

The Fundamental Disconnect Between Understanding of Autism Spectrum Disorder

Cognition: Implications of Empathy:

A Meta Synthesis

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Abstract

This meta-synthesis reviews literature on the Autism Spectrum Disorder (ASD) in relationship with empathy. Specific areas addressed within this meta-synthesis include perspective taking, Theory of Mind, affective vs. cognitive empathy, mirror neurons, imitation/mimicry all in how it relates to those with ASD and their understandings to those typically developing. This meta-synthesis addresses those with high-functioning ASD more so than those who are lower functioning as research and literature did not have a significant amount of information on those lower functioning. The goal is to provide a better understanding of the disconnect that we share from one to another.

1. Introduction

1.1. Background

Up until 2013, autistic disorder, Asperger's disorder, childhood disintegrative disorder, and the catch-all diagnoses of pervasive development disability not otherwise specified (PDD-NOS) were diagnosed separately by the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV-TR). In 2013 the American Psychiatric Association came out with the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), which major change classified those four disorders: autistic disorder, Asperger's disorder, childhood disintegrative disorder, and PDD-NOS as Autism Spectrum Disorder (ASD).

According to the DSM-5, a diagnosis of ASD requires: a) persistent deficits in social communication and social interaction, b) restricted, repetitive patterns of behavior, interests, or activities, c) Symptoms are present in early developmental times, d) Symptoms cause impairment in social, occupational, or other areas of important functioning, and e) the symptoms are not explained better by a different disability.

It is important to note that ASD has a spectrum of severity with those who are high-functioning ASD (often considered Asperger's Syndrome) to those who are low-functioning ASD requiring substantial support and may never be able to live and be completely independent. Table 2 represents the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5, 2013) breakdown for severity levels of ASD.

Table 2: Severity levels for Autism Spectrum Disorder

<u>Severity level</u>	<u>Social communication</u>	<u>Restricted, repetitive behaviors</u>
<p>Level 3 “Requiring very substantial support”</p>	<p>Severe deficits in verbal and nonverbal social communication skills cause severe impairments in functioning, very limited initiation of social interactions, and minimal response to social overtures from others. For example, a person with few words of intelligible speech who rarely initiates interaction and, when he or she does, makes unusual approaches to meet needs only and responds to only very direct social approaches.</p>	<p>Inflexibility of behavior, extreme difficulty coping with change, or other restricted/repetitive behaviors markedly interfere with functioning in all spheres. Great distress/difficulty changing focus or action.</p>
<p>Level 2 “Requiring substantial support”</p>	<p>Marked deficits in verbal and nonverbal social communication skills; social impairments apparent even with supports in place; limited initiation of social interactions; and reduced or abnormal responses to social overtures from others. For example, a person who speaks simple sentences, whose interaction is limited to narrow special interests, and who has markedly odd nonverbal communication.</p>	<p>Inflexibility of behavior, difficulty coping with change, or other restricted/repetitive behaviors appear frequently enough to be obvious to the casual observer and interfere with functioning in a variety of contexts. Distress and/or difficulty changing focus or action.</p>
<p>Level 1 “Requiring support”</p>	<p>Without supports in place, deficits in social communication cause noticeable impairments. Difficulty initiating social interactions, and clear examples of atypical and unsuccessful responses to</p>	<p>Inflexibility of behavior causes significant interference with functioning in one or more contexts. Difficulty switching between activities. Problems of</p>

	social overtures of others. May appear to have decrease interest in social interactions. For example, a person who is able to speak in full sentences and engages in communication but whose-to-and-fro conversation with others fails, and whose attempts to make friends are odd and typically unsuccessful.	organization and planning hamper independence.
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(DSM-5, P. 52)

According to the *Center for Disease Control* (2015) approximately 1 in 68 children have been identified with Autism Spectrum Disorder (ASD). It occurs across all socioeconomic, racial, and ethnic groups, and is five times more likely to be diagnosed in boys than in girls. ASD has been being diagnosed more than it ever has been. This may be in part to the broadened definition, or a more prevalence of the disability, and or a combination of the two.

Andrew Solomon (2012) points out, "... One of autism's core traits is lack of empathy..." (p. 238). Often times this is correlated to the social and communication deficits accompanying ASD. Empathy is a word that was invented by Titchener that was translated from the German word "Einfuhlung." It translates to mean "to project yourself into what you observe" (Titchener, 1909). It seems obvious that empathy is a trait of importance to help us understand and relate to one another more deeply. The book *Born For Love* by Szalavitz & Perry (2010) discusses why empathy is essential and endangered. In it they discuss that someone with autism's social regions in the brain are not damaged, but those with autism

lack the exposure necessary to social stimuli to learn how to empathize. They explain that the “social brain” is similar to that of a muscle and needs social experience to function.

When it comes to defining empathy most would probably define it as being able to feel what another person feels or being able to “put oneself into another person shoes.”

Baron-Cohen & Wheelwright (2004) have observed that empathy has been defined with an affective approach and a cognitive approach. An affective approach to empathy is defined as an observer’s emotional response to the affective state of another " (Baron-Cohen & Wheelwright, 2004). An example of this is you feel sad when you see another person’s sadness. The affective approach may also be referred to as emotional empathy.

A cognitive approach involves understanding another’s feelings. Cognitive processes are often referred to as perspective taking, “theory of mind,” and or role-taking. “Theory of mind” is being able to set aside your personal perspective and comprehend the attitude and or state of another (Leslie, 1987). In some instances the cognitive approach is purely cognitive in that there is no affective state (Baron-Cohen & Wheelwright, 2004). An example is that someone could assume that due to my absence at class, I would not know what occurred during class. With this idea comes the ability to predict. By taking into account my lack of attendance in class, it could be predicted that I was sick or slept in depending upon the time of the class and how well one person knew me.

Empathy is often times accompanied by the idea of mimicking and imitation. Chartrand & Bargh (1999) found a strong correlation between ones tendency to empathize and the amount of imitative behavior displayed. The more someone imitated the person the more a

person would be empathetic towards the other person. The results suggested that through imitation and mimicry, we can feel what other person feels.

Another idea is mirror neurons that are “neurons with motor properties in premotor and posterior parietal cortex that fire not only during action execution, but also while observing somebody else performing the same or similar action” (Iacoboni, 2009, p. 659). Mirror neurons are cells that fire when you do something. Salavitz and Perry (2010) use the example of when someone smiles, your mirror neuron cells will copy the pattern of activity you would experience if you were smiling, but you wouldn’t fully complete the muscle movement required to smile. Mirror neurons respond if you see someone cry or see another’s joy, etc. Mirror neurons are directly related to one’s ability to empathize.

1.2 Author’s experiences and beliefs

For most of my young adult life I have suffered like most Alaskans from the darkness of our winters. In previous years I have found myself in my undergraduate degree program crying for no particular reason in the middle of winter. I would all of a sudden break down and cry. I had to drop classes because I couldn’t attend or I couldn’t keep up with the demand of the course. What was happening? This was not me.

From my emotional hurdles, I learned how to seek professional help (primarily counseling services), advocate for myself, and how to be. I soon discovered how correlational seasons and family background in depression is. After speaking to my own family members on both my fathers and mothers side, I quickly became cognizant that depression runs on both sides of my family, and for me, it appeared to be primarily

seasonal. After two years of an onset of emotional hurdles, I learned how to slow down and be kind to myself. I learned that medication isn't always the best thing. I learned how to balance. More importantly, I learned how to not be depressed and what I had to do for myself to be the person that didn't have a chemical imbalance in the brain.

For me, it was as simple as becoming conscious of my own emotions and those around me, as well as eating healthy, exercising, getting outside every day, sleep, and having a balanced schedule where there was adequate me time. Some may choose medication, but for me, I didn't need it. I just needed to be aware of my own body and those around me. From this part of me I have learned I have an ability to empathize with those around me to the point that others emotions would become me and affect me in a negative way particularly if they were negative emotions. I learned how to disassociate their emotions from my own and distinguish when I needed to leave a particular situation. I learned how to take a more cognitive approach to empathy instead of a solely affective approach. It also means that I have to be conscious of the possible miss-interpretation of my deeper emotions, as they might not be realistic. More to the point I was able to use "theory of mind" to learn about others and myself.

Ever since I was a freshman in college I have known I wanted to work with others. From learning about myself and how I am capable of empathizing with others, I quickly became fascinated with those who have Autism Spectrum Disorder, particularly due to the fact that those who have ASD are said to lack empathy. I have a friend who is on the high functioning side of the spectrum whom I have known for a little over half a decade who I would argue does not lack empathy.

I will note that before I entered into the Masters in Special Education program I was unfamiliar with most disabilities. About the time I began to apply for the program I began to substitute throughout the Juneau School District. I took substitute positions that were mostly in Special Education. It wasn't until I joined the MAT program that I took a job as a part-time Para-educator in a 6th grade resource setting that I really began to understand the depth of disabilities.

Throughout my life I have had experiences with individuals with disabilities, but I was not able to discern their disability often times viewing the person as different. Quite frankly I was very ignorant to individuals with disabilities. It isn't something schools highlighted. In High School I learned about Black and White, minority vs. majority, but nothing about the minorities of those who have disabilities, particularly Autism. In my undergraduate program I learned a lot about art and psychology, but not a lot about specific individuals' disabilities. When culture is taught, it isn't the culture of disabilities, but rather the culture of Native Alaskans, or the culture of Japanese, or Chinese, or Eskimos, etc. We all have our own individualized culture that isn't one or the other, very reminiscent of Autism in the sense that it isn't black or white. One diagnosis is very different from another.

My experiences began as a Paraeducator in a 6th grade resource setting. One of the students I worked with had Autism. It didn't define him, but he lacked social awareness that other students seemed to possess, which severely impacted his ability in the class I assisted him in. It was not an ideal situation. The teacher appeared frustrated with him regularly, oftentimes calling him out in front of the class, which made this student very self-conscious, vulnerable, and upset. Oftentimes he appeared over-stimulated. At certain points this

student seemed to feel so much that he became overwhelmed and had to leave the classroom to take a break. What struck me was how observant and how emotional the student was. This student did not lack emotion. He lacked social awareness, but I question the understanding the teacher had of his abilities. I question the student's ability to relate to those around him. Did the student possess empathy or simply emotion? There were many other variables in this student's life that was not related to school, but affected school that I will not note.

After being in a 6th grade resource setting for a year, I have been privy this year work full-time as a Paraeducator in the Developmental Education Center (DEC) with students of low incidence disabilities that are included into the general education setting for roughly 30% of their day if not less (some more depending upon their level of disability). Several of the students in the program have Autism Spectrum Disorder. One of the students has challenges communicating. Regulating emotion is not something that comes naturally or easy. Oftentimes hitting one's head against the floor is how to get through a high intensity moment. I began to question the outbreaks of screaming, self-injurious behaviors, crying, bolting, etc, in that they may suggest that the student is either trying to communicate or experiences too much at once. What correlation does empathy and emotion play into it? Is the behavior linked? I question if the students aren't feeling more. Perhaps it is feeling and not empathy, but by understanding ASD empathy, is that one step closer to understanding and then to learning?

When I became depressed I internalized everything and pushed people important to me away because I didn't want my negative feelings to encompass them. I had a mindset that

how I was feeling would go away and get better. It did. I worked and grew to become a better version of myself. Bruce Perry talks about empathy and how it is learned from an early age. He explains, “Empathy underlies virtually everything that makes society work—like trust, altruism, collaboration, love, charity” (p.3 Perry). If empathy is something that is learned, can all people, including those with Autism learn how to empathize? Is the idea of mirror neurons, the idea of unconscious mimicking of another person through cells correlation to ASD?

Autism is a syndrome that has a spectrum. Perhaps those higher on the spectrum (in that they are higher functioning and more easily able to communicate and understood) are able to show empathy whereas someone who is low functioning (not easily understood) may not be able to empathize or show it in a way that is discernible. These are all ideas that I hope to explore.

With this meta-synthesis I hope to investigate the following research questions:

1. Can an individual with Autism Spectrum Disorder learn how to empathize both with an affective and cognitive approach? If so, to what degree?
2. What does research on mirror neurons suggest in relation to ASD and one's ability to empathize and or mimic with another person?
3. With what research suggests through findings on ASD and empathy and mirror neurons, can educators improve the outcomes for students with Autism Spectrum Disorder?
4. What discrepancies exist for high functioning vs. low functioning Autism and empathy? Is there a difference in mirror neurons?

My personal belief is that there are better outcomes for those with Autism Spectrum Disorder. I believe there is a disconnect in understanding those who have ASD. I hope that through the understanding of empathy in ASD individuals, professionals in education and the general public will have a greater knowledge of those with ASD that will enable positive interactions with a more empathetic approach.

I believe that those with Autism Spectrum Disorder are capable of learning how to empathize. Whether that is both with an affective approach and/or cognitively I believe will depend on the individuals' level of ASD in that there may be correlation to high functioning vs. low functioning ASD in their abilities to empathize.

1.3 Purpose of the meta-synthesis

This meta-synthesis focus is on individuals with Autism Spectrum Disorder has multiple purposes. The first purpose is to review literature on those individuals with ASD and their abilities to empathize in comparison to individuals without ASD. A second purpose is to review literature on ASD and other specifics closely linked and possibly a contributing factor with the ability to empathize such as Theory of Mind, perspective taking, mirror neurons, and imitation in comparison to those without ASD. Empathy is difficult to define and because of this, I feel it is important to look at these various topics, as the main purpose is to understand individuals with ASD more fully. A third purpose was to classify each article by publication type, to identify the research design, participants, and data sources of each research study, and to summarize the findings of each study. My final purpose in conducting this meta-synthesis was to identify significant themes in these articles, and to connect those themes to my own classroom experience (when that time occurs), in my

student teaching position, and in the community when teaching/interacting with students and peers with Autism Spectrum Disorder.

2. Methods

2.1. Selection criteria

The 27 journal articles included in this meta-synthesis met the following selection criteria:

1. The articles addressed issues related to Autism Spectrum Disorder and at least one of the following: empathy (cognitive and/or affective), Theory of Mind (ToM), mirror neurons, perspective taking, and imitation.
2. The articles were published between 1999 and 2015.

2.2. Search procedures

Database searches and ancestral searches were conducted to locate articles for this meta-synthesis.

2.2.1. Database searches

I conducted Boolean searches within the Educational Resources Information Center (ERIC, Ebscohost) using these specific search terms:

1. ("Empathy") AND ("Autism")
2. ("Theory of Mind") AND ("ASD")
3. ("Mirror Neurons") AND ("Autism")
4. ("Mirror Neurons") AND ("Empathy") AND ("Autism")
5. ("Autism") AND ("Imitation")
6. ("Autism") AND ("Cognitive Empathy")

These database searches yielded a total of 25 articles (Aoki, & et al., 2014; Auyeung, Wheelwright, Allison, Atkinson, Samarawickrema, & Baron-Cohen, 2009; Baron-Cohen & Wheelwright, 2004; Begeer, Gevers, Clifford, Verhoeve, Kat, Hoddenbach, & Boer, 2011; Bons, Broek, Scheepers, Herpers, Rommelse, & Buitelaar, 2012; Cook, & Bird, 2012; Deschamps, Been, & Matthys, 2014; Fan, Decety, Yang, Liu, & Cheng, 2010; Gu, Eilam-Stock, Zhou, Anagnostou, Kolevzon, Soorya, Hof, Friston, & Fan, 2015; Khor, Melvin, Reid, & Gray, 2014; Kimhi, Shoam-Kugelmas, Agam Ben-Artzi, Ben-Moshe, & Bauminger-Zviely, 2014; Lawson, Baron-Cohen, & Wheelwright, 2004; Losh, & Capps, 2006; Matthews et al., 2012; Mitrani, 2010; O’Nions, Sebastian, McCrory, Chantiluke, Happe, & Viding, 2014; Rueda, Fernandez-Berrocal, & Baron-Cohen, 2015; Scheeren, Koot, Mundy, Mous, & Begeer, 2013; Schwenck et al., 2012; Senland, & Higgins-D’Alessandro, 2013; Silliman, Diehl, Bahr, Hnath-Chisolm, Zenko, & Friedman, 2003; Smith, 2006; Sobel, Capps, & Gopnik, 2005; Wakabayashi, Baron-Cohen, Uchiyama, Yoshida, Kuroda, & Wheelwright, 2007; Young, Rogers, Hutman, Rozga, Sigman, & Ozonoff, 2011).

2.2.2. Ancestral searches

An ancestral search involves reviewing the reference lists of previously published works to locate literature relevant to one’s topic of interest (Welch, Brownell, & Sheridan, 1999). I conducted ancestral searches using the reference lists of the previously retrieved articles. These ancestral searches yielded 2 additional articles that met the selection criteria (Oberman, & Ramachandran, 2007; Oberman, Ramachandran, & Pineda, 2008).

2.3. Coding procedures

I used a coding form to categorize the information presented in each of the 27 articles. This coding form was based on: (a) publication type; (b) research design; (c) participants; (d) data sources; and (e) findings of the studies.

2.3.1. *Publication type*

Each journal article was evaluated and classified according to publication type (e.g., research study, theoretical work, descriptive work, opinion piece/position paper, guide, annotated bibliography, review of the literature). *Research studies* use formal research design to gather and/or analyze quantitative and/or qualitative data. *Theoretical works* use existing literature to analyze, expand, or further define a specific philosophical and/or theoretical assumption. *Descriptive works* describe phenomena and experiences, but do not disclose particular methods of attaining data. *Opinion pieces/position papers* explain, justify, or recommend a particular course of action based on the author's opinions and/or beliefs. *Guides* give instructions or advice explaining how practitioners might implement a particular agenda. An *annotated bibliography* is a list of cited works on a particular topic, followed by a descriptive paragraph describing, evaluating, or critiquing the source. *Reviews of the literature* critically analyze the published literature on a topic through summary, classification, and comparison.

2.3.2. *Research design*

Each empirical study was further classified by research design (i.e., quantitative, qualitative, mixed methods research). *Quantitative* research utilizes numbers to convey information. Instead of numbers, *qualitative* research uses language to explore issues and

phenomenon. *Mixed methods* research involves the use of both quantitative and qualitative methods to present information within a single study.

2.3.3. Participants, data sources, and findings

I identified the participants in each of the studies (e.g. an amount of male individuals with ASD, females and males with high-functioning ASD, children between the ages of 6-7, control participants typically developing, parents). I also identified the data sources that were analyzed for each study (e.g. interviews, observations, EEG recordings, survey). Additionally, I summarized the findings of each study (see Table 2).

3. Results

3.1 Publication type

I located 27 articles that met my selection criteria. The publication type of each article is located in Table 1. Twenty-two of the 27 articles (81%) included in this meta-synthesis were research studies (Aoki, & et al., 2014; Auyeung, Wheelwright, Allison, Atkinson, Samarawickrema, & Baron-Cohen, 2009; Baron-Cohen & Wheelwright, 2004; Begeer, Gevers, Clifford, Verhoeve, Kat, Hoddenbach, & Boer, 2011; Cook, & Bird, 2012; Deschapms, Been, & Matthys, 2014; Fan, Decety, Yang, Liu, & Cheng, 2010; Gu, Eilam-Stock, Zhou, Anagnostou, Kolevzon, Soorya, Hof, Friston, & Fan, 2015; Khor, Melvin, Reid, & Gray, 2014; Kimhi, Shoam-Kugelmas, Agam Ben-Artzi, Ben-Moshe, & Bauminger-Zviely, 2014; Lawson, Baron-Cohen, & Wheelwright, 2004; Losh, & Capps, 2006; Matthews et al., 2012; Oberman, Ramachandran, & Pineda, 2008; O’Nions, Sebastian, McCrory, Chantiluke, Happe, & Viding, 2014; Rueda, Fernandez-Berrocal, & Baron-Cohen, 2015; Scheeren, Koot, Mundy, Mous, &

Begeer, 2013; Schwenck et al., 2012; Senland, & Higgins-D'Alessandro, 2013; Silliman, Diehl, Bahr, Hnath-Chisolm, Zenko, & Friedman, 2003; Wakabayashi, Baron-Cohen, Uchiyama, Yoshida, Kuroda, & Wheelwright, 2007; Young, Rogers, Hutman, Rozga, Sigman, & Ozonoff, 2011). Four of the 27 articles (15%) were theoretical works (Matthews et al., 2012; Mitrani, 2010; Smith, 2006; Sobel, Capps, & Gopnik, 2005). One of the 27 articles (3.7%) were reviews of literature (Bons, Broek, Scheepers, Herpers, Rommelse, & Buitelaar, 2012).

Table 1

Author(s) & Year of Publication	Publication Type:
Aoki, & et al., 2014	Research Study
Auyeung, Wheelwright, Allison, Atkinson, Samarawickrema, & Baron-Cohen, 2009	Research Study
Baron-Cohen & Wheelwright, 2004	Research Study
Begeer, Gevers, Clifford, Verhoeve, Kat, Hoddenbach, & Boer, 2011	Research Study
Bons, Broek, Scheepers, Herpers, Rommelse, & Buitelaar, 2012	Review
Cook, & Bird, 2012	Research Study
Deschamps, Been, & Matthys, 2014	Research Study
Fan, Decety, Yang, Liu, & Cheng, 2010	Research Study
Gu, Eilam-Stock, Zhou, Anagnostou, Kolevzon, Soorya, Hof, Friston, & Fan, 2015	Research Study
Khor, Melvin, Reid, & Gray, 2014	Research Study
Kimhi, Shoam-Kugelmas, Agam Ben-Artzi, Ben-Moshe, & Bauminger-Zviely, 2014	Research Study
Lawson, Baron-Cohen, & Wheelwright, 2004	Research Study
Losh, & Capps, 2006	Research Study
Matthews et al., 2012	Research Study

Mitrani, 2010	Theoretical Work, Opinion Piece
Oberman, & Ramachandran, 2007	Theoretical Work
Oberman, Ramachandran, & Pineda, 2008	Research Study
O’Nions, Sebastian, McCrory, Chantiluke, Happe, & Viding, 2014	Research Study
Rueda, Fernandez-Berrocal, & Baron-Cohen, 2015	Research Study
Scheeren, Koot, Mundy, Mous, & Begeer, 2013	Research Study
Schwenck et al., 2012	Research Study
Senland, & Higgins-D’Alessandro, 2013	Research Study
Silliman, Diehl, Bahr, Hnath-Chisolm, Zenko, & Friedman, 2003	Research Study
Smith, 2006	Theoretical Work
Sobel, Capps, & Gopnik, 2005	Theoretical Work
Wakabayashi, Baron-Cohen, Uchiyama, Yoshida, Kuroda, & Wheelwright, 2007	Research Study
Young, Rogers, Hutman, Rozga, Sigman, & Ozonoff, 2011	Research Study

3.2. Research design, participants, data sources, and findings of the studies

As I previously mentioned, I located 22 research studies that met my selection criteria. (Aoki, & et al., 2014; Auyeung, Wheelwright, Allison, Atkinson, Samarawickrema, & Baron-Cohen, 2009; Baron-Cohen & Wheelwright, 2004; Begeer, Gevers, Clifford, Verhoeve, Kat, Hoddenbach, & Boer, 2011; Cook, & Bird, 2012; Deschapms, Been, & Matthys, 2014; Fan, Decety, Yang, Liu, & Cheng, 2010; Gu, Eilam-Stock, Zhou, Anagnostou, Kolevzon, Soorya, Hof, Friston, & Fan, 2015; Khor, Melvin, Reid, & Gray, 2014; Kimhi, Shoam-Kugelmas, Agam Ben-Artzi, Ben-Moshe, & Bauminger-Zviely, 2014; Lawson, Baron-Cohen, & Wheelwright, 2004; Losh, & Capps, 2006; Matthews et al., 2012; Oberman, Ramachandran, & Pineda,

2008; O’Nions, Sebastian, McCrory, Chantiluke, Happe, & Viding, 2014; Rueda, Fernandez-Berrocal, & Baron-Cohen, 2015; Scheeren, Koot, Mundy, Mous, & Begeer, 2013; Schwenck et al., 2012; Senland, & Higgins-D’Alessandro, 2013; Silliman, Diehl, Bahr, Hnath-Chisolm, Zenko, & Friedman, 2003; Wakabayashi, Baron-Cohen, Uchiyama, Yoshida, Kuroda, & Wheelwright, 2007; Young, Rogers, Hutman, Rozga, Sigman, & Ozonoff, 2011).

The research design, participants, data sources, and findings of each of these studies are identified in Table 2.

Table 2

Authors	Research Design	Participants	Data Sources	Findings
Aoki, & et al., 2014	Quantitative	17 males with ASD and 17 typically developing demographically-matched male participants	FMRI, first-order false belief task (meant to infer another’s social emotions rather than beliefs).	Those with ASD showed deficits in inferring others’ social emotions, but not in inferring others’ beliefs when compared to those without ASD. ASD participants also showed less activity in the right anterior insula and posterior superior temporal sulcus during inferring others’ social emotions. When given oxytocin those with ASD were enhanced with

				being able to infer others' social emotions. The peptide enhanced the diminished brain activity in the right anterior insula during inferring others' social emotions, but not in the dorsomedial prefrontal cortex during inferring others' beliefs.
Auyeung, Wheelwright, Allison, Atkinson, Samarawickrema, & Baron-Cohen, 2009	Quantitative	1,256 parent reports of typically developing children. 265 parent reports of children with Autism Spectrum Condition.	Adult Empathy Quotient (EQ) and adult Sympathy Quotient (SQ) questionnaires.	The results suggest girls exhibit more empathetic behavior than boys. Children with ASC scored much lower than typically developing children on the EQ-C. There was a large effect size between typically developing boys and children with ASC. This suggests that the EQ-C questionnaire may be capable of detecting poor empathizing typically associated of ASC. On the SQ-C, boys scored higher than girls. Children with ASC had even higher scores on this

				measure than boys.
Baron-Cohen & Wheelwright, 2004	Quantitative	Study 1: 90 adults with autism spectrum/ high-functioning autism (AS/HFA) and another 90 adults as a comparison. Study 2: 71 males and 126 females	Study 1: The Empathy Quotient(EQ) Questionnaire, 50 AS/HFA were interviewed. Study 2: The EQ Questionnaire	Study 1: Those with AS/HFA scored much lower on EQ than from the general population. From interviews they found that even though AS/HFA had difficulty judging/ explaining/ anticipating or interpreting another's behavior, it isn't that they want to hurt another person. When it was pointed out that they hurt the person, they would feel bad. Often times recognizing was the issue. Study 2: Women scored significantly higher on the EQ than men.
Begeer, Gevers, Clifford, Verhoeve, Kat, Hoddenbach, & Boer, 2011	Mixed Methods	40 children with high-functioning autism spectrum disorder (HFASD) between the ages 8-13 years old	Intervention: Theory of Mind training treatment program 16 weekly sessions 1.5 hours each. Interview, The levels of Emotional Awareness Scale for Children (LEAS-C), The children's Social Behavior Questionnaire (CSBQ),	Treatment had a higher impact on conceptual abilities than on daily life skills. No effects were found on Theory of Mind and basic emotion understanding. The understanding of

			<p>and Self Reported Empathy.</p>	<p>beliefs and false beliefs were shown to improve relative to the waitlist suggesting beliefs, desires, and emotion can be taught. There may be “teaching to the test” effects. Treatment programs may specifically train the generalized behavioral skills rather than conceptual understanding. The study does suggest that Theory of Mind treatment could be a promising intervention for children with high functioning autism spectrum disorder to improve social and emotional skills.</p>
<p>Cook, & Bird, 2012</p>	<p>Quantitative</p>	<p>19 adults with Autism Spectrum Conditions (40.9 years: mean age), and 22 adults age- and IQ-matched with ASC participants.</p>	<p>Priming task, automatic imitation task (reaction time was calculated), debriefing Questionnaire</p>	<p>There was no significant difference between imitation levels shown by individuals with ASC primed with pro-social words compared with those primed with non-social words.</p>

<p>Deschapms, Been, & Matthys, 2014</p>	<p>Mixed Methods</p>	<p>22 children from 6-7 years old with clinical diagnosis of ASD and 29 6-7 year old typically developing children.</p>	<p>Griffith Empathy Measure (GEM), SRS, and WISC-III subtests. Interpersonal Response Task (IRT)</p>	<p>Lower levels of teacher and parent rated cognitive empathy and similar levels of affective empathy compared to typically developing children. Results also suggest that when given a story task, emotion recognition for basic emotions was adequate in ASD children, but those with severe impairments with social responsiveness had difficulty recognizing fear.</p>
<p>Fan, Decety, Yang, Liu, & Cheng, 2010</p>	<p>Quantitative</p>	<p>20 male individual with autism spectrum disorder (ASD) and 20 male controls.</p>	<p>EEG recordings, Toni X120 binocular eye tracker</p>	<p>Mu suppression over the sensorimotor cortex was affected by experimental conditions, but not between individuals with ASD and controls. Those with ASD and those without exhibited stronger mu suppression when watching hand actions relative to a moving dot. Those with ASD failed to imitate the</p>

				observed actions while their mu suppression indicating the MNS activity was intact.
Gu, Eilam-Stock, Zhou, Anagnostou, Kolevzon, Soorya, Hof, Friston, & Fan, 2015	Quantitative	17 unmedicated high-functioning adult males with ASD, and 18 males without ASD	Measures of skin conductance responses (SCR) and functional magnetic resonance imaging (fMRI). Personality Assessments	Results found evidence for impairments in both state and trait empathy in ASD individuals. The results found reduced empathetic pain discriminability during the empathetic pain task, and a greater difficulty with emotional awareness and lower empathy levels.
Khor, Melvin, Reid, & Gray, 2014	Mixed Methods	31 adolescents aged 12-18 years who met DSM-IV criteria for diagnosis of Autistic Disorder or Asperger's disorder.	Various Questionnaires, and Ecological Momentary Assessment (EMA)	Response to Stress Questionnaire (RSQ)- were all individually associated with higher levels of self- and parent-reported behavior and emotional problems. There was similar relationships between coping and behavior and emotional problems for both self- and parent-completed RSQ

				<p>questionnaires. This suggests volitional and involuntary disengagement and involuntary engagement are associated with increased levels of behavior and emotional problems. There were significant differences in RSQ coping factors excepts for disengagement coping and involuntary disengagement, this suggests parents and adolescents have similar perceptions of the level of the adolescents' use of these methods of coping and their overall relationships with behavior and emotional problems.</p>
<p>Kimhi, Shoam-Kugelmas, Agam Ben-Artzi, Ben-Moshe, & Bauminger-Zviely, 2014</p>	<p>Qualitative</p>	<p>29 intellectually able preschoolers with ASD and 30 typical preschoolers, aged 3-6 years.</p>	<p>Mullen Scales of Early Learning, Executive Function (EF) Flexible Item Selection Task (FIST), EF Tower of London (TOL), Theory of Mind (ToM) Unexpected-Location Task, ToM Affective False-Belief Task, and interview</p>	<p>The findings suggest that intellectually able preschoolers with ASD show difficulty on Executive Functioning (includes cognitive shifting and planning)</p>

				abilities, relative to typically developing preschoolers. It also appears the EF onset appears during later preschool years.
Lawson, Baron-Cohen, & Wheelwright, 2004	Quantitative	107 adult participants; group 1: 18 males with AS, group 2: 44 males without AS, group 3: 45 females without AS	Two test booklets, one involving empathizing and one involving systemizing	On empathizing females scored higher than the control males who scored higher than males with AS. On the systemizing task females scored lower than both male groups who did not differ significantly from each other. The results support the E-S theory of autism and the 'extreme male brain' theory of autism.
Losh, & Capps, 2006	Mixed Methods	50 children ranging from 7-13 years of age: 28 high-functioning individuals with autism, and 22 typically developing comparison children.	Personal accounts of emotional and nonemotional experiences, videotaping and audiotaping	High-functioning children with autism were able to discuss contextually appropriate accounts of simple emotions, but their strategies for interpreting and conveying all types of emotional experiences differed from those of typical developing children. This

				<p>being said autistic children were less inclined to organize and convey their emotional experiences in specific explanatory narrative frameworks. Instead the autistic children's script-like emotional accounts lacked reference even to the causes of their emotions. This leaves to question the depth of understanding of emotional experiences.</p>
<p>Matthews et al., 2012</p>	<p>Quantitative</p>	<p>73 children; 37 with ASD and 36 typically developing</p>	<p>Peabody Picture Vocabulary Test III, 4 established Theory of Mind tasks: change of location task, change of contents task, and verbal and non-verbal versions of the appearance-reality task.</p>	<p>Results suggest that children in the regressive autism group performed better than early-onset autism group on the non-verbal appearance-reality task. There was a pattern between the lowest scores in the early-onset group and highest scores in the typically developing group, whereas the regressive autism group tended to score between the</p>

				early-onset and typically developing groups. There may be a lack of universality in Theory of Mind within this study.
Oberman, Ramachandran, & Pineda, 2008	Quantitative	13 typically developing children and 13 children with ASD.	Electroencephalography (EEG) mu frequency band suppression.	The results show normal mu wave suppression to observed actions in ASD children. The results suggest that familiarity modulates mu suppression, with both ASD and typically developing groups with the greatest amount of suppression to their own movements.
O’Nions, Sebastian, McCrory, Chantiluke, Happe, & Viding, 2014	Quantitative	Adolescents Males age 10-16; 16 who were typically developing, 16 who had conduct problems plus callous unemotional traits, and 16 on the Autism Spectrum Disorder (ASD).	Experimental task involving 30 cartoons, 10 each for Theory of Mind (ToM), physical causality (PC), and Affective ToM conditions, and an FMRI.	The results indicated that neural responses did not differ between TD and CP/HCU groups during Theory of Mind. Typically developing (TD) and conduct problems and high levels of callous-unemotional (CP/HCU) traits children did show greater medial prefrontal cortex responses during Theory of

				Mind than did the Autism Spectrum Disorder (ASD) children. The findings suggest that although both ASD and CP/HCY are characterized by social difficulties, only children with ASD display atypical neural processing associated with ToM.
Rueda, Fernandez-Berrocal, & Baron-Cohen, 2015	Mixed Methods	38 participants with Asperger's Syndrome.	Questionnaire, and an Eyes Test	The results suggest a deficit in cognitive empathy in AS (cognitive empathy deals with perspective taking), whereas not a significant difference in affective empathy (being able to feel the emotion of another).
Scheeren, Koot, Mundy, Mous, & Begeer, 2013	Qualitative	151 High Functioning Autism Spectrum Disorder children and adolescents with a clinical diagnosis of autistic disorder, Aspergers Disorder, or PDD-NOS.	Observation, Interviews, parent reports (questionnaire), Peabody Picture Vocabulary Test, and ADOS-Generic	Observed responses to the emotional states of an interviewer were comparable for participants with and without HFASD. Children's empathic responsiveness as described by parents was reduced in the group of participants with HFASD and more severe autistic

				<p>traits both compared with the participants with mild autistic traits and the comparison group. The results suggest that when circumstances are kept simple (interaction with an adult displaying one emotion), children with and without HFASD may behave similarly in response to the emotional states of an unfamiliar adult.</p>
<p>Schwenck et al., 2012</p>	<p>Qualitative</p>	<p>55 boys with ASD, 34 boys with CD-CU+, 34 boys with CD-CU-, and 67 controls. The subjects were recruited from the Department of Child and Adolescent Psychiatry, University of Wurzburg (Bavaria, Germany)</p>	<p>Questionnaire, animated-shapes-task (AST), morphing task (MT), & video sequences task (VST)</p>	<p>Boys with ASD showed less cognitive empathy while participants with CD-CU+ showed less emotional empathy. CD-CU- did not differentiate from the control group. Boys with CD-CU- were less emotionally reactive in response to film stimuli than with boys with ASD. There was also an age effects that indicated an increase in cognitive and affective empathy</p>

				skills beyond infancy.
Senland, & Higgins-D'Alessandro, 2013	Mixed Methods	16 high-functioning autism spectrum disorder individuals (some were nonverbal learning disabilities individuals between 13-18 years of age and 16 typically developing (TD) adolescents.	Interview, 28-item Interpersonal Reactivity Index (IRI) self-report, and sociomoral reflection measure: short form (SRM-SF)	Those with HF-ASD had significantly lower moral reasoning than TD adolescents. Both groups had an equivalent mean empathic concern scores. HF-ASD scored lower on perspective-taking, but not significantly so in comparison to the TD group. Those with HF-ASD scored significantly higher on personal distress than TD individuals. During the interview both groups recounted different challenging sociomoral situations, but those with HF-ASD generated difficult situations involving social isolation/ non-acceptance, whereas those TD involved helping others, managing relationships/peer pressure.
Silliman, Diehl, Bahr,	Qualitative	45 children and adolescents: 15	Two sets of Theory-of-mind tasks	The findings for the children in the

<p>Hnath-Chisolm, Zenko, & Friedman, 2003</p>		<p>adolescents with a diagnosis of Autism Spectrum Disorder (ASD), 15 typically developing children matched for age, gender, and ethnicity, and 15 developing children matched for language, age, gender, and ethnicity.</p>	<p>(logical inferencing and social inferencing.</p>	<p>age, gender, and ethnicity group (CA group) performed at higher levels than the children matched for language age, gender, and ethnicity (LA group), and the ASD group on both tasks. The CA and LA groups performed equally on the logical and social inferencing tasks, but the ASD group performed better on the social inferencing tasks.</p>
<p>Wakabayashi, Baron-Cohen, Uchiyama, Yoshida, Kuroda, & Wheelwright, 2007</p>	<p>Quantitative</p>	<p>48 people with Autism Spectrum Conditions, 137 general population controls, 1,250 university student controls. All participants are from Japan</p>	<p>Surveys</p>	<p>The Empathy Quotient (EQ) results with individuals that have ASC suggest a lack of empathy. Most of the items in the EQ involve theory of mind. The Sympathizing Quotient (SQ) results with individuals that have ASC provides support that those with ASC have a talent systemizing. The results suggested that those with autism are different by two cognitive styles,</p>

				empathizing and systemizing.
Young, Rogers, Hutman, Rozga, Sigman, & Ozonoff, 2011	Mixed Methods	154 infants between the age of 12 and 24 months at risk for ASD, and 78 typically developing infants	Video coding, Social Communication Questionnaire (SCQ), Mullen Scales of Early Learning (MSEL), Autism Diagnostic Observation Schedule-Generic (ADOS), MacArthur Communicative Development Inventory (CDI) questionnaire, and examiner ratings	Study found that those infants identified with ASD at 36 months showed significantly less imitation skills than low-risk typical infants, but showed typical development through 24 months. Both groups showed the same amount of developmental growth. The ASD group appeared simply delayed in the development of imitation.

Summary of findings and discussion

Autism Spectrum Disorder implies implications socially that can affect learning in a multitude of capacities of understanding. Nearly every study I found discovered discrepancies in empathy (both cognitively and affectively), ToM, imitation, and mirror neurons. There were very few articles if any at all that discussed ASD individuals with low-functioning ASD. Most articles focused on high-functioning ASD. Unfortunately there was not a significant amount of articles that focused on teaching the discrepancies that were found. There appeared to be a limited number of articles on any one age and anyone's

direct specificity (ToM, empathy, mirror neurons, mimicry). All of the articles found seemed to intermingle and coincide with one another.

Only one of the articles I found went into discussing a “cure” for those with ASD to be able to infer others’ social emotions more effectively (Aoki et al. 2014). Aoki et al. 2014 found a correlation to taking the drug oxytocin to improve high-functioning ASD individuals first-order false belief task. Is it as simple as taking a drug to correct empathy/social discrepancies? Silliman et al. 2003 compared logical inferencing tasks and social inferencing tasks. They were able to look at a variety of ways Theory of Mind has been studied to combine the methods into one study to look for direct discrepancies when ASD is compared to children who are matched for the same age and a group of children that matched for language age. The results found ASD participants performed higher on the social inferencing tasks than the logical inferencing tasks. With further evaluation, it could be that some ASD children can engage in the level of social reasoning required for social inferencing tasks than they can for a logical reasoning. What seems to be essential is ASD is a spectrum disorder. There are similarities like in anything, but I am finding some of those with ASD are capable of certain social understandings more readily than others.

Part of the development of ASD understanding is the idea of imitation. Two articles looked at imitation. Cook and Bird 2012 looked at high-functioning ASD adults primed with pro-social words and non-social words. They found no significant discrepancies in imitation levels when compared to adults of the same age who were not diagnosed ASD. The other study viewed 12-24 month olds with ASD and typical development. The results did show similarities in imitation, but when the group tracked until 3 years of age, there was delayed

imitation development compared to low-risk typical developing children, but were indistinguishable from other high-risk infants who showed other cognitive delays not related to ASD. These two studies may suggest that as one with ASD grows older, there may be no significant differences in imitation. As this is only 2 studies, I don't feel like there is enough information to conclude or assume anything.

Three of the articles I found focused on mirror neurons (Fan et al. 2010, Oberman, Ramchandran, & Pineda 2008, and Oberman, & Ramachandran 2007). Fan et al. (2010) found when there was less mu suppression or more resting state suppression over the sensorimotor cortex combined with action observation, there was more communication severity. The study revealed ASD individuals failing to imitate the observed actions while their mu suppression indicated the mirror neuron system was intact. Similarly, Oberman, Ramachandra, & Pineda (2008) found findings suggesting the mirror neuron system responds to observed actions in individuals with ASD, but only when the individuals can identify with the stimuli personally.

Matthews et al. (2012) were interested in Theory of Mind between early onset autism and regressive autism. Early-onset is when a child continues atypical social and communicative development prior to 18 months of age. Regressive autism is the loss of acquired language and social skills between 18 and 24 months. The results showed higher ToM scores for the regressive autism group than the early-onset group. This study suggests that previous studies in ToM and autism may have a lack of discrepancies due to the type of autism onset.

Another study suggested that ToM can be taught at an early age (Begeer et al. 2011). Begeer et al. were curious if treatments improved social skills and ToM as there are very few studies to show its effectiveness. Their results suggest that it does improve those with ASD's conceptual ToM skills, but elementary understanding, self reported empathic skill or parent reported social behavior did not improve. Even though this study did show effective conceptual understanding, it does not show much evidence that there is an effectiveness of a ToM treatment on the daily life mind reading skills. It is fascinating to me. Is this the wrong approach?

When looking at empathy-based studies, many studies just focused on if ASD individuals had the ability to empathize in comparison to typically developing individuals. It did not go into too much length on teaching empathy and improving it. Again, there is a lack of research on the learning of empathy for those with ASD. Wakabayashi et al. (2006) compared adults with and without Autism Spectrum Condition (ASC) for differences in empathy and systemizing. They found that ASD adults scored significantly lower on the empathy quotient than the systemizing quotient. This suggests a more methodical way of thinking and goes along with difficulty interpreting emotions. Losh & Capps (2006) suggested that those with ASD use alternative strategies for interpreting emotional encounters in that they were less likely to organize their emotional accounts in personalized frameworks.

Rueda, Fernandez-Berrocal, & Baron-Cohen (2015) looked at the two different types of empathy: affective and cognitive. They found those with Asperger Syndrome scored less than controls on cognitive empathy (associated with ToM), but in the average range on

affective empathy, suggesting those with high-functioning ASD have the ability to feel what another feels (affective empathy), but may have difficulty perceiving the others thoughts (cognitive empathy, often associated with ToM). What is uniquely interesting about Senland & Higgins-D'Alessandro (2013) is that they noted high-functioning ASD perceived themselves as having empathetic concern, but had difficulty using their feelings to support their actions when in sociomoral situations. They suggested teachers should educate in providing adolescents guidance about how to express empathetic concern to promote healthy relationships.

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Rueda, Fernandez-Berrocal, & Baron-Cohen, 2015.... Include this article

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