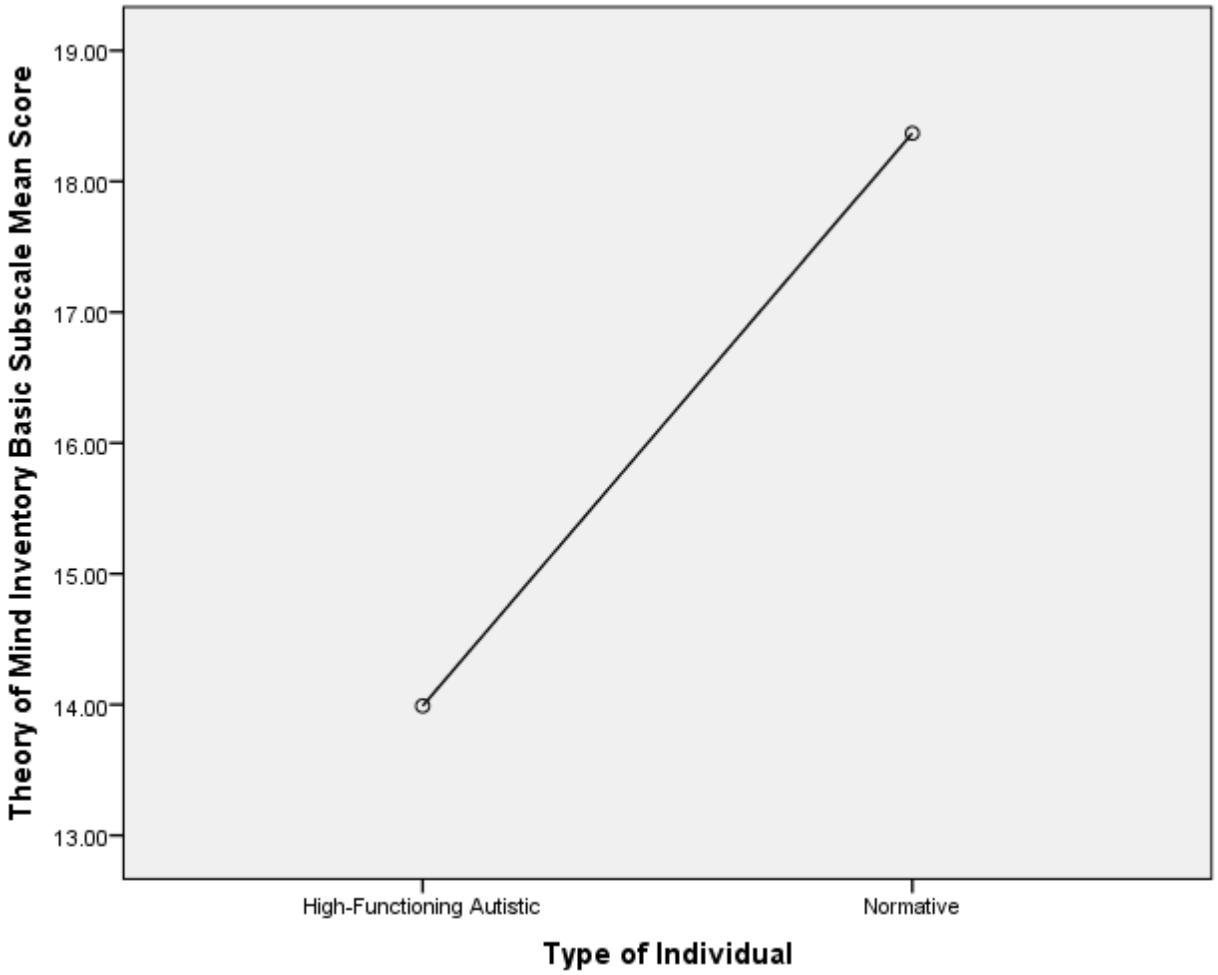


Figure 10. Theory of Mind Inventory Advanced Subscale Mean Scores for Normative and High-Functioning Autistic Individuals.

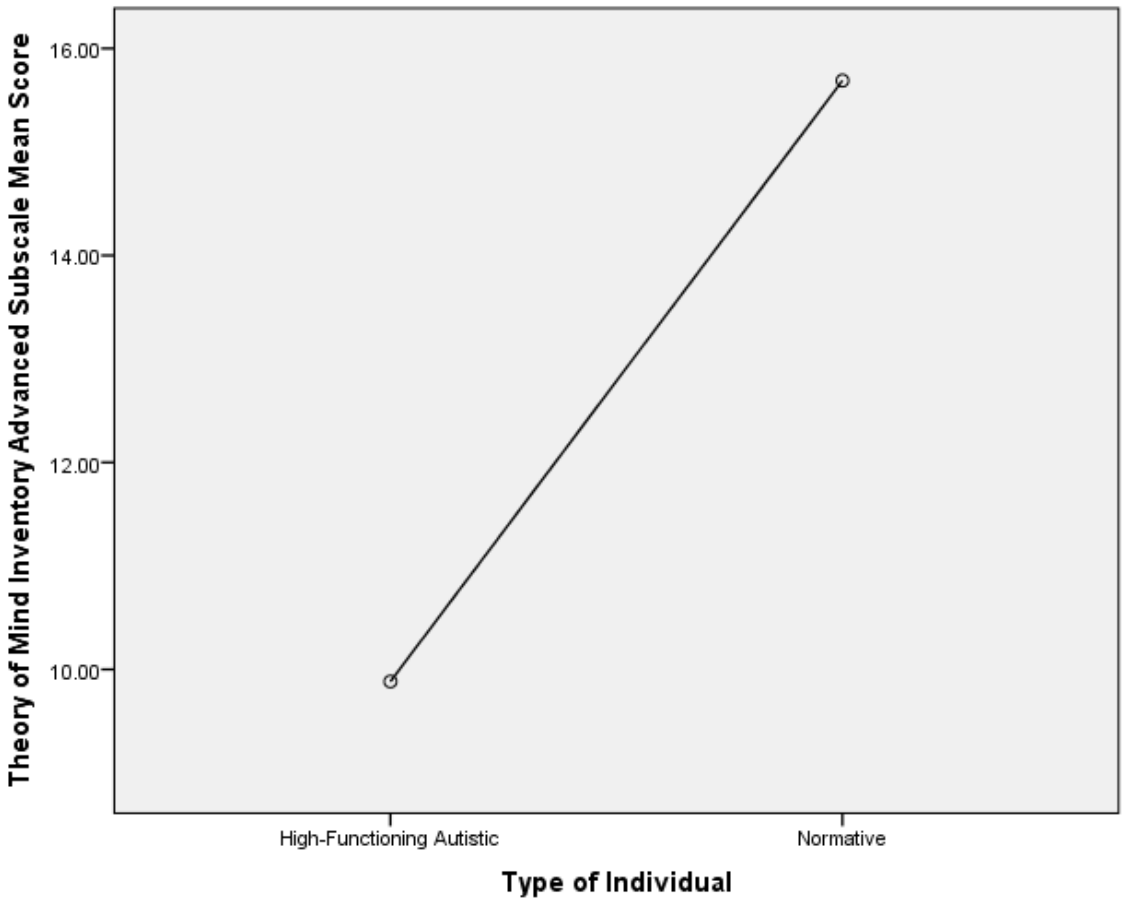


Figure 11.

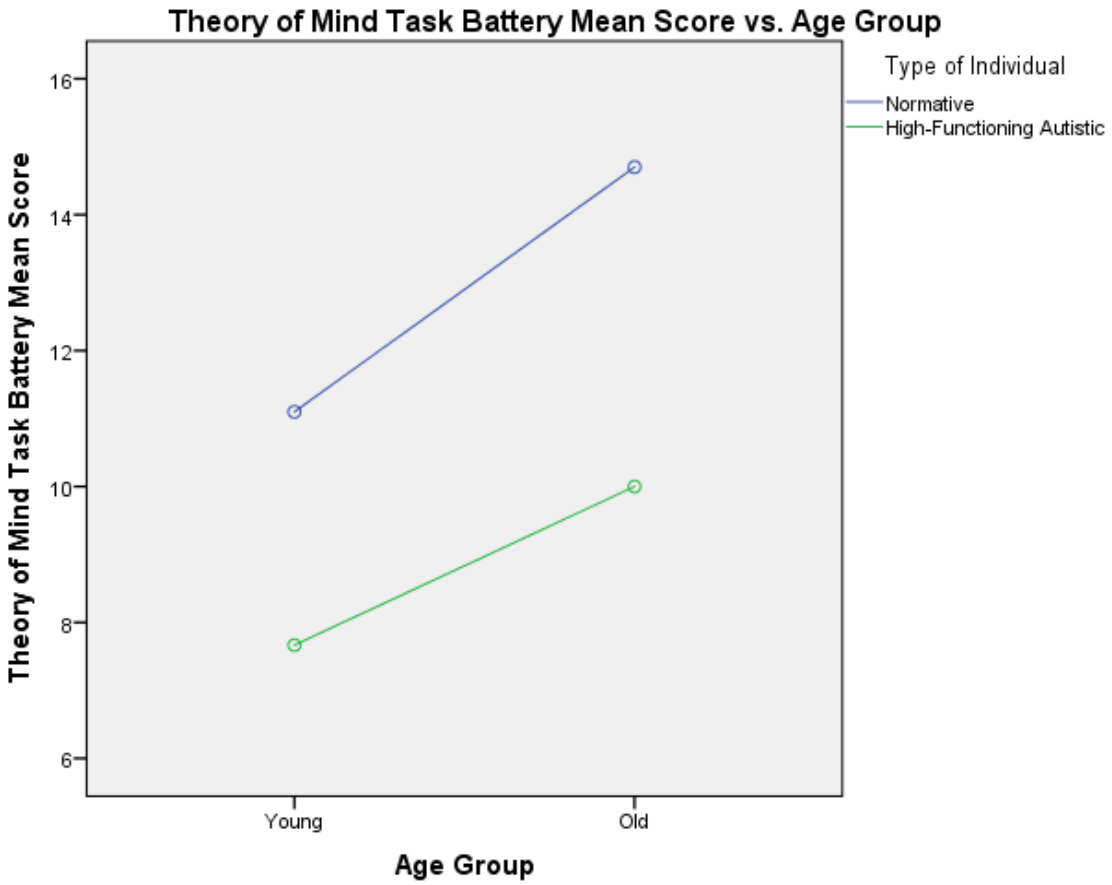

Theory of Mind Task Battery Mean Score vs. Age Group
Type of Individual
Normative
High-Functioning Autistic
Theory of Mind Task Battery Mean Score
16
14
12
10
8
6
Young
Old
Age Group

Figure 12.

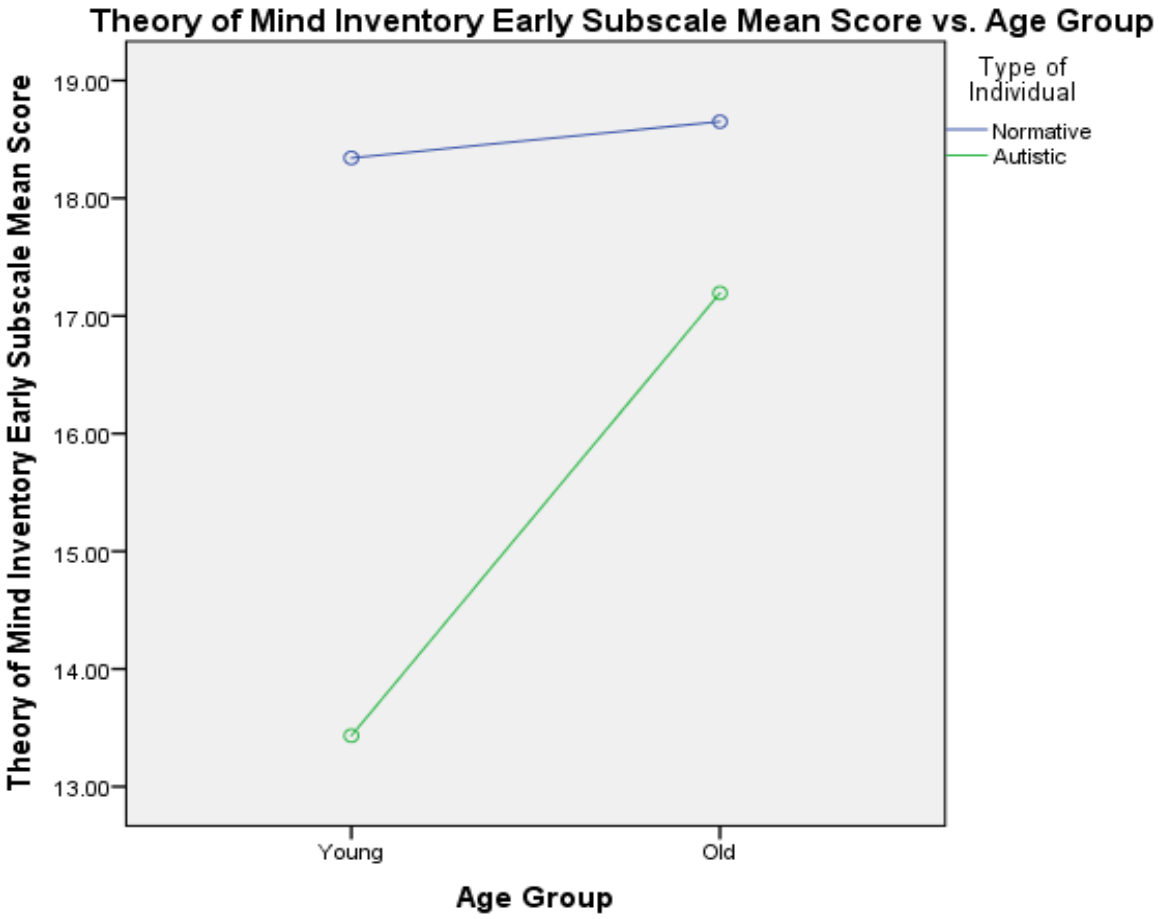

Theory of Mind Inventory Early Subscale Mean Score vs. Age Group
Theory of Mind Inventory Early Subscale Mean Score
19.00
18.00
17.00
16.00
15.00
14.00
13.00
Young
Old
Age Group
Type of Individual
Normative
Autistic

Figure 13.

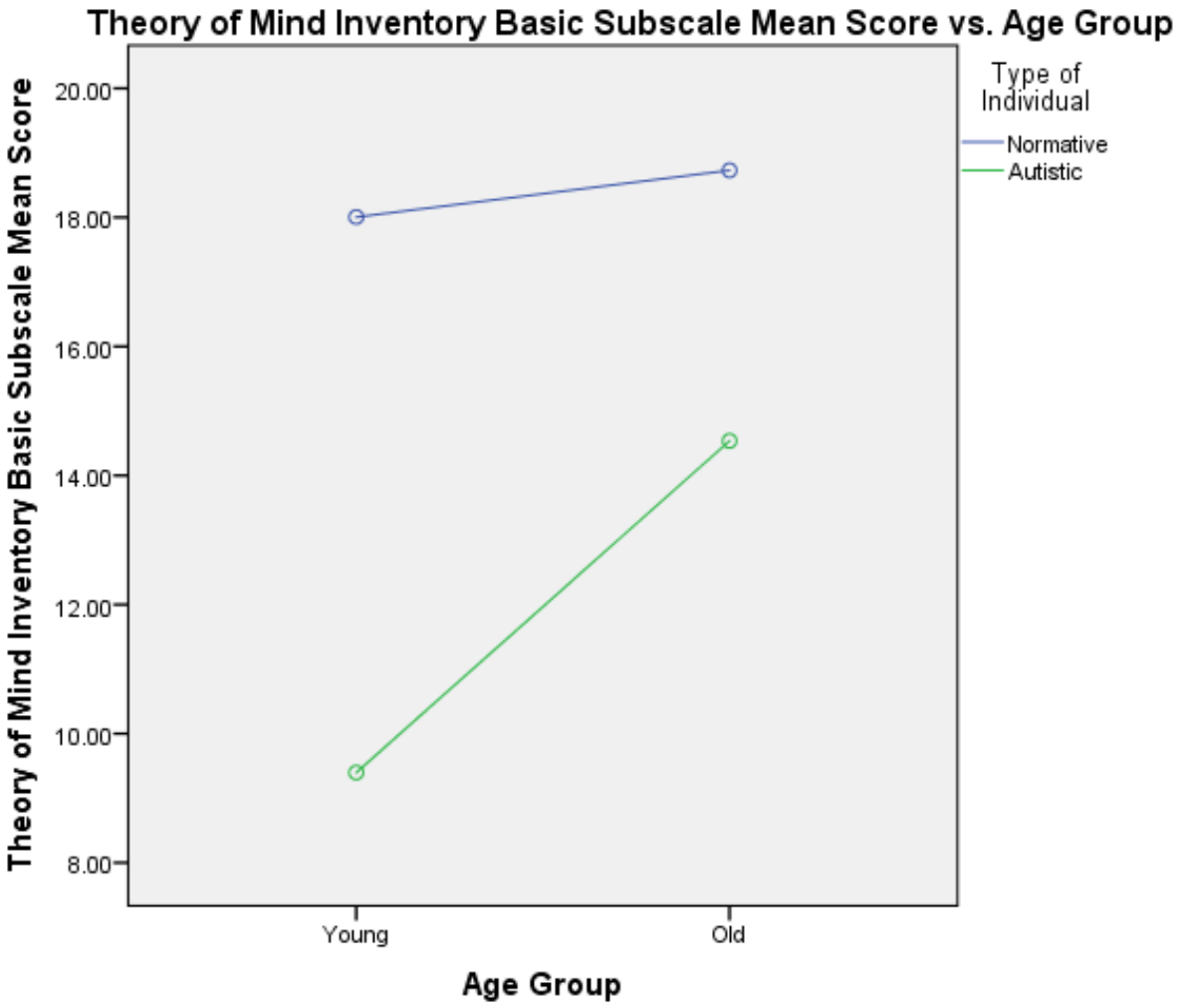
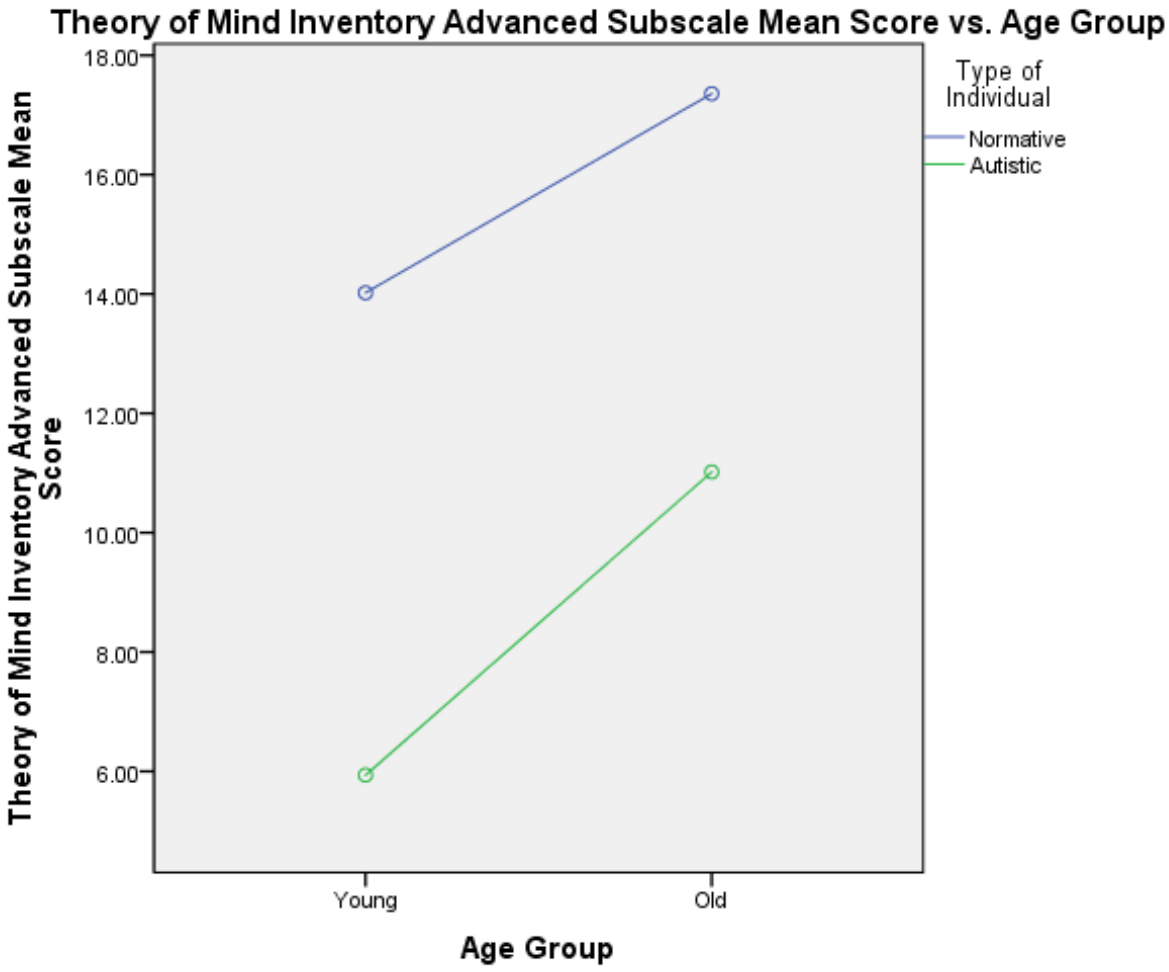

Theory of Mind Inventory Basic Subscale Mean Score vs. Age Group
Theory of Mind Inventory Basic Subscale Mean Score
20.00
18.00
16.00
14.00
12.00
10.00
8.00
Young
Old
Age Group
Type of Individual
Normative
Autistic

Figure 14.


Theory of Mind Inventory Advanced Subscale Mean Score vs. Age Group
Theory of Mind Inventory Advanced Subscale Mean Score
18.00
16.00
14.00
12.00
10.00
8.00
6.00
Young
Old
Age Group
Type of Individual
Normative
Autistic

APPENDIX A

Protocol Instructions

Participant ID# _____ Date _____
Evaluator Initials _____ Time _____

_____ Pre-session check-list:
- _____ Parent consent form, participant assent form, and demographic questionnaire for schools (ideally mailed in advance); provide participant with a packet and read over with participant if not completed
- _____ Binder with Theory of Mind Task Battery and Theory of Mind Inventory, regular pencil or pen
- _____ Theory of Mind Task Battery response sheets
- _____ Create a quiet and confidential space/turn off phone ringer

_____Welcome participant to the study.

I greatly appreciate you taking the time to meet with me today so that we might learn more about the way kids' minds develop. Please understand that most of what I say to you will be read directly from this packet in order to ensure that everything is the same from person to person. We want to make sure that the directions are explained to everyone in the same way to prevent any confusion. This evaluation should take about 10 minutes. Please let me know if you have any questions at any time.

_____ Give parent and participant a copy of the Informed Consent Forms.

Before we begin, I'd like to start by going over some paperwork. Please read this Informed Consent form (give one sheet to parent and one sheet to child) **carefully and sign at the bottom.** (If participant cannot read or write, verbally get his/her informed consent and have researcher or parent fill out form). **If you have any questions, please do not hesitate to ask.**

_____ Administer Theory of Mind Inventory

*Parent/Guardian will fill this out

Please fill out this questionnaire to the best of your ability. Remember that all answers will remain confidential.

_____ Administer Theory of Mind Task Battery (while parent / guardian fills out other forms)

I am going to describe and show you various stories that have related questions, please answer each question as best as you can. It is OK if you do not know the answer, please let me know if you want me to repeat the question or if you are confused by anything and I will try to help you as best I can.

_____ Collect Individual Specific Academic Information (PARCC and MAP scores / placement)

* This information will be collected from the schools

Informed Consent

Parent Informed Consent

My name is Courtney Cross, and I am a student at Union College in Schenectady, NY. I am inviting you and your child to participate in a brief research study. Involvement in this study is voluntary and he/she may decide to participate or not. A description of the study is provided below.

For this study, I will invite your child to participate in a study to learn about the development of theory of mind. Theory of mind is the capability to attribute mental states such as beliefs, desires, and thoughts, to yourself and to others. Theory of mind is also described as having the understanding that other's thoughts, beliefs, and desires may not be the same as your own. He / she will complete the Theory of Mind Task Battery. This pencil and paper form assesses one's theory of mind through the use of various picture scenarios. Each scenario has different characters and a different setting associated with it. I will introduce your child to each scenario and show them the picture stories and then ask him/her to answer a few questions about each scenario.

This assessment should take approximately 10 minutes, but your child can take as much time as he / she wants or needs, up to 20 to 30 min.

To gain another perspective on each child's development, I will ask you to take about 10 minutes to fill out the Theory of Mind Inventory and answer some questions regarding their development and schooling. You can complete the forms at home (enclosed herein) or when you bring your child for their evaluation at the designated location at the school.

There are no known risks posed to you or your child by participating in this study, however your child can choose to not participate in this study and decide to stop participating at any point throughout the assessment.

All information will be kept anonymous and confidential through study identification numbers and results will be de-identified and/or reported in aggregate form. If you have any questions involving the nature of the research, research subject's rights, please contact:
1) Courtney Cross (201) 321-8300, crossc@union.edu
2) Professor Cay Anderson-Hanley, andersoc@union.edu, (518) 388-6355

By signing below, you indicate that you understand the information above, and that you wish for your child to participate in this research study.

_____ _____

Signature of Parent Date

_____

Printed name of Parent

_____ _____

Name of Researcher Date

Participant Assent Form

My name is Courtney Cross, and I am a student at Union College. I am inviting you to join in a study to help me learn more about how you think compared to how other people your age think. This study is about the development of your thinking process and how other people may or may not think differently than you. You may choose to do this study with me or not. That means this study is voluntary and no one is forcing you to do this. Also, you can choose to stop at any point throughout the study, no one will be upset with you if you decide to stop. An explanation of the study is provided below.

I will ask you to complete this test, which measures how developed your theory of mind is through the use of multiple pictures. Each picture scene has different people in different places; I will introduce you to each scene and show you the picture stories and then ask you to answer a few questions about some pictures. If you do not know the answer feel free to say "I don't know" and if you need me to repeat the question or if you need an explanation, I will do my best to help you.

This test should take about 10 minutes, but you can take as much time as you need, so do not feel in a hurry.

There is no harm to you for being in this study, but you may choose to not do this test or to stop doing the test at any point during this study.

You will get a small gift of thanks for helping in this study. If you have any questions during the study, you may call me at any time, Courtney Cross (201 321 8300), or my thesis supervisor, Cay Anderson-Hanley, PhD (518-388-6355).

By signing below, you indicate that you understand the information above, and that you wish to participate in this research study.

_____	_____	_____	_____
Name of Child	Age	Name of Caregiver	Relationship (parent, etc.)

_____	_____	_____	_____
Signature of Child			

APPENDIX B

Theory of Mind Task Battery Response Form

TASK A: Test Question 1: Happy_____ (1 pt.) Sad_____ (0 pt.) Mad _____ (0 pt.) Scared _____ (0 pt.) Test Question 2: Happy_____ (0 pt.) Sad_____ (1 pt.) Mad _____ (0 pt.) Scared _____ (0 pt.) Test Question 3: Happy_____ (0 pt.) Sad_____ (0 pt.) Mad _____ (1 pt.) Scared _____ (0 pt.) Test Question 4: Happy_____ (0 pt.) Sad_____ (0 pt.) Mad _____ (1 pt.) Scared _____ (1 pt.)

TASK B:

Control question: Cake _____ Lollipop _____ Cookie _____ Candy bar _____

IF INCORRECT, SKIP TO TASK C Test Question 5: Happy_____ (1 pt.) Sad_____ (0 pt.) Mad _____ (0 pt.) Scared _____ (0 pt.)

Optional Justification (verbal children with correct answer only): Why will Brynn be happy?
_____
_____
_____

TASK C:

Test Question 6: Drawer_____ (0 pt.) Desk_____ (0 pt.) Table _____ (1 pt.) Chair _____ (0 pt.) Optional Justification (verbal children with correct answer only): Why will Patty think they are on the table?
_____
_____

TASK D:

Test Question 7:

Statue viewed facing forward _____ (1 pt.)

Statue viewed facing left _____ (0 pt.) Statue viewed facing right _____ (0 pt.)

Statue viewed facing away_____(0 pt.)

Test Question 8:

Statue viewed facing forward ____ (0 pt.) Statue viewed facing left ____ (0 pt.)

Statue viewed facing right ____(0pt.) Statue viewed facing away_____(1 pt.)

TASK E:

Test Question 9: Couch_____ (1 pt.) Desk_____ (0 pt.) Drawer _____ (0 pt.) Bed _____ (0 pt.) Optional Justification (verbal children with correct answer only): Why will Franklin to go the couch?

TASK F:

Control question: Table_____ Drawer _____ Shelf _____ Chair _____ IF INCORRECT, SKIP TO TASK G

Control question: Table_____ Drawer _____ Shelf _____ Chair _____ IF INCORRECT, SKIP TO TASK G

Test Question 10: Table_____ (1 pt.) Drawer _____ (0 pt.) Shelf _____ (0 pt.) Chair _____ (0 pt.)

Optional Justification (verbal children with correct answer only): Why will Anthony look for the book on the table?

_____
_____

TASK G

Control question: Truck_____ Train _____ Wagon _____ Airplane _____ IF INCORRECT, SKIP TO TASK H

Control question: Truck_____ Train _____ Wagon _____ Airplane _____ IF INCORRECT, SKIP TO TASK H

Test Question 11: Happy_____ (1 pt.) Sad _____ (0 pt.) Mad _____ (0 pt.) Scared _____ (0 pt.)

Optional Justification (verbal children with correct answer only): Why will Lee feel happy?

_____
_____
_____

Control question: Truck_____ Train _____ Wagon _____ Airplane _____ IF INCORRECT, SKIP TO TASK H

Test Question 12: Happy_____ (0 pt.) Sad _____ (1 pt.) Mad _____ (0 pt.) Scared _____ (0 pt.)

Optional Justification (verbal children with correct answer only): Why will Lee feel sad?

_____
_____
_____

IF INCORRECT, SKIP TO TASK H Test Question 13: Happy_____ (1 pt.) Sad _____ (0 pt.) Mad _____ (0 pt.) Scared _____ (0 pt.)

Optional Justification (verbal children with correct answer only): Why does dad think Lee will be happy?

_____
_____
_____

TASK H

Control question: Salad _____ Spaghetti _____ Bread _____ Soup _____ IF INCORRECT, SKIP TO TASK I

Control question: Salad _____ Spaghetti _____ Bread _____ Soup _____ IF INCORRECT, SKIP TO TASK I

Control question: Salad _____ Spaghetti _____ Bread _____ Soup _____ IF INCORRECT, SKIP TO TASK I

Control question: Salad _____ Spaghetti _____ Bread _____ Soup _____ IF INCORRECT, SKIP TO TASK I

Test Question 14: Salad _____ (0 pt.) Spaghetti _____ (1 pt.) Bread _____ (0 pt.) Soup _____ (0 pt.) TASK I

Control question: Rollerblades_____ Bike_____ Basketball _____ Baseball glove _____

IF INCORRECT, END HERE

Test Question 15: Rollerblades_____ (1 pt.) Bike_____ (0 pt.) Basketball _____ (0 pt.) Baseball glove _____ (0 pt.)

Optional Justification (verbal children with correct answer only): Why will Mom say Enrique thinks he is getting roller
blades?_____
_____
_____
_____

---END---

TOTAL NUMBER OF CORRECTLY ANSWERED TEST QUESTIONS:_____

APPENDIX C

Demographic Questions – For Schools

ID#**:** _____ Date: ____

Years of Education (First grade = 1; Senior in High School = 12) _____

New Jersey Assessment of Skills and Knowledge (NJ ASK) – if applicable

English score: _____

Category placement (such as partially proficient, proficient or advanced proficient): _____

Math score: _____

Category Placement: _____

Science score: _____

Category Placement: _____

Measure of Academic Progress (MAP):

Reading score: _____ Math score: _____

Do you receive any specialized service (ex: for learning disability or ADHD, etc.) _____

First Language = (English or list other) _____

Gender (male or female): _____

Ethnicity (circle as many that apply):

Caucasian / White African-American / Black

Hispanic-American Asian – American

Native American Other: _____

Age: _____