The Report Committee for Alyssa Simone Luckenbach
Certifies that this is the approved version of the following report:

Social Perception of Children with Autism Spectrum Disorders

APPROVED BY
SUPERVISING COMMITTEE:

Supervisor: _____
Barbara Davis

Co-Supervisor: _____
Jessica Franco

Social Perception of Children with Autism Spectrum Disorders

by

Alyssa Simone Luckenbach, B.S.C.S.D.

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Abstract

Social Perception of Children with Autism Spectrum Disorders

Alyssa Simone Luckenbach, M.A.

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Supervisors: Barbara Davis, Jessica Franco

A broad review of assessment and intervention research relevant to Theory of Mind (Baron-Cohen, 1985) and Autism Spectrum Disorders from birth to age twelve was conducted. Nine assessment articles were reviewed to examine the major differences between children with autism spectrum disorders and children who are typically developing, particularly in the area of social perception. Assessment tasks aimed to discover a child's thoughts relevant to another's thoughts, beliefs, and emotions. It was discovered that children with autism spectrum disorders performed less well on Theory of Mind tasks, and tended to provide responses that were more egocentric and idiosyncratic in nature. A review of the intervention research revealed improvement in Theory of Mind domains is possible when teaching strategies explicitly target goals relevant to perspective taking. Generalization of skills to natural environments was a lacking area across all twelve articles, indicating a need for more intensive practice in natural environments. Interestingly, when social skills were taught in the absence of Theory of Mind training, no collateral effects were observed to Theory of Mind domain.

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Introduction

Social communication and interaction are fundamental aspects of everyday life. Skills required to be successful in these areas include social perception and understanding, which begins developing very early on in typically developing children. For the child with autism spectrum disorder (ASD), however, development of social skills does not come as naturally. Social impairment is considered a core feature of children with ASD (Carter, Davis, Klin, & Volkmar, 2005). Research thus far has revealed this deficit to be caused by an inability to identify social cues and norms (Nah & Poon, 2010) and failure to take into account others' mental states (Rajendran & Mitchell, 2007).

Inadequacy in these areas leads to an individual experiencing difficulty in all aspects of life (i.e. personal relationships, work, etc.). One particular social skill is thought to be paramount to success in social interaction and has become a major area of focus in research over the last two decades. Theory of Mind (TOM) is known as the ability to take on the thoughts, beliefs, and feelings of another person (Adolphs, Sears & Piven, 2001). Essentially, it is the understanding that others' thoughts are different from your own, which is a critical component to social interaction. Ultimately, our ability to understand others thoughts determine the actions and behaviors we display. For children with ASD, TOM is often severely delayed or lacking entirely (Hutchins & Prelock, 2008; Miller, 2006). Examining this area of deficit has potential to tap into the mind of the child with ASD, to understand what she thinks, feels, and believes about her peers, which can provide useful information at every stage of the assessment and intervention

process. Furthermore, investigating children's perception of others can provide parents and families' valuable insight into the best possible school and educational settings for their child.

In order to better understand the development of social perception in children with autism, this paper will review the available literature pertaining to ASD and focus on elementary school age children. Studies related to assessment and intervention of theory of mind capacities will be reviewed to evaluate the hypothesis that children with ASD unintentionally violate social norms and behavioral rules (Nah & Poon, 2011) due to deficits in theory of mind. This deficit impacts their ability to make inferences, attend to, and engage in appropriate conversation with peers.

Research data pertinent to two questions will be analyzed in this paper utilizing the information from the relevant assessment and intervention literature:

1. Based on the available research examining theory of mind deficits, how do children with high functioning autism socially perceive their peers (Chapter 2)?

2. Based on effective interventions, what can be concluded as appropriate educational placement for children with high functioning autism (Chapter 3)?

Chapter 1: Background on Theory of Mind

In order to provide a basic understanding of its theoretical background, developmental trajectory, and deficits present in children with ASD, the following section will present a broad overview of Theory of Mind.

A critical background for understanding social perceptions of the child with ASD is to understand their major impairments and/or deficits specific to social impairment. A current review of the available literature describing assessment and intervention pertaining to Theory of Mind (TOM) abilities will provide an avenue into this area. Prior to reviewing the relevant research, it is critical to provide an overview describing the major elements of TOM abilities. The following section will 1) define theory of mind, 2) outline the expected TOM milestones reached by typically developing individuals from birth to early adolescence, and 3) explain the expected TOM deficits for children with ASD.

Theory of Mind

Theory of Mind (TOM) is a dynamic construct (Astington & Baird, 2005) that includes a repertoire of abilities related to social functioning, all of which are necessary for competent communication (Miller, 2006). Most notable components involve the ability make inferences of others' thoughts, feelings, and emotions (Peterson & Slaughter, 2009), which is central to social life (Leslie, Friedman, & German, 2004). TOM aids in the understanding that thoughts and beliefs guide behaviors of others

(Peterson & Slaughter, 2009), making it possible to predict actions, desires, and intentions (Hutchins, 2008).

Researchers acknowledge distinct categories of TOM including cognitive, affective, interpersonal, and intrapersonal (Westby, 2012). Westby and colleagues note that the first, *cognitive* TOM encompasses the ability to attribute mental states. This area is considered to be an early developing, first-order false belief understanding, which can be defined as the ability to accurately infer another person's beliefs pertaining to a tangible object or event. *Affective* TOM includes the ability to both share emotions and understand emotions of others, which drives ones behavior. *Interpersonal* TOM is the process of inferring thoughts and feelings of other. Finally, *intrapersonal* TOM is the ability to reflect one's own thoughts, knowledge, and emotions. With this ability, an individual is able to monitor his/her own behavior (Westby, 2012). Each category demonstrates increasing complexity, which reveals TOM to be dynamic and evolutionary in nature.

For typically developing individuals, TOM reasoning is carried out with little conscious reflection and is so closely related to the maturation of language it is rarely recognized as a distinct part of development (Miller, 2006). However, it is broadly believed that children with autism do not develop TOM ability along the same trajectory as their typically developing counterparts. TOM is thought to be a major contributor to the core social, behavioral, and communicative deficits present in the child with ASD (Hutchins & Prelock, 2008).

Primary characteristics of ASD include marked deficits in communication, impaired ability to establish and maintain social relationships, and restrictive, repetitive, and stereotyped patterns of behavior, interests, or activities (American Psychiatric Association, 2000). Within this population are children who vary greatly in the type and severity of deficits they display, making the disorder complex in nature. According to the recent DSM-5 diagnostic manual (Diagnostic and Statistical Manual, 5th ed., 2013), autism disorders no longer exists as individual subtypes (i.e. pervasive developmental disorder-not otherwise specified/PDD-NOS, Asperger syndrome, autistic disorder, childhood disintegrative disorder), rather, all children are diagnosed as having ASD. While this large umbrella term is used to describe all children with ASD, it is necessary to distinguish groups based on the uniqueness of their deficits to insure appropriate assessment and intervention is provided to each individual child. Research reviewed here will pertain to children with autism spectrum disorders (ASD) who have average or above average intelligence and are considered high functioning. Generally, this group includes children with IQs above seventy. Diagnoses may include high functioning autism spectrum disorder (Diagnostic and Statistical Manual, 4th ed., 1994;HFASD) Asperger syndrome (Diagnostic and Statistical Manual, 4th ed., 1994; AS), Pervasive Developmental Disorder-Not Otherwise Specified (Diagnostic and Statistical Manual, 4th ed., 1994; PDD-NOS), or autism diagnoses (AD).

Within this subtype are individuals who have average or above average intellectual abilities, but display marked deficits in cognition most relevant to social functioning (Adolphs, Sears, & Piven, 2001). Both verbal and nonverbal communication

are persistent areas of difficulty, making social interactions and verbal transactions a major challenge (American Psychiatric Association, 2000). According to Baron-Cohen, Wheelwright, and Jolliffe (1997), individuals with ASD have a particularly difficult time recognizing complex emotions from faces. They may show little awareness of others' feelings and emotions (Kaland at al., 2008).

Development of Theory of Mind

Although a child is not born with TOM ability, it develops slowly over time. In infancy, a child displays certain prerequisite behaviors prior to or during the development of TOM. These include joint attention, use of gestures and mental state terms (i.e. think, know, want), pretend play, appreciation of intentionality, and recognition of differing perspectives (Miller, 2006). For typically developing infants around six to ten months of age it is common for him/her to follow an adult's head and demonstrate gaze shifts, otherwise known as joint attention (Miller, 2006; Westby, 2012). It is believed that joint attention is deeply intertwined in the development of TOM due to the understanding that people are "intentional agents" who have independent motives that drive actions (Hutchins & Prelock, 2008). As a result of this understanding children will engage with others via joint attention and develop a very basic understanding of intentionality (Tomasello, 1995). While variability exists amongst individuals, it is believed the ability to infer mental states of another is said to develop by 36 months of age (Leslie et al., 2004), but can be witnessed as early as 18 months (Repacholi & Gopnik, 1997). It is around this same time that children begin to talk about mental states such as "I think" or

"I know" (Miller, 2006) and engage in pretend play schemes (Westby, 2012). By four years of age a typically developing child can correctly categorize mental state terms from action words.

What is commonly referred to as first-order false belief understanding is usually achieved between three and four years of age (Hutchins & Prelock, 2008; Leslie et al., 2004; Wellman et al., 2001). This understanding is an early form of TOM and involves the "attribution about other's false belief with regard to real events" (Bauminger & Kasari, 1999). It is considered the precursor to the more sophisticated second-order false belief understanding. As one might suspect, TOM is fluid in nature; much like other aspects of development it continues to evolve (Wellman et al., 2001) in a stage-like manner as children gain a more mature understanding of others thoughts and motives (Beeger et al., 2012).

Second-order false-belief understanding, said to emerge between 5 and 6 years of age (Sullivan & Tager-Flusberg, 1994), is the ability to think about other people's thoughts. This social understanding is undoubtedly more advanced and refined than first-order false belief, as children are able to decipher that different interpretations may be made by two different individuals (Hutchins & Prelock, 2008). For example, a child who demonstrates adequate second-order understanding is able to predict an individual's belief about an emotion. Further, children gain the ability to "make appropriate judgments of situations in which one knows, remembers, forgets, or guesses" (Westby, 2012). A broader understanding of emotions are also developed around 6-8 years of age, as children are able to understand emotions are a result of what an individual thinks even

when those thoughts don't match reality (Westby, 2012). By ten years of age a typically developing child should understand the concept of deceit, figurative language, sarcasm, and social faux pas (Westby, 2012). While variability exists, these are the expected milestones in the area of TOM development for typically developing individuals.

Deficits in Theory of Mind

The available research clearly demonstrates that theory of mind follows a developmental pattern for children who are typically developing. As children grow, so does their cognitive capacity and social understanding. Recently, there has been a considerable increase in the attention to either delayed or lacking capacities specific to TOM. Particular interest has been directed towards deficits in TOM over the past two decades in the areas of research specific to ASD (Hutchins & Prelock, 2008). While variable, the majority of research suggests deficits are unique to children with autism (Hutchins, 2008). For example, individuals with Down syndrome (Baron-Cohen, Leslie, & Frith, 1985) matched on equivalent mental age have been shown to demonstrate TOM ability by passing of false belief assessment tasks.

Deficits in TOM manifest in a multitude of ways, impacting the "acquisition and processing of information relevant to social competency across contexts (Stitcher, O'Conner, Herzog, Lierheimer, & McGhee, 2012). Because TOM deficits cause an individual to have difficulty inputting mental states to themselves and others, children may lack the necessary awareness to build meaningful peer relationships. At early educational stages, this deficit can have grave impact as learning and social interactions

are closely intertwined. Based on the research conducted over the last two decades, researchers established that children with ASD experience challenges recognizing and matching emotions, understanding non-literal language, intentions, and theory of mind tasks (Steele, Joseph, & Tager-Flusberg, 2003). Further, children with ASD utilize fewer affective expressions (Bauminger, 2002), have difficulties recognizing faux pas (Baron-Cohen, O'Riordan, Stone, Jones, & Plaisted, 1999), and often have trouble with adjusting behavior to accommodate to a situation. As one might imagine, these delayed or lacking cognitive capacities contribute to the core social, communicative, and behavioral deficits that characterize ASD (Baron-Cohen, 1995).

While these are the core deficits expected to be present, it is important to acknowledge the variability that exists amongst children diagnosed with autism. Wellman & Liu (2004) state "TOM understanding evidences a progression of insights that unfold over development". Thus, it would be incorrect to suggest that TOM skills are either present or absent; TOM should not be characterized in such a black and white manner. Rather, there appears to be a broad spectrum of abilities from one individual to the next. To say that children with ASD experience delayed or inconsistent acquisition of TOM would be a more accurate assumption. It seems that the progression of development may take place differently or in a delayed manner from their typically developing counterparts.

Review of Theory of Mind

Children with Autism Spectrum Disorders (ASD) experience a broad array of deficits in the areas of communication, emotion regulation, and social interaction. As one might suspect these deficits manifest in various ways, impacting the child's educational and social environments.

This paper will examine a critical area related to social functioning, Theory of Mind (TOM), and draw from it information relevant to social perception of the child with ASD. Because research suggests that marked deficits in this particular area are unique to individuals with Autism Spectrum Disorders, an in depth examination of this area in isolation is needed. In order to do so, this paper will review the relevant available research specific to assessment of TOM ability and interventions aimed at improving this area of deficit. From this information assessments will be categorized based on the type and degree of complexity (i.e. basic first-order false belief tasks, advanced second-order false belief tasks). Key elements of available intervention approaches aimed at improving TOM deficits will be described. This review involves a systematic analysis of assessment and intervention studies that examine theory of mind (TOM) as an outcome variable for children with Autism Spectrum Disorders (ASD).

CHAPTER 2: Assessment of Theory of Mind

A first major question posed in this review is to analyze research to consider the following: Based on the available assessment research examining theory of mind deficits, how do children with autism spectrum disorders (ASD) socially perceive their peers? The following section is a review of the available measures to assess TOM relevant to that question. This analysis will provide an avenue to draw conclusions regarding social perceptions of children with ASD from available research. For example, when a child with ASD is in conversation with a peer in a social setting, how does he/she perceive the situation and what inferences can he/she make about the other person? Furthermore, how do those perceptions impact the conversation?

Methods

In order to answer the preceding question, the following search procedures and inclusion criteria were set to ascertain studies of particular relevance to TOM assessment measures for children with ASD.

Search Procedures.

Systematic searches were conducted in five electronic databases: Communication & Mass Media Complete (CMMC), MEDLINE, Cumulative Index to Nursing & Allied Health (CINAHL), and PsycINFO, and ERIC. In all databases, the following terms were inserted into the keyword field: a) *theory of mind assessment* and *children with autism*.

Inclusion Criteria

To be included in this review, the article had to meet the following criteria:

(a) The studies included at least one participant with a formal diagnosis of autism, ASD, AS, HFASD, or PDD-NOS.

(b) The majority of participants in each assessment article had to be under the age of twelve. Of the nine assessment articles reviewed, three contained participants out of the specific age range. For the purposes of this report, these results were interpreted with caution.

(c) The studies contained clinical assessments that directly measured TOM performance/ability of children with autism, ASD, AS, PDD-NOS, or HFASD.

(d) Assessment articles were published in peer-reviewed journals after the year 1999 (i.e. 2000-present).

The most common reasons for exclusion were as follows: 1) The methods of assessment was based on interviewing parents or using checklists (2 of these), 3) The methods of assessment was solely qualitative in nature (1 of these), or 4) The studies focused on a comparison between two assessment measures rather than the differences in abilities between typically developing and children with ASD (2 of these).

Results

Table 3.1 provides the following information: 1) the current researchers utilizing the assessment measure, 2) description of participants including age, diagnosis, and IQ range (if available), 3) the name of the assessment employed, classified by two broad categories (i.e. basic first-order false belief tasks, second-order advanced TOM tasks), 4) a brief description of the key components, and 5) subsequent results. The two broad categories of assessments are based on the complexity of the tasks. First-order false belief tasks are

believed to tap into basic, early developing TOM abilities. This involves the attribution of other's false beliefs based on a *tangible object* or *real event*. Advanced TOM tasks, otherwise known as second-order false belief tasks, are intended to measure an individual's ability to think about another person's thoughts. While there are variations in what assessments precisely measure, these basic definitions can provide a broader understanding of each major category. Key elements and major components of assessment measures are further discussed below.

Table 2.1 Summary of Theory of Mind Assessments

Study	Child	Assessment	Key Components	Results
		First Order		
Van Buijsen et al. (2011)	N=27 Age=4-7 ASD	Sally Anne False Belief Task	1) Objects are placed in a container by person A (ex. marble in a basket) and then leaves the room, 2) Objects transferred to another container by person B, 3) Person A returns to room; Child is asked "Where will person A look for the object?"; task presented via different modes: spoken, video, and line drawing	ASD performed ASD group were impacted by the mode of presentation while TD children were not; Children with ASD were not able to pass spoken presentation, which indicates they have trouble picking out essential information on an already complex task as compared to TD peers
Van Buijsen et al. (2011)	N=27 Age=4-7 ASD	Smarties Task (Appearance–Reality Task)	Task draws upon child's own experience by using different characters and objects containing unexpected objects (ex. showing a smarties package that contains a pencil) and then asking the child what others think will be in the package; task presented via different modes: spoken, video, and line drawing	ASD group were impacted by the mode of presentation while TD children were not; Although ceiling were nearly reached for all 3 presentations, lowest scores resulted on line drawing presentation

Table 2.1 (continued)

Van Buijsen et al. (2011)	N=27 Age=4-7 ASD	The Charlie Task	Task assesses the ability of the child to read the mentalistic significance of the eyes; 3 characters with different objects (i.e. fruits, toys, and sweets) were presented; Ex. After a character looks to the object he desires, the child was asked to name the items the character most desires; task presented via different modes: spoken, video, and line drawing	ASD group were impacted by the mode of presentation while TD children were not; Children with ASD had lowest scores with spoken and video versions indicating interpretation of real-life gaze information is a challenge for children with ASD
Beeger et al. (2013)	N=40 Age=8-13 HFASD, AD, AS, PDD-NOS IQ>70	The Sandbox Task (Continuous false belief)	Pictures of an object being buried and reburied in sandbox were shown to children, then a false belief story was read aloud; children were asked to indicate object location based on the stories provided	When compared to TD peers, children with ASD gave egocentric responses more often (i.e. indicated location based on their own privileged knowledge); Performance increased as age increased
Lind & Bowler (2010)	N=40 Age=5-17 AS, AD, PDD-NOS VIQ=39-102	Seeing is Knowing Task	Children were shown 5 boxes, each with distinct appearance and each containing a different toy object; 2 dolls (i.e. John & Fiona) were introduced and were either shown the box or what was inside the box; Children were asked "Who knows what's in the box?"; task repeated with different objects and characters 5 times for each participant; Task designed to assess explicit understanding of the relationship between informational access and knowledge	When compared to TD peers matched on age and verbal ability, ASD group were found to perform significantly less well on tasks
Sivaratnam et al. (2012)	N=12 Age=6-8 IQ>70 HFASD, AD	Comic Strip Task (CST)	*Intentions* and *Emotions* subscales (belief subscale was removed due to low internal consistency); 21 total items; 5-picture comic strips illustrating everyday social scenarios; children presented with stories and alternate endings were asked which one best completes story and why	HFASD group performed significantly lower than TD group on the *Intentions* subscale; HFASD group performed equally well on the *Emotions* subscales; Results suggest that basic emotion-understanding in HFASD is comparable to TD children

Table 2.1 (continued)

		Second-Order		
Peterson & Slaughter (2009)	N=22 Age=6-13 AD	Simplified Eye-Reading Test (SERT)	Eye photos depicted emotions (i.e. upset, scared, sad, kind, friendly, thinking, not believing, worried, remembering) and were presented to participants; results were compared to traditional first-order false belief task to determine correlation	Children with autism discerned meaning of the eye expressions as accurately as TD children of the same age; Results revealed significant correlations between SERT and false belief scores for children as a whole
Kaland et al (2008)	N=21 Age=10-20 IQ>80 AS, PDD-NOS	The Eyes Task	28 black/white photographs of the eye region; participants had to distinguish the correct simple mental state (ex. serious, bored) and describe what the person in the photo might be thinking	When compared to the TD control group, AS group: -performed less well with regard to number of correct mental state target words
Kaland et al (2008)	N=21 Age=10-20 IQ>80 AS, PDD-NOS	The Strange Stories Task	24 mentalistic vignettes comprised of pretense, joke, lie, white lie, misunderstanding, persuasion, appearance/reality, figure of speech, irony, double bluff, contrary emotions, and forgetting; Vignettes read aloud to children and were asked test questions specific to the underlying intention of character in the story	When compared to TD control group, AS group: -obtained a lower total score than TD controls on task -needed significantly more prompt questions than controls to answer the questions -gave more context-inappropriate mental state inferences
Kaland et al (2008)	N=21 Age=10-20 IQ>80 AS, PDD-NOS	The Stories from Everyday Life	26 contextually demanding short stories comprised of lie, white lie, figure of speech, misunderstanding, double bluff, irony, persuasion, contrary emotions, forgetting, jealousy, intentions, empathy, and social blunders; Participants were required to infer mental states	When compared to TD control group, AS group: -performed significantly less well -had a significantly longer response time on mental state inference task -Needed significantly more prompt questions when answering test questions

Table 2.1 (continued)

Beaumont & Sotronoff (2008)	N=26 Age=7-11 IQ>85 AS	Animated Theory of Mind Inventory for Children (ATOMIC)	12 computerized cartoons presented to children; 7 TOM questions following presentation examined the ability to infer complex mental states (ex. guilt, embarrassment); 5 TOM questions examined characters cognition;	Participants with AS performed more poorly than TD children on the TOM Questions and memory questions (possible attention and/or memory deficits may have contributed to poor TOM task performance
Scheeren et al. (2013)	N=194 Age=10-16 IQ>70 AS, PDD-NOS, HFASD	Social Stories	Story narrative were read aloud to child and examined second-order false beliefs, display rules, double bluff, faux pas, and sarcasm; Physical and mental state questions followed	HFASD & TD children performed equally well on TOM stories; task performance positively associated with chronological age and verbal ability; Researcher suggest challenges with advanced mental state reasoning may only be present in everyday social interactions
Peterson et al. (2012); adapted from Wellman & Liu (2004)	N=85 Age=5-12 AS, AD	6 Step TOM Scale	Tasks: 1) diverse desires, 2) diverse beliefs, 3) knowledge and access, 4) false belief, 5) hidden emotion, 6) sarcastic irony (SARC)	Tasks revealed children with Autism were delayed relative to TD peers on all 6 tasks

Number of participants (N); Age (A); Intelligence quotient (IO); Verbal Intelligence quotient (VIO); Autism disorder (AD); Autism Spectrum Disorders (ASD); High functioning autism disorder (HFASD); Pervasive developmental disorder-not otherwise specified (PDD); Asperger syndrome (AS)

Review of Theory of Mind Assessments

Based on the studies reviewed, it is obvious TOM tasks are diverse in nature. As such, it is imperative to review the major elements and key components of each assessment measure. Major areas of interest relative to this review involve *what* researchers aimed to measure, and *how* this relates to a child's social perception of their peers.

A review of the studies revealed two broad categories of TOM assessments, first-order false belief and second-order advanced TOM tasks. These two categories can be

distinguished by the degree of complexity that is required to correctly respond to the task items. Below will be an examination of critical elements of each assessment belonging to the two broad categories. Based on the information from the assessment research I will discuss the skills required to correctly attribute the thoughts, feelings, and beliefs of others based on complexity of the tasks. This will allow some conclusions to be drawn pertaining to how children with ASD perceive peer interactions.

First Order False Belief Tasks

Of the thirteen studies reviewed, four consisted of first-order false belief tasks (Beeger, Bernstein, Van Wijhe, Scheeren, & Koot, 2013; Van Buijsen, Hendricks, Ketelaars, & Verhoeven 2011; Lind & Bowler, 2010). Assessment measures were characterized by an individual's belief about tangible objects or actions. While many variations of first-order false belief tasks exist, the ultimate goal of tasks remained constant: to accurately measure a child's social cognitive ability.

The classic *Sally Anne Task* was utilized by Van Buijsen et al. (2011) to compare performance of children with ASD to their typically developing peers. Twenty-seven participants were included in the study between the ages of 4 and 7. This task involved showing the participant two characters, Sally and Anne. Both characters saw an objects initial location (ex. a book on a table). When Sally left the room, Anne moved the book to a new location (ex. into a cabinet). Once Sally returned, the child was asked, "Where will Sally look for the book?" If the child said the original location (i.e. the table) this indicated he/she understood Anne held privileged knowledge.

Correctly answering the *belief* question indicated the participant had the most basic, early developing TOM ability. On the contrary, when a child responded by saying the new location (i.e. the cabinet), this response indicated the child did not understand Sally was missing information. This task attempted to measure the participant's understanding that different people hold different knowledge based on what they see. In other words, it is awareness that individuals have their own distinct beliefs that may not match reality (i.e. Sally believes the book is on the table even though it is really not).

A similar assessment measure called the *Appearance-Reality Task* draws upon the child's previous experiences and/or knowledge about an object. Van Buijsen et al. (2001) administered this assessment to the same group of participants for comparison purposes. During this task a container (ex. A Smarties candy bag) held an unexpected object (ex. pencil). The examiner then asked the child what he/she thought another person would believe was inside the Smarties bag. In this particular task, the main area of interest was the distinction between an objects appearance versus reality.

The *Charlie Task* was the third task Van Buijsen and colleagues utilized for comparison purposes (2011). The goal of this task was slightly different in that it measured the child's ability to read the mentalistic significance of the eyes. Tangible objects (e. g. toys, fruits) were placed on a table in front of an individual, and the examiner asked that individual which one he/she most desired. The individual then looked to that object in order to indicate the desired object. The child, who witnessed this presentation, was asked to name the object the individual most desired. While this task

was slightly more complex than the *Sally-Anne* or *Charlie* tasks, the goal was similar: to assess the child's understanding of another person's thoughts.

Van Buijsen et al. (2011) went a step further and compared participants performance when the three assessment measures were presented via different modes (i.e. video, line drawings, and spoken). Researchers administered all three tasks to children with ASD, children with Specific Language Impairment (SLI), and TD children aged between 4-6 years of age. Performance was compared once participants were matched on age, sex, and non-verbal age. Researchers wanted to know: 1) Did the mode of presentation across the three tasks impact performance differently across groups of children and 2) did TOM in the various presentation modes relate to the participant's verbal age, non-verbal age, and short-term memory capacity? In total, nine presentations were administered to participants (i.e. *Sally-Anne, Charlie*, and *Smartie* task presented via video, line drawing, and spoken). Results revealed both ASD and SLI groups performed significantly less well on TOM tasks as compared to their TD peers. In addition, children with ASD demonstrated significantly different performance on TOM tasks based on presentation mode across all three tasks. For the *Sally-Anne* and *Charlie* tasks children with ASD were not able to pass the spoken presentation. The line drawing presentation was most challenging for the ASD group during the *Smarties* task. Because results were similar for the SLI participants, it was concluded that mode of presentation had an impact on performance only for children with communication disorders (i.e., ASD, SLI).

The *Sandbox* task (Beeger et al., 2012) aimed at measuring more subtle egocentric biases as compared to other first-order false-belief tasks. Researchers compared participants with HFASD, AD, AS, and PDD-NOS to typically developing peers between 8-13 years of age with IQ scores of seventy and above. This continuous task measured the "extent to which participants could ignore or disregard their own beliefs in order to reason from an ignorant perspective on a continuous scale" (Beeger et al., 2012, p. 358). Interestingly, this task was presented on two-dimensional stimulus (i.e. paper). Children looked at pictures of a sandbox while listening to a relevant story, and were then asked to indicate the perceived location of the object by pointing. Similar to previously discussed tasks, the goal was to examine the child's ability to infer mental states/thoughts of the characters in the stories. Results revealed children with HFASD to be more egocentric in their responses, even when controlling for age and verbal ability.

The *Seeing is Knowing Task* was utilized by Lind & Bowler (2010) for purposes of comparing TD children to those with ASD matched on age and verbal mental age. Participants were between 5-17 years of age and had a verbal IQ between 39 and 107. During this task children were shown five unique looking boxes, each of which held a distinct object or toy inside. Two characters, John and Fiona, were introduced to the participants. John and Fiona were then shown either the outside of the box or the inside of the box. Participants watched the scenario take place, and are then asked, "Who knows what is in the box?" Similar to the *Charlie* task, this task requires an understanding mental significance of a character's eye gaze. When one of the characters looks into the box and sees the object, does the participant understand that is privileged

knowledge? Results revealed children with ASD performed significantly less well than the comparison group. In addition to the initial comparison between groups, researchers went a step further and excluded those who failed the control task. After re-analyzing the data with only the participants who passed the see-know test in both comparison groups, results remained consistent and differences were still found to be significant. Because this task had no ceiling effects, results were considered to be more reliable.

A final assessment measure within this category was unique to in that it did not measure tangible objects, rather, it measured basic TOM understanding relative to intention and emotion. For this reason, it was not considered a complex, advanced second-order false belief task. Sivaratnam and colleagues (2012) gathered 12 participants with either HFASD or AD between the 6 and 8 years old. They were interested in children's performance on the *Comic Strip Task (CST),* which contained a belief, intention, and emotion subscale. The comic strips illustrated everyday social scenarios with alternate endings. Children were asked to choose the ending that *best* completed the story and then they had to explain why. Results revealed that the children with ASD performed significantly lower that the TD group on the *Intentions* subscale across all five items. Interestingly, the *Emotion* subscale revealed that the ASD group performed equally as well as the TD group. The final subscale, *Beliefs*, was removed from the assessment measure due to low internal consistency. Researchers suggest that results show the most basic-emotion understanding is comparable across ASD and TD populations.

Advanced Theory Of Mind Tasks

Seven of the thirteen assessment tasks aimed at tapping into higher order mental state thinking (Sivaratnam et al., 2012; Peterson & Slaughter, 2009; Kaland et al., 2008; Beaumont & Sotronoff, 2008; Scheeren et al., 2013; Peterson et al., 2012). These can be classified as second-order false belief tasks, as participants were asked to attribute embedded mental states of another.

Two assessment measures focused on reading emotions in the eyes (Peterson & Slaughter, 2009, SERT; Kaland et al., 2008, The Eyes Task). Both studies presented black and white photographs to two groups (i.e. TD group vs ASD group). Photographs showed just the eye region presenting a mental state (ex. serious, bored, sad, friendly, thinking). Because tasks of this nature are more complex and are testing higher-order mental state reasoning, participants ranged from 6-20 years of age.

The easier of the two tasks, SERT, was presented to children between the ages of 6-13 years of age (Peterson & Slaughter, 2009). Results from the study revealed that children with ASD discerned meaning of eye expressions equally as well as typically developing peers. Scores were then compared to first-order false belief task scores, which revealed significant correlations to the group as a whole. Results indicate the SERT task may have been to simple and ceilings were too low to discriminate between the two groups. For The Eyes Task (Kaland et al., 2008), results discriminated between groups to a larger degree. Children in this group were between 10-20 years of age, and the study group was formally diagnosed with either AS or PDD-NOS. When compared to their TD

peers, children with ASD performed less well with regard to the number of correct mental state target words.

Five assessment measures focused on short story narratives or computerized cartoons that examined a child's ability to interpret TOM components such as faux pas, sarcasm, hidden emotion, diverse desires, intentions, and social blunders (Kaland et al., 2008; Beaumont & Sotronoff, 2008; Scheeren et al., 2013; Peterson et al., 2012). Researchers were interested in participants' ability to perceive underlying intentions of characters from the stories and cartoons. *The Stories From Everyday Life* (Kaland et al., 2008) consisted of 26 contextually demanding stories that described actions and proceeding climax. Mental state and control questions were asked to participants between 10-20 years of age and a formal diagnosis of AS or PDD-NOS. This required them to infer mental states of the characters from the stories. Similarly, the *Strange Stories Task* was comprised of 24 stories read aloud to the participants between 10-20 years of age (Kaland et al., 2008). Results from the two assessment measures revealed similar results. The study group obtained lower overall scores on assessment tasks and required significantly more prompt questions to respond. Results from *The Strange Stories Task* revealed the children with AS or PDD-NOS gave more context-inappropriate mental state inferences than the TD group. As for the *Stories From Everyday Life*, children with AS and PDD-NOS had a significantly longer response time as compared to their TD peers.

The Animated Theory of Mind Inventory for Children (ATOMIC) consisted of 12 computerized cartoons, which were presented to children between the ages of 7-11.

Each cartoon was presented and followed by two multiple-choice questions. These questions aimed at examining the child's ability to infer complex emotions or were related to the characters' cognitions. Memory and central coherence questions were also included in the assessment to examine the child's ability to attend to tasks and to integrate information unrelated to TOM capacity. Results revealed children with AS performed significantly more poorly than their TD peers on TOM and memory questions. Because there was a correlation seen in performance on TOM and memory questions, researchers indicated poor attention skills may contribute to poor TOM task performance.

Scheeren et al. (2013) conducted a study using social stories to examine second-order false beliefs, display rules, double bluffs, faux pas, and sarcasm. Each advanced domain was examined through five different story narratives, which were read aloud to participants between ten and sixteen years of age. Stories were presented typed on paper, and the children were given the option to read aloud with the examiner. Following the story were physical and mental state questions. Results revealed the study group (i.e. AS, PDD-NOS, and HFASD) performed equally well on TOM stories as their TD peers. In other words, the Social Stories did not significantly distinguish the two groups from one another. Additionally, performance on tasks was positively correlated with the child's chronological age and verbal ability.

A similar assessment measure, referred to as the 6-Step TOM Scale (Peterson et al., 2012), aimed to measure diverse desires and beliefs, knowledge and access, false belief ability, hidden emotion, and sarcastic irony. This measure was closely adapted from Wellman and Liu (2004). A primary aim of researchers was to focus on the newly

created sarcastic irony task (SARC), which was considered important for "understanding of the social use of nonliteral language" (Peterson et al., 2012, pg. 474). An example provided involved a story about a little boy and girl going on a picnic on a sunny day. It begins to rain while they are one their picnic and their food is ruined. The young girl then says to the boy, "It's a lovely day for a picnic". This short story is read aloud to the child and she is presented with matching colored drawings. Following the presentation, questions are asked to the child to see if they understood the sarcasm present in the story (i.e. "Is it true what the girl said, Why did the girl say it was a lovely day for a picnic? Was the girl happy about the rain?"). Participants included within this study were between the ages of five and twelve years of age and were formally diagnosed with AS or AD. The remaining tasks also asked about the "focal contrast between a protagonist's inner psychological state and either reality or the mental state of another protagonist" (Peterson et al., 2012, pg. 473). Drawing and toys were used to facilitate comprehension of the presented stories. Results revealed that, across all 6 tasks, children with ASD were delayed in their performance compared to the TD group even after controlling for age and language ability.

CHAPTER 3: Intervention Aimed at Improving Theory of Mind Ability

A major goal of this review was to consider relevant research to support an understanding of the following question: Based on effective treatment and interventions, what can be concluded as the most appropriate interventions for children with autism spectrum disorders (ASD)?

This chapter will review research on the available published materials on interventions aimed at improving TOM in children with autism. This analysis will allow some conclusions about effective intervention techniques for children with autism.

Methods

In order to address the preceding question, the following search procedures and inclusion criteria were set to ascertain studies of particular relevance to TOM interventions for children with ASD.

Search Procedures.

Systematic searches were conducted in five electronic databases: Communication & Mass Media Complete (CMMC), MEDLINE, Cumulative Index to Nursing & Allied Health (CINAHL), and PsycINFO, and ERIC. In all databases, the following terms were inserted into the keyword field: a) *theory of mind intervention* and *children with autism*

Inclusion Criteria

To be included in this review, the article had to meet the following criteria:

(a) The studies included at least one participant with a formal diagnosis of autism, ASD, AS, HFASD, or PDD-NOS.

(b) The majority of participants in each intervention article had to be under the age of twelve. Of the twelve intervention articles reviewed, two contained participants out of the specific age range. For the purposes of this report, these results were interpreted with caution.

(d) The studies contained interventions aimed at improving TOM ability for children under the age of twelve. Five out of the twelve interventions also included training aimed at improving other areas of deficit in the child with HFASD (ex. social competence, social skills, executive functioning). This dual focus allowed for conclusions to be made about generalization to TOM ability and also the effectiveness of contrasting techniques.

(e) Intervention articles were published in peer-reviewed journals after the year 1999 (i.e. 2000-present).

The most common reasons for exclusion were as follows: 1) The methods of assessment was based on interviewing parents or using checklists (2 of these), 3) The methods of assessment was solely qualitative in nature (1 of these) or 4) The studies focused on a comparison between two assessment measures rather than the differences in abilities between typically developing and children with ASD (2 of these).

Results

Table 3.1 includes key components of the literature that met study criteria for inclusion. It summarizes the following: 1) pertinent information including the number and age of participants, diagnosis, and measures of IQ, 2) type and length of training or intervention (i.e. T & L), 3) setting in which therapy was carried out (i.e. S), 4) specific

skills targeted in the intervention, 5) teaching strategies used during therapy sessions, and 6) the outcomes of the interventions.

Three broad categories of interventions were reviewed. The first included interventions aimed solely at improving TOM skills. Therapy sessions included specific TOM tasks such as first and second-order mental state reasoning, recognition of emotion, perception, and reality vs fantasy. Researchers measured improvements in this area.

The second broad category included TOM and Social Skills training (i.e. TOM+SS). For these interventions, TOM was a portion of the focus of therapy. An example of a therapy session within this category might include recognizing facial expressions, taking an adequate number of turns in conversation, and using appropriate social behavior with peers.

The final category (i.e. SS) included studies aimed at improving other areas of social functioning (ex. executive functioning). Researchers conducting studies were interested in whether improving another area of social deficit would generalize to improvements in TOM. A summary of these interventions and subsequent outcomes are discussed below.

Table 3.1 Summary of Interventions Aimed at Improving Theory of Mind

Study	Child	T & L	S	Target Skills	Strategies	Results
		TOM				
Begeer et al. (2011)	N=40 Age= 8-13 AD, AS, PDD IQ>70	TOM NS=53	G	Listening, perception, fantasy vs reality, social situations, recognition of other's intentions and emotions	Second-order mental state reasoning; Direct TX and parent training; stimulated imagination and humor; hierarchical	Improved conceptual TOM skills, but did not improve their elementary understanding, empathetic skills, and social behavior

Table 3.1 (continued)

Wellman et al. (2002)	N=10 Age= 5-17 AD	TOM NS=30	I	Introducing thought-bubbles, tasks focused on what happens to objects when you cannot see them	Thought bubble training; 6 stages presented hierarchically; demonstration and feedback stages	Improved ability to pass false belief tasks, efficacy of picture-in-the-head teaching about mental states through the use of thought bubbles; enhanced performance on transfer tasks
Charlop-Christy & Danechvar (2003)	N=3 Ages= 6-9 AD	TOM NS=Varied	I	First-order perspective taking; problem solving strategies	5 perspective taking tasks were taught with video modeling and immediate review; adult model provided	Children improved their TOM ability and demonstrated stimulus and response generalization
Gould et al. (2011)	N=3 Ages= 3-5 ASD	TOM 11-18 mths (20 hrs per week)	I	Basic perspective taking skills (i.e. identifying what another person can see during table-top tasks with two-dimensional stimuli)	Multiple exemplar training; Stimulus cards and therapist instruction using prompt-fading; generalization probes	All children demonstrated consistent generalization to novel tasks, but not to natural environments
Paynter & Peterson (2013)	N=24 Age= 4.6-12.25 ASD	TOM NS=varied	I	5 training stages addressing TOM concepts (Stages 1-5 same as Wellman et al. (2002), Stage 6: people have different thought bubbles depending on what they see)	Thought bubble training; demonstration & feedback stages closely followed Wellman et al. (2002)	Significant improvements were made by trained children; demonstrated generalization to novel TOM tasks
Fisher & Happe (2005)	N=27 Age= 6.5-15.3 ASD, AS	TOM & EF NS=4-10	I	One group was trained on Theory of Mind and another group was trained on Executive Functioning (EF)	Visual models (i.e. dolls, illustrative stories, photo and reminder cards); TOM Training: beliefs are "photos in the head" EF Training: our "brain as a machine" analogy	TOM improved for both groups (i.e. TOM and EF); Generalization was demonstrated on TOM tasks; No improvement on EF for either group

Table 3.1 (continued)

		TOM+ SS				
Stichter et al. (2012)	N=20 Age=6.75-10.83AD, ASD, AS, PDD IQ>70	SCIE NS=20	G	5 activity based units: recognizing facial expressions, sharing ideas, turn taking, recognizing feelings and emotions of self & others, problem solving	Review of skills introduction of new skill, skill modeling, practice in structured and naturalistic activities, and review; free play & adult facilitation; teacher led positive behavior system	Children demonstrated significant improvements on problem solving skills, and parent perceptions of social abilities, and executive functioning; No improvement on direct TOM assessment measures
Beaumont & Sofronoff (2008)	N=49 AS Ages=7.5-11 IQ>85	JDTP NS=8	G	Aimed at enhancing complex emotion recognition, emotion regulation, and social interaction	Junior Detective Computer Game; Small group social skills training included visual and verbal modeling, role-play, and group discussion; parent training and teacher handouts	Improved overall social skills and social functioning (per parent report); No improvement on emotion recognition assessment measures but some improvement made on emotion recognition tasks; no generalization
Feng et al. (2008)	N=1 Age=11 AD IQ=85	TOM NS=61	G & I	Entry level TOM, emotional expression, advanced level TOM, and conversational interactions; identification of emotion, basic beliefs, first and second-order false beliefs	TOM + Social Skill units; hierarchical; animated presentation, performance feedback, verbal prompting, role-play, student sharing, scripts, and generalization tasks	Participants appropriate social interactions increased substantially across settings; improved TOM test scores; parent, teachers, and peers responded positively to intervention
		SS				
Chin & Bernard-Opitz (2000)	N=3 Ages=5.11-7.9 HFASD	CST NS=10	I	Making a conversation, turn-taking in conversation, listening, maintaining a topic, and changing topic	Puppet story time, role-play, practice skills with trainer	Children increased the amount of shared interest during conversation and appropriate responses; False belief performance did not improve

Table 3.1 (continued)

Baumin ger-Zviely et al. (2013)	N=22 ASD Age=9. 3 IQ>70	CTI & CBT NS=6	G	Social Skill Collaboration & Social Conversation; Computer programs included in intervention: "Join-in" and "No-Problem"	Computerized social vignettes: joint performance, negotiating, and mutual planning; Social conversation: initiating, maintaining and ending conversation	Improved total score of social engagement; Improved socio-cognitive measures; TOM partially improved (i.e. children could decide between truth and lies but could not justify why)
William s et al. (2012)	N=55 Ages=4 -7 AD IQ>47	ETP 4 wks	G	*Transporters* DVD designed to teach emotion recognition skills was shown to children	Video training	Improved ability to recognize anger, but no generalization to TOM or social skills; poor maintenance

Individual (I); Group (G); Number of participants (N); Number of Sessions (NS); Age (A); Intelligence quotient (IO); Autism disorder (AD); Autism Spectrum Disorders (ASD); High functioning autism disorder (HFASD); Pervasive developmental disorder-not otherwise specified (PDD); Asperger syndrome (AS); Executive Functioning (EF)

Theory of Mind Interventions

During examination of intervention approaches for children with ASD, several distinct categories were noted. Of the total thirteen studies, six explicitly aimed to improve TOM ability. Tasks involved in these interventions were directly related to understanding others intentions, emotions, and beliefs. Five of the six studies yielded positive outcomes and generalization to novel tasks. The remaining three studies reported variable performance outcomes.

The second group of interventions incorporated TOM tasks into a larger social skills training program. This category consisted of three different interventions focused

on improving social competence and conversational skills. Regardless of the total number of skills taught, a portion of all the tasks explicitly aimed to improve TOM. One out of the three studies revealed significant improvement in TOM capacity. While the remaining two studies showed improved social skills, TOM capacity remained constant.

The final category of interventions included social skills training without TOM tasks. Researchers were interested in whether trained social skills would generalize to improved TOM abilities. As such, they measured TOM as a collateral outcome. Out of all categories (i.e. TOM Training, Social Skills and TOM training, and Social Skill training), social skill training demonstrated the least amount of improvement in TOM capacity. All three studies reviewed within this category showed little or no improvement, indicating generalization of TOM skills is not likely.

Below is a summary of the key elements of each intervention, outcomes/results, and the degree of generalization to novel tasks or environments.

Theory of Mind Training

Six out of the thirteen studies measured TOM based on explicit training (Begeer, et al., 2011; Wellman et al., 2004; Charlop-Christy & Danechvar, 2003; Gould, Tarbox, Hora, Noone, & Bergstrom, 2011; Paynter & Peterson, 2013; Fisher & Happe, 2005). Across all of the interventions, participants were between the ages of three and seventeen.

Of all studies reviewed within this category, Gould et al. (2011) provided participants between 3 and 5 year of age the most time intensive training working on basic perspective taking skills. Two dimensional photo stimulus cards were used to teach

the participants what people see. Results were mixed: Children were able to generalize their learned skills to other similar tabletop tasks, but not to real life environments. Children were able to improve in the areas that were explicitly taught to them.

Another long term intervention approach, conducted by Beeger et al. (2011), aimed to train participant's *conceptual* understanding of TOM and emotion, self reported empathy, and parent reported social skills. While participants, aged between 8 and 13 years of age, improved on their ability to understand beliefs and false beliefs, parents reported this improvement was confined to conceptual abilities rather than real-life skills. Further, empathetic understanding and social skills remained unchanged. Similar to Gould et al. (2011), children demonstrated the ability to improve in the areas that were explicitly taught to them.

Wellman et al. (2002) and Paynter et al. (2013) demonstrated more promising results by using "thought bubble" training to a group of children between five and seventeen years of age. Sessions focused on teaching participants that thoughts are like pictures-in-the-head. Using cardboard cutouts (i.e. Sally-Anne figures) and attached thought bubbles, trainers were able to progress through a hierarchy of increasingly complex stages related to thoughts of others. For Wellman et al. (2002) and Paynter et al. (2013) improvement was observed during post testing, generalization was seen during novel TOM tasks, and measurable improvement was noted in the understanding of thoughts rather than just understanding of behavior. Similar results were found for Fisher & Happe (2005) through the use of visual models (ex. dolls, photo cards). Trainers taught participants between the ages of 6 and 15 years of age that beliefs are like "photos

in the head" during individual, short-term therapy sessions. Improvement was measured on TOM tasks and also to untrained novel stimulus.

Charlop-Christy & Danechvar (2003) incorporated video modeling into training five, first-order perspective taking tasks. Three children took part in the intervention who were between six and nine years old. After each video was shown twice, trainers immediately reviewed and provided participants with an adult model. Although all participants showed stimulus and response generalization, only two of the three participants experienced generalization to untrained tasks, novel tasks.

Although results were mixed, all studies suggested that participants improve in TOM ability. The degree to which this change was seen varied from study to study, with the most positive outcomes being when participants were presented with visual models and aids (Wellman et al., 2002; Paynter & Peterson., 2013; Fisher & Happe, 2005). Furthermore, these interventions presented tasks in a hierarchical manner, incorporated the use of demonstration, provided participants with verbal feedback, and conducted at least a portion of the training individually with participants.

Theory of Mind & Social Skills Training

The second broad category interventions incorporated TOM and social skill training together (Beaumont & Sofronoff, 2008; Feng, Lo, Tsai, & Cartledge, 2008; Stichter, O'Conner, Herzog, Lierheimer, & McGhee, 2012). Participants across all interventions in this category were between six and eleven years of age. All of the training programs took place with small groups and lasted between a total of eight and

thirty-two sessions. For Feng et al. (2008) and Stichter et al. (2012), TOM and social skill units were presented in a hierarchical manner and included tasks such as emotional expression and recognition, turn taking/sharing, and recognizing the feelings and emotions of yourself and others. Common teaching strategies included role-play practice and skill modeling. Stichter et al. (2012) incorporated the concept, "Rules of the Road" into the Social Competence Intervention, which was presented to the participants before sessions. This was a critical piece to intervention and involved instructing participants between the ages of six and 11 years of age on greetings in social interactions, making appropriate eye contact, and acknowledging initiations of others. Stichter et al. (2012) reported significant improvement on problem solving abilities, social skills, and executive functioning. In regards to TOM measures, first-order tasks remained stable from pre to post intervention and participants actually experienced a regression on second-order false beliefs. In contrast to this performance, participants demonstrated improvement in their ability to recognize social mistakes during Faux pas tasks.

Feng et al. (2008) provided individual and group therapy to one eleven-year-old participant, which allowed for personalized target skills to be addressed. Unique from other interventions in this category, tasks were presented using animation, teaching scripts guided sessions, and generalization tasks were carried out to increase the likelihood of carryover. This involved naturalistic practice of skills in the classroom setting. Drastic improvements were observed on all of the eight learner outcomes (i.e. desire-based belief, basic beliefs, emotion expression, anger control, first and second-

order false belief, greeting, and needs expression). These results were maintained during follow-up conditions and generalization was noted.

The *Junior Detective Training Program* (JDTP) aimed at enhancing complex emotion recognition (i.e. guilt, embarrassment, suspicion, and teasing), emotion regulation, and social interaction for children between the ages of 7 and eleven. (Beaumont & Sofronoff, 2008). Therapy was carried out in small groups and was mainly centered on the *Junior Detective Computer Game*, which taught all social skills. To ensure carryover of these skills, small group sessions reiterated computer game content and allowed the children to practice emotion recognition and social skills. Results indicated improved social functioning that was maintained five months post-intervention. Emotion recognition measures, on the other hand, did not show improvement as a result of the intervention.

Effects of Socials Skills Training on TOM

The final category of interventions included training aimed solely on social skills training (Chin & Bernard-Opitz , 2000; Bauminger-Zviely, Eden, Zancanaro, Weiss, & Gal, 2013; Williams, Gray, & Tonge, 2012). Participants within this category of interventions fell between the ages of five and nine.

Without directly targeting tasks specific to TOM, researchers wanted to see if effects of social skills training would have any impact on a child's ability to take on the perspective of others. Chin & Bernard-Opitz (2000) conducted Conversational Skills Training (CST), which included making a conversation, turn-taking in conversation, and

listening, maintaining, and changing a topic. All ten sessions were conducted in the participant's home, and visual models (i.e. puppets) and role-play were the major components used when teaching specific tasks. Results showed that while children did improve on their ability to carry on a successful conversation, their performance on false belief tasks did not change. Thus, generalization to TOM improvement was not seen.

Bauminger-Zviely et al. (2013) conducted a Collaborative Technology Intervention (CTI) incorporating the use of Cognitive Behavioral Therapy (CBT). Similar to Chin & Bernard-Opitz (2000), researchers were interested in the indirect effects this training would have on TOM skills. Computer programming was a major component of the intervention, which provided participants with social vignettes focused on joint attention, peer negotiations, mutual planning, and initiating and maintaining a conversation. While there was notable improvement in the overall social engagement and socio-cognitive measures (i.e. increased explanations of collaborative acts, social conversation, and social solutions) as a result of the intervention, minimal improvement was seen in regards to TOM. As a result of treatment, participants were able to distinguish the difference between truth and lies, but when asked to provide related justifications and explanations they were unable to give adequate responses. It was concluded that generalization to TOM ability was little to none.

In very similar nature to Collaborative Technology Intervention, Williams et al. (2012) incorporated the use of technology into therapy. For four weeks, children participated in an Emotion Training Program (ETP), wherein they watched videos intended to teach basic emotion recognition skills. While children did improve on their

ability to identify and match expressions of a few basic emotions (i.e. anger) post-treatment, it was not maintained during follow-up testing. Furthermore, there was no generalization to improvements in TOM skills. As a result, the Emotion Training Program provided limited benefits not only for TOM skills, but also for general improvement in emotion recognition.

CHAPTER 4: Discussion

In order to better understand social perceptions of children with ASD, a meta-analysis of research studies that met inclusion criteria for TOM was conducted. Thirteen articles examined assessment of TOM abilities of varying degrees of complexity. Overall, results indicate that children with ASD perform less well than their typically developing peers. Although variable, across the majority of tasks, both first and second-order false belief tasks were able to discriminate between ASD and typically developing child populations.

In addition to a review of assessment literature, an evaluation of published reviews of available TOM interventions was also conducted. In total, twelve studies were examined in order to pick out recurring and effective key components across different articles. Results indicate that improvements in TOM capacities are possible. The most efficient way to target TOM seems to be in an explicit manner that is both motivating and salient to the child. Interestingly, results showed no generalization of TOM skills when social skills are taught alone. Implications of these findings are further discussed below.

Social Perception of Children with Autism Spectrum Disorders

A major goal of this review was to answer the following question: Based on the available assessment research examining theory of mind deficits, how do children with autism spectrum disorders (ASD) socially perceive their peers?

In order to answer this question, a closer examination into what TOM assessments measured and how children with ASD compared to typically developing peers was analyzed. A common theme noted across TOM assessment tasks included measurement of a child's ability to understand another's thoughts, feelings, or emotions. Although there were varying degrees of complexity, this held true for first and second-order false belief tasks.

Examining TOM assessments from birth to age twelve revealed that, on the whole, children with ASD performed less well on tasks as compared to their typically developing peers. Although children with ASD were delayed in areas relevant to TOM (eg. false-belief, emotion recognition, etc.), a complete lack of TOM abilities was rarely observed in participants. Furthermore, the ability to pass TOM tasks was correlated with age; as children developed, so did their ability to pass increasingly complex tasks. This brings about a critical element relevant to TOM development; abilities seem to be *delayed* rather than lacking all together. While a slower trajectory of growth undoubtedly presents social challenges for children with ASD in school and home environments, it should be promising for parents and families to know that change takes place naturally. This is not to suggest that area of deficit should remain untreated; rather, assessment and intervention should be tailored to the individual and begin where he/she is developmentally. The major goal for professionals assessing and treating this population should be to try and close the gap currently existing for children with ASD.

An examination of the available TOM assessments revealed that false belief tasks measure how a child perceives another person. From a broad perspective, these social

judgments were more egocentric in nature for the child with ASD (Beeger et al., 2013), and contained more context inappropriate responses (Kaland et al., 2008) when compared to the typically developing participants. It is possible that measurable deficits of this nature result from children basing their social judgments on personal experience rather than typical social norms (Loveland et al., 2001). As such, children with ASD may unintentionally violate social norms while in one-on-one conversation with a peer. This undoubtedly impacts a child in a social sphere, especially in an education environment where social interactions and learning are closely intertwined.

Several researchers also gave special consideration to *attention and autism*. As demonstrated by Kaland et al. (2008), children with ASD needed more prompting in order to answer questions on the Strange Stories task and on the Stories from Everyday Life task. Additionally, Beaumont & Sotronoff (2008) showed that children with ASD answered poorly on memory questions compared to TD peers. Participants in this study also had trouble with real life gaze information. These results suggest that attention may impact a child's ability to attend to specific tasks. This undoubtedly carries over to real-life situation, particularly during conversational and one-on-one interactions. The ability to attend to and maintain conversation may be especially challenging when added distractions (i.e. television, iPad, other conversations, etc.) are present.

To better understand how social perception and theory of mind go hand in hand, consider the following example:

During free-play time in an inclusion-based classroom with twenty typically developing kindergarteners, Aden is searching for his favorite toy. Aden is a child

diagnosed with ASD, and presents with moderate to severe behaviors, especially when having to negotiate the sharing of toys with peers. Naturally, this is the most challenging time of the day for him. Aden sees his classmate Ben with his favorite toy race car. Instead of verbally asking to have a turn, Aden becomes visibly upset and throws himself on the floor in front of Ben. His teacher knows it's not because he is lacking the expressive language abilities to ask for a turn with the toy car, so she doesn't understand why he has such difficulty with this task. When considering many of the first-order assessment tasks (ex. Sally-Anne, sandbox task, seeing is knowing task, etc.), some conclusion can be made as to what might be going on with Aden. If Aden is in fact lacking the very basic TOM understanding, then this means he genuinely believes that his peer holds the same privileged knowledge that he does, which is: "I should have that race car right now." We know some children with ASD respond on TOM tasks in a more egocentric or biased way, meaning they believe others hold the same knowledge, thoughts, or desires as their own. In this case, it would make sense that Aden doesn't understand he needs to verbally explain his desire to have the toy because he thinks Ben already knows. Taking this example a step further, we also know that children with ASD perform less well than typically developing peers when predicting emotions from the eye region. Even if Aden looked at the child holding the toy, who is likely showing some signs of distress, there is a good chance he would not be able to discern how he was making his classmate feel by acting out. While this example is simple and surely doesn't adequately describe all children with ASD, it demonstrates how deficits in theory of mind can negatively impact children in a social setting.

Limitations of TOM Assessments

Although the majority of assessment measures have been shown to successfully distinguish between children with ASD and their typically developing peers, it is important to consider some apparent weaknesses that might have an impact on performance outcomes.

The most obvious weakness deals with presentation of assessment tasks. When asking a child to look at a two-dimensional piece of stimulus and decipher the hidden meaning behind it (i.e. thoughts, beliefs, or intentions of the characters on the page), several problems can arise. First, children with ASD may not have the required motivation to attend to tasks of this nature. When tasks are lengthy in addition to being complex in nature, a child may not provide his/her best answers. A second issue with two-dimensional stimuli is how performance translates to real-life scenarios. For example, although Beeger et al. (2012) aimed to create a task that would detect a more subtle egocentric bias, the apparent weakness is the lack of real-life applicability. Children were tested on their belief of the location of an object buried within a sandbox. However, the sandbox was a color drawing and the 'object' was indicated by an 'X'. For children with ASD who already have challenges picking up on subtleties this may not translate effectively, and in turn, may not accurately test a child's true abilities.

Another limitation with TOM assessments is that there are currently very few tasks for children under the age of four. As revealed by the literature review, no participants were under four years. This presents a problem for early identification of ASD. Because

TOM is thought to be a unique feature to those with ASD, it would be extremely beneficial to have effective assessment measures available for the younger population.

Ceiling effects during testing is another limitation to consider. During the Smarties task (Van Buijsen et al. 2011) and SERT (Peterson & Slaughter, 2009) ceilings were either reached or nearly reached for all of the participants, which made it difficult to distinguish performance across populations. Furthermore, it lessened the degree to which real life events could be represented in a task. This reveals a need for assessment tasks that have a broad enough spectrum to appropriately detect deficits across a broad population. This is mainly due to the fact that TOM deficits vary greatly between individuals so ceilings should be high enough to encompass expansive set of strengths and weaknesses.

Many assessments are heavily language based; considering the first-order false belief tasks, each required participants answer 'wh' questions. Answering questions such as this requires both receptive and expressive language abilities. Thus, performance outcomes are undoubtedly impacted by language abilities. While there is not a clear solution to this issue, it does warrant a discussion. An important question should be considered: should researchers attempt to remove language from TOM assessments? The role of language in TOM development is particularly relevant to this discussion. Mental states, such as "I think" or "I know", are unobservable (Miller, 2006). This presents a unique challenge for children in the early stages of acquisition; this domain of learning may be more ambiguous than acquiring vocabulary that can be accompanied by actual objects or actions (i.e. ball, horse, jump, sit, etc.). Because language is a major

component of TOM acquisition and development, it seems that language embedded in assessment tasks would be appropriate. On the other hand, if a child's language abilities fall short in either expressive or receptive domains, this has the potential to unintentionally impact TOM performance.

Interestingly, several of the intervention articles reviewed discussed potential weaknesses of TOM assessment measures (Chin & Bernard-Opitz, 2000, Stichter et al., 2012). Researchers suggested that the assessment measures utilized for measuring pre and post-abilities may not adequately measure the change seen as a result of the intervention. Stichter et al. (2012) suggested TOM assessments are more "static" in nature and do not measure complex skills. Similarly, Chin & Bernard-Opitz (2000) used assessments to measure pre and post abilities but no improvements were observed. Researchers suggested this was not a result of poor intervention; rather, it was the fact that TOM is a complex construct. As a result, real life theory of mind application may require different facets of the construct that are not measured by TOM tasks. Scheeren et al. (2013) similarly suggested that subtle real-life TOM deficits are not being detected through TOM assessment batteries.

While assessments have been shown to detect differences in performance between children with ASD as compared to TD peers, the question remains: do TOM assessment measures detect change in these domains *reliably*? Based on the literature reviewed, growth is still needed for reliable measures that consistently measure TOM capacity.

Interventions Aimed at Improving Theory of Mind

A major goal of this review is to answer the following question: Based on effective treatment and interventions, what can be concluded as the most appropriate interventions for children with autism spectrum disorders (ASD)?

Taking on another person's perspective is difficult for even a typically developing child. Learning how to share, for example, requires a child to understand that giving up a toy has the potential to make another child happy. This taps into the most basic first-order TOM understanding. For a child with ASD, mastering skills of this nature are often the most challenging.

Based on the available literature, TOM training has shown to be effective when TOM was either explicitly taught or when it was incorporated into a larger social skills curriculum. On the contrary, no collateral effects on TOM were demonstrated when other areas were trained such as emotion training or conversation skills (Bauminger-Zviely et al., 2013; Chin & Bernard-Opitz, 2000; Williams et al. 2012). The one exception to this was noted during executive functioning training; generalization to TOM improvement was noted (Fisher & Happe, 2005). More than likely, this was due to executive functioning and theory of mind tasks being very similar in nature. From these results, it was concluded that generalization of TOM skills is not likely, and therefore, should be explicitly taught to children with ASD.

As previously discussed, there is a broad variation of TOM abilities that exist, even amongst children in the same population. As a result, the most beneficial and effective interventions seem to be those that are tailored to the individual. Feng et al.

(2008) demonstrated the most effective use of this method, likely because researchers had only one participant receiving treatment. This allowed for goals to be uniquely tailored to the child, particular to his specific needs. Considering the complex nature of TOM, creating unique goals for each child is key for an individual who presents with deficits in this area. Therapists working with this population should start where each child is developmentally and work up from there in a hierarchical manner. This seems to be the most effective way to close the currently existing gap in TOM deficits. For example, if a child with ASD demonstrates little to no TOM capacity, then basic precursors such as joint attention, use of gestures and mental state terms (i.e. think, know, want), pretend play, appreciation of intentionality, and recognition of differing perspectives (Miller, 2006) should be the focus of therapy. Working up from there would be the most natural progression, tackling basic first-order false belief tasks targeting goals relative to manipulating tangible objects and/or actions. Goal should continually increase in a hierarchal manner as the child demonstrates an increasingly complex awareness of others thought, feelings, and beliefs. Much like other speech and language therapy, it is important that a child master the most basic forms of TOM before more complex forms are taught.

Considering tailored interventions are often the most time intensive and costly, it is important that the specific tasks targeted are also the most effective. After reviewing the literature, two explicit teaching strategies aimed at improving TOM skills resulted in the most positive outcomes. These included 1) the use of visual aids, and 2) practice within a naturalistic environment. Visual aids included items such as thought-bubbles,

stimulus cards, videos, and computer animations. Thought-bubble training revealed generalization to post-performance and children were able to make improvements answering questions about other thoughts (Wellman et al., 2002). Training of this nature seems to be not only an effective and motivating intervention strategy for children with ASD, but the visual support may provide a method of compensation for children lacking in TOM. Computer animation was also utilized in many of the intervention approaches, and while it did prove to be motivating, it was only shown to be effective when incorporated with real-life naturalistic practice. Thus, computer programming and animation should be utilized appropriately and as a tool to teach skills. It should never be the main component to an intervention; rather, it should be incorporated with other teaching strategies such as role-play. Similar conclusions can be drawn with the use of stimulus cards (Gould et al. 2011).

It is also important to consider the level practicality in terms of administration of visual aids in treatment. Although variability exists, it seems to be fairly easy and straightforward therapy technique to administer. This particular teaching strategy would be helpful for therapists with large caseloads with little time to plan sessions or for teachers providing therapy to children in the classroom.

The second effective teaching strategy focused on placing learned skills into a natural environment to aid in carryover of skills. As one might imagine, it is important that TOM skills carryover, or *generalize* to real-life scenarios. In fact, this is the single most important piece to any intervention for children with ASD. Practice in a natural setting increase the likelihood that generalization will take place and treatment effects

will be maintained. Within the articles reviewed, researchers utilized natural settings in order to carry out demonstrations, provide feedback (Feng et al., 2008; Paynter & Peterson, 2013; Stichter et al., 2012; Wellman et al. 2002), carry out group discussions (Beaumont & Sofronoff, 2008), practice role-play scenarios, provide teaching scripts, facilitate student sharing, and maintain generalization tasks (Feng et al., 2008). Additionally, practice within a natural setting simply allows a child exposure to social interactions. Because TOM is so complex in nature, it is imperative that skills be explicitly taught within environments that translate and make sense for that child.

Another important consideration to address is language and the intrinsic tie it has to TOM. As previously discussed in regards to TOM assessment, it is difficult to remove language from the equation; the same goes for TOM intervention. For children with ASD, language and social pragmatics are often major areas of focus in treatment. Long and short-term goals, which drive therapy sessions, are centered on these areas. Mastering the use of pronouns, for example, is as task that requires both TOM and language skills. As a result, SLPs are often charged with the responsibility to create developmentally appropriate goals that are applicable across both domains.

While there doesn't seem to be one intervention that is better than the rest, it does seem that several broad conclusions can be made in regards to effective TOM treatment for children with ASD. First, any intervention should incorporate tasks into real life scenarios that are both applicable and salient to the particular child receiving therapy. In order for the child to carry skills into their daily lives, tasks should be relevant and applicable to that child.

From the perspective of a professional required to set specific goals and carry out therapy with this population, it is often a challenge to know where to begin. The following is a simplified example of how TOM intervention might look for a child struggling in this area:

A mother reports her six year old child named Fred is having a particularly challenging time when interacting with his younger sister after school. The mother thinks the major problem stems from Fred not being able to share toys with his sister. He was diagnosed with PDD-NOS three years prior and has been seeking treatment for him ever since. The new therapist working with Fred, who has administered several different TOM assessments, knows that Fred is lacking in his basic understanding of first-order false belief. The therapist creates a session focusing on role-play between Fred and his younger sister (the therapist takes the role of the sister). As they practice playing in a natural setting, the therapist targets how she is feeling when she wants the object that Fred has. She incorporates visual aids (i.e. thought bubbles, emotion cards) so that Fred has added support during sessions. Fred can express himself and receive constructive feedback at the same time. This task aims to teach Fred that people have thoughts different from his own and that his actions, in this case sharing, can affect those around him. As sessions progress the therapist can move up the hierarchy to increasingly more complex TOM tasks.

Limitations of Intervention Techniques

While many of the interventions have shown to be effective in improving TOM capacity, the apparent weaknesses should be discussed for future clinicians providing intervention to this growing population. Theory of mind is extremely complex in nature. It is difficult to pinpoint the exact areas of deficit experienced by a particular child. Furthermore, TOM deficits manifest in vastly different ways across children, even those belonging to the same population. This presents a challenge to professionals working in this area. It is also possible that assessment measures are not providing a complete picture of a child's true ability, which makes it particularly difficult to know what areas are most in need of intervention.

There was an apparent lack of real-life, naturalistic practice during training on techniques. For example, Gould et al. (2011) utilized stimulus cards during tabletop tasks to guide training of basic TOM skills. Two-dimensional training of this nature did not provide the child with a good representation of real-life perspective taking. Because generalization was seen to novel tabletop tasks but not to real life real life environments, the participants were capable of learning what was explicitly taught to them. Similarly, Beeger et al. (2011) carried out intervention that focused on conceptual rather than practical TOM skills. Results showed there was no improvement in TOM skills in a natural environment, likely because of the lack of real-life practice during the intervention. This outcome is further confirmed by the fact that conceptual TOM skills did improve, which demonstrates children are capable of improving in this domain.

However, results indicate value in two-dimensional, visual models (Wellman et al., 2002; Paynter et al., 2012; Fisher & Happe, 2005). Each intervention approach that utilized these materials did so in addition to other tasks. For example, Wellman et al. (2002) utilized thought-bubbles (i.e. two-dimensional training) in addition to demonstration and feedback stages. Fisher & Happe (2005) incorporated dolls and illustrative stories into therapy. From these results it is possible to conclude the following: Two-dimensional training should be used in addition to other salient tasks such as clinician facilitated one-on-one peer conversation. Furthermore, training skills should be taught within a rich and meaningful context.

The most apparent weakness was the overall lack of generalization of trained skills to natural, real-life environments. Although carry-over was seen to novel tasks during several post-measurements, only one study (Feng et al., 2008) reported generalization to natural environments. Several studies were interested in pre and post-performance, but did not highlight generalization to natural settings. Additionally, the success of certain intervention approaches was measured based on novel tasks specifically created for the intervention. Although these measures are important, the lack of focus on generalization presents a major problem in the area of TOM intervention. These deficits can be attributed to one of two things: 1) children are unable to learn the adequate skills, or 2) there is a deficiency present in interventions techniques in terms of real-life applicability. Based on the research reviewed we know children are capable of learning in areas specific to TOM. As such, it seems that the interventions may be deficient in their attention to generalization. Increased focus to this area is a critical

element to improving TOM abilities and ultimately closing the gap for children with ASD.

Practical Applications

Practical applications should be considered relevant to assessment and intervention of TOM skills for children with ASD. Based on what is known in regards to the development of TOM, change appears to occur naturally as children grow. For this reason, it is imperative that professionals working with this population frequently administer TOM assessment tasks to accurately document strengths and weaknesses of the clients they are working with. Ongoing assessment ensures that the evolving TOM capacity is well documented and better treated.

In addition it is important that multiple TOM tasks are administered to one particular individual when determining strengths and weaknesses. Each assessment reviewed in this report measured theory of mind using different elements, or key components. Although different methods were used to achieve their goal, the Sally-Anne task, Smarties task, and the Charlie task aimed to measure the same basic TOM understanding (Van Buijsen et al., 2011). Similarly, the ATOMIC and Social Stories tasks aimed to measure second-order false belief understanding using distinct items (Beaumont & Sotronoff, 2008; Scheeren et al., 2013). ATOMIC targeted complex mental states through a series of questions pertaining to a character's cognition. Although Social Stories also used story narratives, they targeted children's understanding of sarcasm, faux pas, and double bluffs. Therefore, results from one assessment

undoubtedly revealed unique results as compared to another assessment. When assessing a new client, an SLP will want to administer a range of assessments. Hopefully, some commonalities will be seen across assessments and provide a solid picture of the child's abilities particular to TOM.

In regard to intervention, it appears that explicit training using visual models in a natural environment are the most effective teaching strategies. There was a consensus across studies reviewed that improvement in TOM rarely takes place without explicit training It is for this reason that children with ASD who are experiencing deficits in this area should receive specialized training and support. Research has also suggested that specialized educational settings with smaller ratio classes may lead to more positive (Beckman & Kohl, 1987) and increased (King, 2004) social interactions for children with ASD.

Future Research

With the steady increase in the number of individuals diagnosed with ASD brings the need for the maximally efficient and accurate assessment measures. TOM assessment task performance should be consistent with actual performance in real-life settings, which is a difficult task to accomplish. TOM assessments should be geared toward measuring abilities within a natural environment to capture a child's true abilities.

It is surprising that generalization into natural environments was not a core feature of intervention studies. Future research should investigate different techniques for theory of mind treatment that positively impacts and carries over to natural settings. In

particular, there is a need for studies exploring the use of combined social skills and theory of mind treatment that focuses on the use of visuals, technology, modeling, role-play, and naturalistic practice. Further, a major focus of these interventions should be to effectively measure the carry-over of skills to new and varying environments.

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