AN EXAMINATION OF EMPATHY AND SOCIAL OUTCOMES FOR INDIVIDUALS WITH INTELLECTUAL AND DEVELOPMENTAL DISABILITIES

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ABSTRACT

AN EXAMINATION OF EMPATHY AND SOCIAL OUTCOMES FOR INDIVIDUALS WITH INTELLECTUAL AND DEVELOPMENTAL DISABILITIES

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Empathy is generally described as a multidimensional construct, consisting of cognitive and affective components. Researchers demonstrate that a better ability to understand and express empathy toward others is associated with positive social outcomes such as strong communication skills and meaningful social relationships. For individuals with intellectual and developmental disabilities (IDD), the understanding and expression of empathy and its various components can be challenging. However, different etiologies can elucidate various strengths and weaknesses related to empathy. Given empathy's critical role in various social domains and potential differences in empathy skills and social outcomes across different IDD groups, the purpose of this dissertation is to expand the current literature on empathy for three distinct and unique IDD groups to better inform current and future interventions.

This dissertation consists of three independent, but related manuscripts presented in journal submission format. The first study was a systematic literature review of 169 studies conducted to identify the current research on empathy skills and social outcomes for individuals with autism spectrum disorder (ASD), Williams syndrome (WS), and Down syndrome (DS). Overall, the results of the systematic literature review indicate that individuals with ASD experience poorer empathy skills and these deficits relate to poor social skills. Further, there is a lack of research on empathy for other IDD conditions (e.g., WS and DS) and in relation to other social domains (e.g., social skills).

As such, the second study examined the specific relationship of empathy and social skills for individuals with ASD, WS, and DS and examined for differences across groups and compared to a typically developing (TD) control group. The final sample (N = 120) included 30 students diagnosed with ASD (mean age = 10.73 years) and their caregivers, 30 students diagnosed with WS (mean age = 12.07 years) and their caregivers, 30 students with DS (mean age = 11.53 years) and their caregivers, and 30 TD students (mean age = 10.90 years) and their caregivers. Results demonstrate that, according to parent reports, students with ASD present with lower empathy skills compared to students with WS and DS and to students without disabilities. Differences between groups were also demonstrated regarding the relationship between empathy skills and social skills. More specifically, for students with WS, lower empathy skills were not significantly correlated with social motivation. The results of Chapter 3 highlight that differences in empathy and social skills should be accounted for in empathy-related interventions and underscore the importance of developing etiology-specific interventions.

In response to the importance of developing interventions that account for the student's disability, the third manuscript was written to guide special educators in addressing empathy skills for students with ASD. When assessing empathy skills, it is crucial that special educators obtain accounts from multiple informants including parent- and teacher-reports. The use of multiple sources will provide both a general picture of a student's empathy skills along with information for specific areas of concern. Other general considerations for empathy assessment and intervention include incorporating elements of cognitive and affective empathy during assessment, adopting a developmental framework to guide both short term and long-term goals, and identifying additional social skills deficits to target prior to or during the empathy intervention, if applicable.

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KEY TO ABBREVIATIONS

ADHD: Attention Deficit Hyperactivity Disorder

ANOVA: Analysis of Variance

ASD: Autism spectrum disorder

AQ: Autism quotient

DS: Down syndrome

EQ: Empathy Quotient

EQ-C: Children's version of Empathy Quotient

ERIC: Educational Resources Information Center

GEM: Griffith Empathy Measure

HFA: High functioning autism

IDD: Intellectual and developmental disabilities

IEP: Individualized education plan

IRI: Interpersonal reactivity index

NIHTB-CB: NIH toolbox cognitive battery

PDD-NOS: Pervasive developmental disorder-Not otherwise specified

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement

SRS-2: Social responsiveness scale-2nd edition

TD: Typically developing

WS: Williams syndrome

CHAPTER 1

The State of Empathy in Individuals with Intellectual and Developmental Disabilities

Over the years, researchers have come to acknowledge the importance of empathy and its role in various social domains. While there is no consensus on a definition (Fletcher-Watson & Bird, 2020; Hall & Schwartz, 2019), empathy is generally described as a multidimensional construct, consisting of cognitive and affective components. Cognitive empathy refers to an individual's ability to *recognize* their emotional state as well as the emotional states of others; whereas affective empathy describes an individual's ability to *share* in another person's emotional state (Mazza et al., 2014; van Noorden et al., 2015). Components of cognitive empathy include perspective-taking (i.e., the understanding that another person may have a different perspective than your own) and emotion recognition (i.e., the understanding of facial expressions; Blair, 2005; de Waal, 2008). Components of affective empathy include imitating another person's emotional state (Hatfield et al., 1994) and responding to the emotional state of another person (Tone & Tully, 2014). While cognitive and affective empathy are distinct in definition, the two components are interrelated. That is, cognitive and affective empathy are interdependent with one component relying on the other and vice versa (Baron-Cohen & Wheelwright, 2004; Behrends et al., 2012).

For individuals with intellectual and developmental disabilities (IDD), the understanding and expression of empathy and its various components can be challenging. Overall, individuals with IDD perform lower on empathy-related tasks and measures compared to individuals without IDD (e.g., Cebula & Wishart, 2008; Johnson et al., 2017); yet the empathy skills of individuals with IDD also vary across and within IDD groups (e.g., Kasari et al., 2003; Rueda et al., 2014). That is, different etiologies can elucidate various strengths and weaknesses related to empathy

skills (Dykens & Hodapp, 2001; Waite et al., 2014). As such, due to potential differences across and within various IDD groups, careful consideration must be taken when designing empathy-related tasks, measures, and even interventions. For example, differences in empathy skills have been observed across individuals with autism spectrum disorder (ASD), William syndrome (WS), and Down syndrome (DS).

Empathy in ASD

Individuals diagnosed with ASD exhibit impairments in various social domains, including challenges with social interaction, atypical or unconventional communication skills, and restricted and repetitive behaviors (American Psychiatric Association, 2013). Difficulties with displays of empathy have been observed across the autism spectrum for individuals of all ages. According to teacher reports, students with ASD between the ages of 3 and 12 display significantly fewer signs of empathy compared to their typically developing peers (Peterson, 2014). Qualitative interviews with adolescents with ASD further reveal that they perceive themselves as struggling to show empathy in their actions (Senland & Higgins-D'Alesandro, 2013). Finally, older individuals with ASD between 16 and 61 years old also report displaying lower empathy than those without disabilities (Trimmer et al., 2017).

Researchers have developed several theories to explain the observed empathy deficit in individuals diagnosed with ASD. For instance, some researchers suggest that autism should be defined as a single-minded attentional system, often referred to as monotropism, that prefers to take in one information source at a time (Murray et al., 2005). Monotropism may explain why individuals with ASD (especially young children) are less likely to detect another person's emotional cues, as this detection requires orienting towards other people (Mundy, 2018). This lack of social orientation displayed by individuals with ASD may lead them to miss social cues,

thereby affecting their ability to respond appropriately and empathically to another person's emotional state.

More recently, researchers have also turned to the 'double empathy problem' to explain observed challenges in empathy, particularly between individuals with and without ASD. The 'double empathy problem' suggests that individuals with ASD experience poorer social outcomes not just because they have challenges in social and communication skills but because they may also be misunderstood by individuals without ASD (Milton, 2012). As such, challenges in empathy skills come from both directions; both individuals with and without ASD may misunderstand each other's social and communication skills (Mitchell et al., 2021). As a result, to better understand the empathy skills of individuals with ASD, researchers are now turning their attention to differences in how individuals with ASD socially interact with each other compared to social interactions between individuals with and without ASD (e.g., Crompton et al., 2019; Heasman & Gillespie, 2019).

Empathy in WS

WS is a rare genetic disorder caused by a deletion of ~26 genes on chromosome 7q11.23, affecting an estimated 1 in 7500 to 20,000 live births each year in the US (Hillier et al., 2003; Pober, 2010). Individuals diagnosed with WS present a unique adaptive behavior and cognitive phenotype which is characterized by mild to moderate intellectual disability with average IQ scores between 50 and 60 (Martens et al., 2008; Mervis et al., 2000). In contrast to individuals with ASD, individuals with WS are often depicted as having a sociable nature. In the literature, individuals with WS are generally described as friendly (Gosch & Pankau, 1997) and charming (Fryns et al., 1991) with a social desire to interact with others that is observed across the lifespan (Järvinen-Pasley et al., 2010). This is consistent with reports from parents rating their children

with WS higher on global measures of sociability and a lack of inhibition toward engaging with known and unknown individuals (Doyle et al., 2004; Haas et al., 2010; Järvinen-Pasley et al., 2010; Jones et al., 2000).

Individuals with WS seem to display strong empathy skills and are described as compassionate and highly sensitive to the emotional needs of others (Jones et al., 2000). In fact, the literature suggests that individuals with WS may have high cognitive empathy. Storytelling and interview task studies have demonstrated that those with WS make rich use of empathic markers and evaluative comments when determining the emotional states of others (Jones et al., 2000). This high sensitivity to the emotional needs of others, however, may also result in a preoccupation with the suffering of others and overwhelming feelings of anxiety related to the well-being of family, friends, and even strangers (Semel & Rosner, 2003).

Despite these relative strengths in sociability and cognitive empathy, individuals with WS often experience difficulties with anxiety, attention, and emotional regulation (Dykens, 2003; Leyfer et al., 2006), as well as difficulties in several social domains including social communication, social cognition (Fisher & Morin, 2017; Klein-Tasman et al., 2011; van der Fluit et al., 2012), and social reciprocity (Klein-Tasman et al., 2011). Struggles with these social domains may explain some of the social outcomes for individuals with WS including poor development and maintenance of friendships and experiencing feelings of loneliness (Sullivan et al., 2003; Thurman & Fisher, 2015), but it is unclear whether empathy skills are related to their social skills.

Empathy in DS

DS is the most common genetic cause of intellectual disability and, in 95% of cases, is caused by an extra 21st chromosome (i.e., Trisomy 21; Fidler & Nadel, 2007; Sherman et al.,

2007). Described as a multisystem neurogenetic disorder, DS can affect development, growth, and participation in daily living activities across the lifespan (Krinsky-McHale et al., 2008). As one of the leading genetic causes of intellectual disability, many individuals with DS present with mild to moderate intellectual disability (IQ scores ranging from 40 to 70; Hodapp et al., 1999). Individuals with DS also present a unique learning profile that involves higher levels of off-task behavior compared to peers matched in mental age (Daunhauer & Fidler, 2011; Kasari & Freeman, 2001; Pitcairn & Wishart, 1994) and specific difficulties with some aspects of executive function (e.g., challenges in working memory; Jarrold et al., 2002; Lanfranchi et al., 2012).

Individuals with DS are generally reported to have strong social and communication skills. Specifically, both younger and older children with DS demonstrate high levels of social engagement, social orientation, and social competency compared to other children with developmental disabilities (Dykens, 2006; Fidler et al., 2005; Kasari et al., 2003). As children with DS grow older, however, some researchers report observations of poorer interpersonal interactions with peers in general education classroom settings (Buckley et al., 2006).

Empathy is a rather under-developed line of research for individuals with DS, as only a handful of studies have investigated empathy skills in this population (e.g., Sigman & Ruskin, 1999; Kasari et al., 2003). Among those studies that have been conducted, results indicate that individuals with DS are more attentive to facial expressions and engage in positive affect compared to other developmental disabilities (Kasari et al., 1990; Kasari et al., 1995). However, general cognitive slowing (which is characteristic of DS) may affect empathy skills over time. In a study of emotion recognition, children with DS (with observed mental ages of 3 years old)

performed similarly to neurotypical children of the same mental age but showed lags in emotion recognition over time (Kasari et al., 2001).

Empathy and Social Outcomes

Deficits in empathy skills have been linked to poor social outcomes. For those with IDD, social outcomes are often reported to be poor or lacking compared to individuals without IDD. In fact, many individuals with IDD have trouble forming and maintaining relationships, and, as a result, have few close and meaningful social relationships in comparison to individuals without IDD (Fulford & Cobigo, 2018). Difficulties in developing and maintaining the social relationships necessary for a healthy quality of life have prompted families and advocates of individuals with IDD to urge policy makers and researchers to increase focus on improving our understanding of and interventions to support social outcomes for individuals with IDD (Turnbull et al., 2000). In fact, leading national organizations for IDD, including the American Association on Intellectual and Developmental Disabilities, have called for an increase in research, practice, and policies that focus specifically on social outcomes for individuals with IDD (Bogenschutz et al., 2015).

As a result, several factors that can improve social outcomes have been identified, including the ability to empathize with others. Researchers demonstrate that a better ability to understand and express empathy toward others is associated with stronger positive social communication and interactions such as higher quality and more meaningful relationships with friends and romantic partners (Chow et al., 2013; Cramer & Jowett, 2010) and better social engagement (Bailey et al., 2008) throughout the lifespan (Tone & Trully, 2014). Higher empathy skills are also associated with the inhibition of aggressive or anti-social behaviors (Björkqvist et al., 2000; Eisenberg & Miller, 1987; Roberts et al., 2014). Therefore, the impact of higher levels

of empathy may extend beyond day-to-day social communication to also affect social outcomes and overall long-term social development positively for individuals with IDD.

Assessment and Measurement of Empathy

Given its role in positive social outcomes, empathy has become the primary dependent variable in many research and intervention studies. Due to its multi-dimensional nature (i.e., cognitive and affective empathy), however, several methods exist to measure empathy. For instance, methods to measure or assess affective empathy in children with ASD include the use of pictures and stories, self-reports with hypothetical situations, or experimental procedures designed to elicit an empathic response from the child (Miller & Eisenberg, 1988). For older individuals with ASD, self-report measures (e.g., surveys or questionnaires) of their empathy skills are often a popular method used by researchers (Baron-Cohen & Wheelwright, 2004).

Among the various measurements and assessments for empathy, the Empathy Quotient (EQ; Baron-Cohen & Wheelwright, 2004) has been widely distributed, frequently used by researchers, and recognized as one of the leading standardized measures for assessing empathy (Fletcher-Watson & Bird, 2020). Developed by Baron-Cohen and Wheelwright (2004), the EQ is a 60-item (or a shorter 40-item) self-report measure that provides a summed total EQ score. The EQ consists of items concerning components of cognitive and affective empathy; however, the items are not separated into sub-scales because Baron-Cohen and Wheelwright (2004) determined that both components actually co-occur and cannot easily be disentangled from each other. Whereas the EQ is validated primarily with samples of participants with ASD without intellectual disability (Lawrence et al., 2004), it is unclear if the EQ (or other measures of empathy) is valid for use with other IDD groups (e.g., DS and WS). Further research is warranted to evaluate the assessment and measurement of empathy across different IDD groups.

In addition to variations in assessment and measurement, the definition of empathy can vary widely based on the type of empathy being targeted. In fact, thus far, there is no standard or agreed-upon definition of empathy in the research literature (Fletcher-Watson & Bird, 2020; Hall & Schwartz, 2019). Operational definitions of cognitive empathy can include the number of times an individual correctly identifies the emotion of a person shown in a picture (Baron-Cohen et al., 2001) or coding the accuracy of an individual to predict the emotions, thoughts, or inner states of another person through personal diary entries (Sened et al., 2017). Operational definitions of affective empathy can include the expression of listening statements and follow-up questions (Koegel et al., 2016) or a response that must exactly match the emotional state of an individual (e.g., expressing sadness if the individual is feeling sad; Hall & Schwartz, 2019). These various approaches only reflect the difficulties and challenges of defining and consequently testing empathy (Decety & Cowell, 2014) and the variability of definitions and corresponding methods to assess empathy could have important implications for the development and application of interventions (van Noorden et al., 2015).

Interventions Addressing Empathy Deficits

Interventions addressing empathy deficits for ASD, WS, and DS vary greatly. Compared to the research literature of WS and DS, there appears to be a much larger focus on addressing empathy deficits for individuals with ASD. Historically, much of the focus has primarily been on cognitive empathy, as the observed empathy deficits in individuals with ASD has largely been explained by various cognitive theories (e.g., monotropism; Mundy, 2018) using a medical model approach (Mitchell et al., 2021). However, more recent research has also focused on examining the empathy skills of individuals with ASD as differences rather than deficits. For the example, the ‘double empathy problem’ suggests that challenges in empathy skills may be due to

differences in the understanding and expression of empathy between individuals with and without ASD (Mitchell et al., 2021).

For individuals with WS, the development and evaluation of interventions is only beginning to emerge (Mervis & John, 2010). Past research in the WS literature suggests that this population may struggle with cognitive components of social and communication skills (similar to their ASD counterparts) and, therefore, has been a primary focus of intervention for individuals with WS as well (Laws & Bishop, 2004; Tager-Flusberg & Sullivan, 2000). As such, some researchers postulate that interventions already used for other IDD groups may also be beneficial for individuals with WS, such as applied behavior analysis (Klein-Tasman et al., 2009) and social skills training (Mervis & John, 2010).

There are also few empathy interventions that have been developed specifically for individuals with DS. One promising approach, however, is responsive teaching. Responsive teaching is an early intervention curriculum designed to address the cognitive, language, and social-emotional needs of children with developmental delays, particularly children with DS (Mahoney et al., 2006). Responsive teaching includes empathy as one of 16 behaviors that children should learn in order to gain skills and competency across the developmental domains of cognition, communication, and social emotional functioning (Mahoney et al., 2006).

Purpose of Current Dissertation

Given empathy's critical role in various social domains, potential differences of empathy skills across different IDD groups, and the variability observed in defining and measuring empathy, the purpose of this dissertation is to expand the current literature on empathy for three distinct and unique IDD groups (i.e., ASD, WS, and DS) to better inform current and future interventions. Three independent but related manuscripts presented in journal submission format

follow this introduction as chapters two through four. Chapter two is a systematic literature review of the current research on what is *generally* known about the empathy skills and social outcomes of individuals with ASD, WS, and DS. Using a group comparison research design, chapter three then collects direct data on the *specific* factors that may relate to any similarities and/or differences in empathy skills and social skills across the three diagnostic groups. Finally, chapter four combines the findings from chapters 2 and 3 to provide recommendations on how to address empathy deficits for individuals with ASD. Chapter five consists of a comprehensive discussion of the findings from all three studies.

Chapter 2: Empathy Systematic Literature Review

Given the relationship between empathy skills and social outcomes, there is a need to more closely examine whether empathy skills in individuals with ASD, WS, and DS are related to their social outcomes. Identifying these relationships may inform current and future interventions. Therefore, the primary purpose of this study is to generally examine the current research on empathy skills of individuals with ASD, WS, and DS and how these skills are related to their social outcomes.

Chapter 3: Comparing Empathy and Social Skills across Individuals with ASD, WS, and DS

Chapter 3 examines similarities and differences in empathy skills and social skills across individuals with ASD, WS, and DS using standardized measures. If empathy and social skills are different across these groups, it is critical to identify such differences for consideration in current and future interventions. Therefore, in this study, measures of empathy and social skills were administered to compare skills across individuals with ASD, WS, and DS and to individuals without IDD. Identifying differences in empathy skills in relation to social skills provides a

deeper understanding of what to address in interventions for each diagnostic group. Additionally, results from the literature review were used to consider additional factors that may be related to empathy skills and social skills for each diagnostic group and to supplement the findings of this study.

Chapter 4: Development of Individualized Interventions

The results of the literature review and the group comparison study can be used to inform individualized and specialized interventions addressing empathy skills for individuals with ASD. Chapter four consists of a conceptual piece outlining unique considerations that special educators should consider when designing interventions to address the specialized needs and characteristics of individuals with IDD, in particular for individuals with ASD.

Chapter 5: Discussion

The final chapter is a discussion of all three studies.

REFERENCES

REFERENCES

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Bailey, P. E., Henry, J. D., & Von Hippel, W. (2008). Empathy and social functioning in late adulthood. *Aging & Mental Health, 12*(4), 499-503. https://doi.org/10.1080/13607860802224243

Baron-Cohen, S., & Wheelwright, S. (2004). The empathy quotient: An investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. *Journal of Autism and Developmental Disorders, 34*, 163-175. https://doi.org/10.1023/B:JADD.0000022607.19833.00

Baron-Cohen, S., & Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The "Reading the Mind in the Eyes" Test revised version: A study with normal adults, and adults with Asperger syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry, 42*(2), 241-251. https://doi.org/10.1017/S0021963001006643

Behrends, A., Müller, S., & Dziobek, I. (2012). Moving in and out of synchrony: A concept for a new intervention fostering empathy through interactional movement and dance. *The Arts in Psychotherapy, 39*(2), 107-116. https://doi.org/10.1016/j.aip.2012.02.003

Blair, R. J. R. (2005). Responding to the emotions of others: Dissociating forms of empathy through the study of typical and psychiatric populations. *Consciousness and Cognition, 14*(4), 698-718. https://doi.org/10.1016/j.concog.2005.06.004

Björkqvist, K., Österman, K., & Kaukiainen, A. (2000). Social intelligence - empathy = aggression? *Aggression and Violent Behavior, 5*(2), 191-200. https://doi.org/10.1016/S1359-1789(98)00029-9

Bogenschutz, M., Amado, A., Smith, C., Carter, E., Copeland, M., Dattilo, J., Gaventa, B., Hall, S., McManus, M., Quraishi, S., Romer, L., & Walker, P. (2015). National research goals for social inclusion for people with IDD. *Inclusion, 3*(4), 211-218. https://doi.org/10.1352/2326-6988-3.4.211

Buckley, S., Bird, G., Sacks, B., & Archer, T. (2006). A comparison of mainstream and special education for teenagers with Down syndrome: Implications for parents and teachers. *Down Syndrome Research and Practice, 9*, 54–67. https://doi.org/10.3104/reports.295.

Cebula, K. R., & Wishart, J. G. (2008). Social cognition in children with Down syndrome. *International Review of Research in Mental Retardation, 35*, 43-86. https://doi.org/10.1016/S0074-7750(07)35002-7

Chow, C. M., Ruhl, H., & Buhrmester, D. (2013). The mediating role of interpersonal competence between adolescents' empathy and friendship quality: A dyadic approach. *Journal of Adolescence, 36*(1), 191-200. https://doi.org/10.1016/j.adolescence.2012.10.004

Cramer, D., & Jowett, S. (2010). Perceived empathy, accurate empathy, and relationship satisfaction in heterosexual couples. *Journal of Social and Personal Relationships, 27*(3), 327-349. doi: 10.1177/0265407509348384

Crompton, C. J., Ropar, D., Evans-Williams, C. V., Flynn, E. G., & Fletcher-Watson, S. (2019). Autistic peer-to-peer information transfer is highly effective. *Autism, 24*(7), 1704–1712. https://doi.org/ 10.1177/1362361320919286

Daunhauer, L. A., & Fidler, D. J. (2011). The Down syndrome behavioral phenotype: Implications for practice and research in occupational therapy. *Occupational Therapy in Health Care, 25*(1), 7-25. https://doi.org/10.3109/07380577.2010.535601

de Waal, F. B. M. (2008). Putting the altruism back into altruism: The evolution of empathy. *Annual Review of Psychology, 59*, 279-300. https://doi.org/10.1146/annurev.psych.59.103006.093625

Doyle, T. F., Bellugi, U., Korenberg, J. R., & Graham, J. (2004). "Everybody in the world is my friend" hypersociability in young children with Williams syndrome. *American Journal of Medical Genetics Part A, 124*(3), 263–273. https://doi.org/10.1002/ajmg.a.20416.

Dykens, E. M. (2003). Anxiety, fears, and phobias in persons with Williams syndrome. *Developmental Neuropsychology, 23*, 291–316. https://doi.org/10.1080/87565641.2003.9651896.

Dykens, E. M. (2006). Toward a positive psychology of mental retardation. *American Journal of Orthopsychiatry, 76*, 185-193. https://doi.org/10.1037/0002-9432.76.2.185.

Dykens, E. M., & Hodapp, R. M. (2001). Research in mental retardation: Toward an etiologic approach. *Journal of Child Psychology and Psychiatry, 42*(1), 49-71.

Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological Bulletin, 101*(1), 91–119. https://doi.org/10.1037/0033-2909.101.1.91

Fidler, D. J., Hepburn, S., Mankin, G., & Rogers, S. (2005). Praxis skills in young children with Down syndrome, other developmental disabilities, and typically developing children. *American Journal of Occupational Therapy, 59*, 129-138. https://doi.org/10.5014/ajot.59.2.129

Fidler, D. J., & Nadel, L. (2007). Education and children with Down syndrome: Neuroscience, development, and intervention. *Developmental Disabilities Research Reviews, 13*(3), 262-271. https://doi.org/10.1002/mrdd.20166

Fisher, M. H., & Morin, L. (2017). Addressing social skills deficits in adults with Williams syndrome. *Research in Developmental Disabilities, 71*, 77–87. https://doi.org/10.1016/j.ridd.2017.10.008.

Fletcher-Watson, S., & Bird, G. (2020). Autism and empathy: What are the real links? *Autism, 24*, 3-6. https://doi.org/10.1177/1362361319883506

Fryns, J. P., Borghgraef, M., Volcke, P., & Van den Berghe, H. (1991). Adults with Williams syndrome. *American Journal of Medical Genetics, 40*, 253. https://doi.org/10.1002/ajmg.1320400228.

Fulford, C., & Cobigo, V. (2018). Friendships and intimate relationships among people with intellectual disabilities: A thematic synthesis. *Journal of Applied Research in Intellectual Disabilities, 31*(1), 18-35. https://doi.org/10.1111/jar.12312

Gosch, A., & Pankau, R. (1997). Personality characteristics and behaviour problems in individuals of different ages with Williams syndrome. *Developmental Medicine & Child Neurology, 39*, 527–533. https://doi.org/10.1111/j.1469-8749.1997.tb07481.x.

Haas, B. W., Hoeft, F., Searcy, Y. M., Mills, D., Bellugi, U., & Reiss, A. (2010). Individual differences in social behavior predict amygdala response to fearful facial expressions in Williams syndrome. *Neuropsychologia, 48*, 1283–1288. https://doi.org/10.1016/j.neuropsychologia.2009.12.030.

Hall, J. A., & Schwartz, R. (2019). Empathy present and future. *Journal of Social Psychology, 159*(3), 225-243. https://doi.org/10.1080/00224545.2018.1477442

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1994). *Emotional Contagion.* Cambridge University Press.

Heasman, B., & Gillespie, A. (2019). Neurodivergent intersubjectivity: Distinctive features of how autistic people create shared understanding. *Autism, 23*, 910–921. https://doi.org/10.1177/ 1362361318785172

Hillier, L. W., Fulton, R. S., Fulton, L. A., Graves, T. A., Pepin, K. H., Wagner-McPherson, C., Layman, D., Maas, J., Jaeger, S., Walker, R., Wylie, K., Sekhon, M., Becker, M. C., O'Laughlin, M. D., Schaller, M. E., Fewell, G. A., Delehaunty, K. D., Miner, T. L., Nash, W. E.…Wilson, R. K. (2003). The DNA sequence of human chromosome 7. *Nature, 424*(6945), 157–164. https://doi.org/10.1038/nature01782.

Hodapp, R. M., Evans, D. W., & Gray, F. L. (1999). Intellectual development in children with Down syndrome. In J. Rondal, J. Perera, & L. Nadels (Eds.), *Down syndrome: A review of current knowledge* (pp.124-132). Whurr.

Jarrold, C., Baddeley, A. D., & Philips, C. E. (2002). Verbal short-term memory in Down syndrome: A problem of memory, audition, or speech? *Journal of Speech, Language, and Hearing Research, 45*(3), 531-544. https://doi.org/10.1044/1092-4388(2002/042)

Järvinen-Pasley, A., Adolphs, R., Yam, A., Hill, K. J., Grichanik, M., Reilly, J., Mills, D., Reiss, A. L., Korenberg, J. R., & Bellugi, U. (2010). Affiliative behavior in Williams syndrome: Social perception and real-life social behavior. *Neuropsychologia, 48*, 2110–2119. https://doi.org/10.1016/j.neuropsychologia.2010.03.032.

Johnson, E., Hervás, R., Gutiérrez-López-Franca, C., Mondéjar, T., & Bravo, J. (2017). Analyzing and predicting empathy in neurotypical and non-neurotypical users with an affective avatar. *Mobile Information Systems*, 1-11. https://doi.org/10.1155/2017/7932529

Jones, W., Bellugi, U., Lai, Z., Chiles, M., Reilly, J., Lincoln, A., & Adolphs, R. (2000). II. Hypersociability in Williams syndrome. *Journal of Cognitive Neuroscience, 12*(Supplement 1), 30–46. https://doi.org/10.1162/089892900561968

Kasari, C., & Freeman, S. F. N. (2001). Task related social behavior in children with Down syndrome. *American Journal on Mental Retardation, 106*(3), 253-264. https://doi.org/10.1352/0895-8017(2001)106<0253:TRSBIC>2.0.CO;2

Kasari, C., Freeman, S. F. N., & Bass, W. (2003). Empathy and response to distress in children with Down syndrome. *Journal of Child Psychology and Psychiatry, 44*, 424–431. https://doi.org/10.1111/1469–7610.00132.

Kasari, C., Freeman, S. F. N., & Hughes, M. (2001). Emotion recognition of children with Down syndrome. *American Journal on Mental Retardation, 106*(1), 59-72. https://doi.org/10.1352/0895-8017(2001)106<0059:ERBCWD>2.0.CO;2

Kasari, C., Freeman, S., Mundy, P., & Sigman, M. (1995). Attention regulation by children with Down syndrome: Coordinated joint attention and social referencing looks. *American Journal on Mental Retardation, 100*, 128-136.

Kasari, C., Sigman, M., Mundy, P., & Yirmiya, N. (1990). Affective sharing in the context of joint attention interactions of normal, autistic, and mentally retarded children. *Journal of Autism and Developmental Disorders, 20*(1), 87-100.

Koegel, L. K., Ashbaugh, K., Navab, A., & Koegel, R. L. (2016). Improving empathic communication skills in adults with autism spectrum disorder. *Journal of Autism and Developmental Disorder, 46*, 921-933. https://doi.org/10.1007/s10803-015-2633-0

Klein-Tasman, B. P., Li-Barber, K. T., & Magargee, E. T. (2011). Honing in on the social phenotype in Williams syndrome using multiple measures and multiple raters. *Journal of Autism and Developmental Disorders, 41*, 341–351. https://doi.org/10.1007/s10803-010-1060-5.

Klein-Tasman, B. P., Phillips, K., Lord, C., Mervis, C. B., & Gallo, F. (2009). Overlap with the autism spectrum in young children with Williams syndrome. *Journal of Developmental & Behavioral Pediatrics, 30*(4), 289-299. https://doi.org/10.1097/DBP.0b013e3181ad1f9a

Krinsky-McHale, S. J., Devenny, D. A., Gu, H., Jenkins, E. C., Kittler, P., Murty, V. V., Schupf, N., Scotto, L., Tycko, B., Urv, T. K., Ye, L., Zigman, W. B., Silverman, W., & Taylor, S. J. (2008). *Intellectual and Developmental Disabilities, 46*(3), 215-228. https://doi.org/10.1352/2008.46:215-228

Lanfranchi, S., Baddeley, A., Gathercole, S., & Vianello, R. (2012). Working memory in Down syndrome: Is there a dual task deficit? *Journal of Intellectual Disability Research, 56*(2), 157-166. https://doi.org/10.1111/j.1365-2788.2011.01444.x

Lawrence, E. J., Shaw, P., Baker, D., Baron-Cohen, S., & David, A. S. (2004). Measuring empathy: Reliability and validity of the Empathy Quotient. *Psychological Medicine, 34*(5), 911-920. https://doi.org/10.1017/S0033291703001624

Laws, G., & Bishop, D. V. M. (2004). Pragmatic language impairment and social deficits in Williams syndrome: A comparison with Down's syndrome and specific language impairment. *International Journal of Language & Communication Disorders, 39*(1), 45-64. https://doi.org/10.1080/13682820310001615797

Leyfer, O. T., Woodruff-Borden, J., Klein-Tasman, B., Fricke, J., & Mervis, C. B. (2006). Prevalence of psychiatric disorders in 4–16-year-olds with Williams syndrome. *American Journal of Medical Genetics Part B (Neuropsychiatric Genetics), 114B*, 615–622. https://doi.org/10.1002/ajmg.b.30344.

Lowenthal, R., Paula, C. S., Schwartzman, J. S., Brunoni, S., & Mercadante, M. T. (2007). Prevalence of pervasive developmental disorder in Down's syndrome. *Journal of Autism and Developmental Disorders, 37*, 1394–1395. https://doi.org/10.1007/s10803-007-0374-4.

Mahoney, G., Perales, F., Wiggers, B., & Herman, B. (2006). Responsive teaching: Early intervention for children with Down syndrome and other disabilities. *Down Syndrome Research and Practice, 11*(1), 18-28. https://doi.org/10.3104/perspectives.311

Martens, M. A., Wilson, S. J., & Reutens, D. C. (2008). Williams syndrome: A critical review of the cognitive, behavioral, and neuro-anatomical phenotype. *Journal of Child Psychology and Psychiatry, 49*, 576–608. https://doi.org/10.1111/j.1469-7610.2008.01887.x.

Mazza, M., Pino, M. C., Mariano, M., Tempesta, D., Ferrara, M., De Berardis, D., Masedu, F., & Valenti, M. (2014). Affective and cognitive empathy in adolescents with autism spectrum disorder. *Frontiers in Human Neuroscience, 8*, 1-6. https://doi.org/10.3389/fnhum.2014.00791

Mervis, C. B., & John, A. E. (2010). Cognitive and behavioral characteristics of children with Williams syndrome. *American Journal of Medical Genetics Part C, 154C*, 229-248. https://doi.org/10.1002/ajmg.c.30263

Mervis, C. B., & Klein-Tasman, B. P. (2000). Williams syndrome: Cognition, personality, and adaptive behavior. *Mental Retardation and Developmental Disabilities Research Reviews,6*(2), 148–158. https://doi.org/10.1002/1098-2779(2000)6:2<148::AID-MRDD10>3.0.CO;2-T

Miller, P. A., & Eisenberg, N. (1988). The relation of empathy to aggressive and externalizing/antisocial behavior. *Psychological Bulletin, 103*(3), 324–344. https://doi.org/10.1037/0033-2909.103.3.324

Milton, D. E. (2012). On the ontological status of autism: the 'double empathy problem'. *Disability & Society, 27,* 883–887. https://doi.org/10.1080/09687599.2012.710008

Mitchell, P., Sheppard, E., & Cassidy, S. (2021). Autism and the double empathy problem: Implications for development and mental health. *British Journal of Developmental Psychology, 39*(1), 1-18.

Mundy, P. (2018). A review of joint attention and social-cognitive brain systems in typical development and autism spectrum disorder. *European Journal of Neuroscience, 47*(6), 497-514. https://doi.org/10.1111/ejn.13720

Murray, D., Lesser, M., & Lawson, W. (2005). Attention, monotropism and the diagnostic criteria for autism. *Autism, 9*(2), 139-156. https://doi.org/10.1177/1362361305051398

Peterson, C. (2014). Theory of mind understanding and empathic behavior in children with autism spectrum disorders. *International Journal of Developmental Sciences, 39*, 16-21. https://doi.org/10.1016/j.ijdevneu.2014.05.002

Pitcairn, T. K., & Wishart, J. G. (1994). Reactions of young children with Down's syndrome to an impossible task. *British Journal of Developmental Psychology, 12*(4), 485–489. https://doi.org/10.1111/j.2044-835X.1994.tb00649.x

Pober, B. (2010). Williams-Beuren syndrome. *New England Journal of Medicine,362*, 239–252. https://doi.org/10.1056/NEJMra0903074.

Roberts, W., Strayer, J., & Denham, S. (2014). Empathy, anger, guilt: Emotions and prosocial behaviour. *Canadian Journal of Behavioural Science / Revue canadienne des sciences du comportement, 46*(4), 465–474. https://doi.org/10.1037/a0035057

Rueda, P., Fernández-Berrocal, P., & Schonert-Reichl, K. A. (2014). Empathic abilities and theory of mind in adolescents with Asperger syndrome: Insights from the Twenty-First century. *Review Journal of Autism and Developmental Disorders, 1*(4), 327-343. https://doi.org/10.1007/s40489-014-0026-5

Semel, E. M., & Rosner, S. R. (2003). *Understanding Williams syndrome: Behavioral patterns and interventions.* Psychology Press.

Sened, H., Yovel, I., Bar-Kalifa, E., Gadassi, R., & Rafaeli, E. (2017). Now you have my attention: Empathic accuracy pathways in couples and the role of conflict. *Emotion, 17*, 155–168. https://doi.org/10.1037/emo0000220

Senland, A. K., & Higgins-D'Alessandro, A. (2013). Moral reasoning and empathy in adolescents with autism spectrum disorder: Implications for moral education. *Journal of Moral Education, 42*(2), 209-223. https://doi.org/10.1080/03057240.2012.752721

Sherman, S. L., Allen, E. G., Bean, L. H., & Freeman S. B. (2007). Epidemiology of Down syndrome. *Developmental Disabilities Research Reviews, 13*(3), 221-227. https://doi.org/10.1002/mrdd.20157

Sigman, M., & Ruskin, E. (1999). Continuity and change in the social competence of children with autism, Down syndrome, and developmental delays. *Monographs of the Society for Research in Child Development, 64*(1), 1-139. Retrieved from http://www.jstor.org/stable/3181510.

Sullivan, K., Winner, E., & Tager-Flusberg, H. (2003). Can adolescents with Williams syndrome tell the difference between lies and jokes? *Developmental Neuropsychology, 23*, 85–103. https://doi.org/10.1080/87565641.2003.9651888.

Tager-Flusberg, H., & Sullivan, K. (2000). A componential view of theory of mind: Evidence from Williams syndrome. *Cognition, 76*(1), 59-90. https://doi.org/10.1016/S0010-0277(00)00069-X

Thurman, A. J., & Fisher, M. H. (2015). The Williams syndrome social phenotype: Disentangling the contributions of social interest and social difficulties. *International Review of Research in Developmental Disabilities, 49*, 191–227. https://doi.org/10.1016/bs.irrdd.2015.06.002.

Tone, E. B. & Tully, E. C. (2014). Empathy as a "risky strength": A multilevel examination of empathy and risk for internalizing disorders. *Development and Psychopathology, 26*(4), 1547-1565. https://doi.org/10.1017/S0954579414001199

Trimmer, E., McDonald, S., & Rushby, J. A. (2017). Not knowing what I feel: Emotional empathy in autism spectrum disorders. *Autism, 21*(4), 450-457. https://doi.org/10.1177/1362361316648520

Turnbull, A. P., Pereira, L., & Blue-Banning, M. (2000). Teachers as friendship facilitators: Respecto and Personalismo. *Teaching Exceptional Children, 32*(5), 66-70. https://doi.org/10.1177/004005990003200509

van der Fluit, F., Gaffrey, M., & Klein-Tasman, B. P. (2012). Social cognition in Williams syndrome: Relations between performance on the social attribution task and cognitive and behavioral characteristics. *Frontiers in Developmental Psychology, 3*, 197. https://doi.org/10.3389/fpsyg.2012.0019.

van Noorden, T. H. J., Haselager, G. J. T., Cillessen, A. H. N., & Bukowski, W. M. (2015). Empathy and involvement in bullying in children and adolescents: A systematic review. *Journal of Youth and Adolescence, 44*(3), 637-657. https://doi.org/10.1007/s10964-014-0135-6

Waite, J., Heald, M., Wilde, L., Woodcock, K., Welham, A., Adams, D., & Oliver, C. (2014). The importance of understanding the behavioural phenotypes of genetic syndromes associated with intellectual disability. *Paediatrics and Child Health, 24*(10), 468-472. https://doi.org/10.1016/j.paed.2014.05.002

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

CHAPTER 2

Empathy and Social Outcomes for Individuals with Intellectual and Developmental Disabilities: A Systematic Literature Review

The research literature generally classifies social outcomes are as "good", "fair", or "poor" (Levy & Perry, 2011). Individuals with intellectual and developmental disabilities (IDD) have consistently been classified as having "poor" social outcomes (Howlin et al., 2013), suggesting that despite progress in the social inclusion of individuals with IDD, such inclusion has not always led to their improved social experiences (Hughes et al., 2002; Rossetti et al., 2015). In fact, differences in the type of IDD condition may relate to varying social outcomes across diagnoses. Specifically, the different behavioral characteristics of different IDD conditions indicates that one diagnostic group may present different social strengths and weaknesses compared to another IDD group (Waite et al., 2014). Three examples of diagnostic groups with different behavioral phenotypes and potentially different social outcomes include autism spectrum disorder (ASD), Williams syndrome (WS), and Down syndrome (DS).

Social Outcomes for ASD

ASD is typically characterized by delays in the development of social and communication skills (American Psychiatric Association, 2013). Significant advances in interventions targeting the social and communication skills of individuals with ASD across the lifespan have improved certain outcomes such as independent living, education attainment, and employment (Byrd, 2002; Howlin, 2005; Matson & Horovitz, 2010; Shattuck et al., 2007; Shea & Mesibov, 2005), particularly for individuals who are less impacted by ASD symptoms (Cederland et al., 2008; Gilchrist et al., 2001; Howlin, 2005; Shea & Mesibov, 2005). Unfortunately, these interventions do not seem to have the same impact on improving social

relationships. For example, in a meta-analysis of 18 descriptive research studies with 1,768 participants, school-aged boys with ASD reported poorer quality friendships and lower feelings of companionship, help, security, and closeness compared to school-aged boys without disabilities (Mendelson et al., 2016). Past research also suggests poor social outcomes extend to adults with ASD, as they experience limited support networks compared to the typically developing population (Beadle-Brown et al., 2006; Keogh et al, 2004).

Social Outcomes for WS

WS, caused by a micro-deletion of genes on chromosome 7 (Hillier et al., 2003), is a rare genetic disorder that results in borderline to moderate levels of intellectual disability (Mervis & John, 2010). Individuals with WS are generally described as hypersocial, often displaying social inhibition and overfriendliness toward known and unknown individuals (Jawaid et al., 2012; Jones et al., 2000). Despite their reported sociable personality, individuals with WS also experience poor social outcomes. For example, individuals with WS experience interpersonal difficulties that can result in poor peer relationships and social isolation (Davies et al., 1998; Dykens & Rosner, 1999; Fisher et al., 2020; Jawaid et al., 2012). The difficulties individuals with WS experience with developing and maintaining friendships also relate to feelings of loneliness (Davies et al., 1998; Sullivan et al., 2003; Thurman & Fisher, 2015).

Social Outcomes of DS

DS is the most common chromosomal cause of intellectual disability, in most cases due to a third copy of chromosome 21 (i.e., Trisomy 21; Fidler & Nadel, 2007; Sherman et al., 2007). Individuals with DS are often described as charming, social, engaging, and friendly toward others (Dykens, 2000); however, they also experience difficulties in initiating and maintaining conversations (Porter et al., 2007), which may then impact social relationships across the

lifespan. While studies on the social outcomes of DS are sparse in the more current literature, there is some research using parental reports that indicates that adults with DS experience infrequent social communication and interactions with friends (Esbensen et al., 2010).

The Role of Empathy in Social Outcomes

Empathy has long been regarded as a critical factor toward successful social outcomes and interactions (Chow et al., 2013; Cramer & Jowett, 2010; Roberts et al., 2014). Empathy can generally be described as a multicomponent phenomenon consisting of a cognitive component (i.e., the ability to understand another person's emotional state) and an affective component (i.e., the ability to share and respond to another person's emotional state; de Wied et al., 2007). Generally, researchers demonstrate that decreased displays of empathy are correlated with more anti-social behavior such as aggression, whereas better empathy skills may result in more prosocial behaviors (Eisenberg et al., 2010). Overall, the ability to empathize is considered critical for social functioning and wellbeing (de Waal, 2008; Fink et al., 2014; Gaudion et al., 2014) and may ultimately impact social outcomes.

Empathy as a Facilitator of Friendship Development

Developmental theorists have long suggested that meaningful and intimate relationships develop along with empathy and perspective-taking skills (Selman, 1980). Empathy development across the lifespan may also factor into the development of long-term friendships, with some suggesting that empathy is crucial to the maintenance of well-adjusted friendships (Davis, 1996; Davis & Karus, 1991). In fact, studies on children and adolescents in the general population have consistently demonstrated that those who display high levels of empathy report better functioning friendships characterized by more caring, companionship, validation of the

friendship, and fewer conflicts (Clark & Ladd, 2000; Davis & Karus, 1991; Smith & Rose, 2011; Soenens et al., 2007).

Despite theoretical and empirical evidence illustrating the relationship between empathy skills and social outcomes in the general population, it is unclear if empathy skills are similarly related to social outcomes for individuals with IDD. In particular, whether differences in empathy skills are related to differences in social outcomes across different IDD groups, such as ASD, WS, and DS, remains relatively unknown. Therefore, the primary purpose of the current literature review is to examine the relation between empathy skills and social outcomes for these three distinct IDD conditions (i.e., ASD, WS, and DS).

Measurement and Assessment of Empathy

To fully understand the relationship between empathy skills and social outcomes for individuals with different IDD conditions, it is also important to account for the different ways in which empathy is defined and measured. Due to its multidimensional nature, empathy is a challenging construct to measure and assess. The complexity of empathy and its components have resulted in a myriad of different definitions and approaches for measurement (Innamorati et al., 2019). Given that not all measurement approaches will be equal or similar in methods or procedures and may even use different theories at the construct level, this review will also examine how empathy is defined and measured within the IDD population (Davis, 1983; Gerdes & Segal, 2011; Jolliffe & Farrington, 2006).

Purpose of Current Study

Given the relationship between empathy and social outcomes in the general population, we hypothesize that empathy may also be a critical factor in facilitating positive social outcomes for individuals with IDD and that the relationship between empathy and social outcomes may

differ across different IDD conditions such as ASD, WS, and DS. Therefore, the aim of this literature review was to examine the current research on empathy skills and social outcomes for individuals with ASD, WS, and DS by specifically evaluating a) how empathy is measured for each group; b) the reported empathy skills of each group; c) the reported social outcomes of each group; and d) any reported correlations between empathy skills and social outcomes.

To achieve the study aims, the following research questions were used to guide the literature review: (a) In what ways is empathy defined and measured for individuals with ASD, WS, and DS?; (b) What are the reported empathy skills of individuals with ASD, WS, and DS?; (c) What are the reported social outcomes for individuals with ASD, WS, and DS?; and (d) What correlations between empathy skills and social outcomes are reported for each diagnostic group?

Method

Information Sources and Search Strategy

A literature search was conducted in five online databases: Education Full-text, PsycInfo (including PsycARTICLES), ERIC, PubMed, and Sociological Abstracts. The following search terms were entered separately into each database: (a) "empath* AND autis* OR Asperger syndrome"; (b) "empath* AND Williams syndrome"; and (c) "empath* AND Down syndrome." A manual search was also conducted in the top three journals that most frequently appeared during the online database search (*Journal of Autism and Developmental Disabilities*, *Research in Developmental Disabilities*, and *Research in Autism Spectrum Disorders*). After the database and manual search, all articles were screened through a three-step process (described below). The last update of this literature search was conducted on October 13, 2020.

Study Selection

Studies were included in the literature review if they met the following three inclusion criteria. First, participants had to have an ASD diagnosis (e.g., autism or autistic disorder, Asperger's syndrome), WS diagnosis, or a DS diagnosis, as indicated through self-report or a diagnostic assessment. Second, one of the variables of interest in the study had to include empathy or one of its main components (i.e., cognitive empathy, affective empathy). Third, the study had to be published in English in a peer-reviewed journal in 2004 or later. This final inclusion criterion is because the Empathy Quotient (EQ; Baron-Cohen & Wheelwright, 2004), published in 2004, is widely recognized as one of the leading standardized measures of empathy (Fletcher-Watson & Bird, 2020). The EQ has been validated with normative samples of individuals with ASD (Lawrence et al., 2004) and is widely used with other disability conditions. Given the extensive use of the EQ with individuals with IDD and in anticipation that many studies may have frequently used the EQ to measure empathy in individuals with disabilities, only research articles published in or after 2004 were considered for review.

Studies were excluded if they solely used neurology-related tasks (e.g., FMRI) to measure empathy. Systematic literature reviews, think pieces, and dissertations were also excluded. Studies that focused on the empathy of others (e.g., parents, siblings, care staff, peers) toward individuals with IDD were not included in the literature review. Finally, studies that did not explicitly state that they were measuring empathy but instead reported findings of related components of empathy (e.g., facial emotion recognition, theory of mind, perspective-taking) were excluded given that this systematic literature review is specifically focused on empathy and not general or related components.

Following the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement* (Page et al., 2021), trained coders (the first author and three research assistants) determined inclusion of relevant studies through a three-step procedure involving the sequential examination of the titles, abstracts, and full texts. Specifically, a screening form was developed to determine which articles from the database and manual search met inclusion criteria based first on an examination of the titles and abstracts. Two trained reviewers screened all titles and abstracts for relevance. A random sample of 10% of titles and abstracts (n = 442) was then double reviewed by the first author; this is an accepted practice when a review is large and resources are limited (Popay et al., 2006). Interrater reliability was 92.98% and all discrepancies between reviewers were resolved by discussion.

Data Extraction and Synthesis

Information from each full-text article of studies meeting the inclusion criteria was collected using a data extraction form (see Appendix A) designed to address the research questions of this literature review. The following information was extracted from reviewed studies: (1) characteristics of the participants (e.g., diagnosis, gender, ethnicity, age, etc.); (2) study characteristics (e.g., setting, study design); (3) how empathy was defined and measured (e.g., type of empathy skill(s), instrument or method used to measure empathy); (4) reported empathy skills of the participants (if empathy was measured more than one time, only baseline measures of empathy scores were extracted); (5) any reported reliability and validity of measures used to assess empathy; (6) characteristics of the social outcome(s) of interest including type of social outcome(s) reported (e.g., peer interactions, social skills, friendships, etc.); and (7) reports of any relationship between variables of empathy and social outcomes (e.g., correlations between variables or in a regression model). Two research assistants completed data extraction, and the

first author double coded 20% (*n* = 65) of all full-text articles. Interrater reliability was 90.77% and discrepancies between coders were resolved by discussion.

Results

The database search yielded a total of 7,362 articles. After duplicates were removed (*n* = 2,946), 4,416 articles were screened for inclusion based on an examination of the title and abstract. After screening, a total of 326 studies were considered to have met inclusion criteria and were assessed for data extraction through an examination of the full-text articles. Additionally, the manual search of journals yielded 1,031 articles. After removing duplicates and screening for inclusion criteria, an additional 9 articles were identified and examined for full-text data extraction. Following data extraction of the full-text articles, a total final count of 169 articles were included in the systematic literature review (see Figure 1 for the PRISMA diagram). Findings from these manuscripts highlight several key patterns across studies that focused on empathy and social outcomes for individuals with ASD, WS, and DS within the past 15 years (see Appendix B for an overview of all studies included in the study).

Figure 1

PRISMA Flow Diagram of Systematic Literature Review

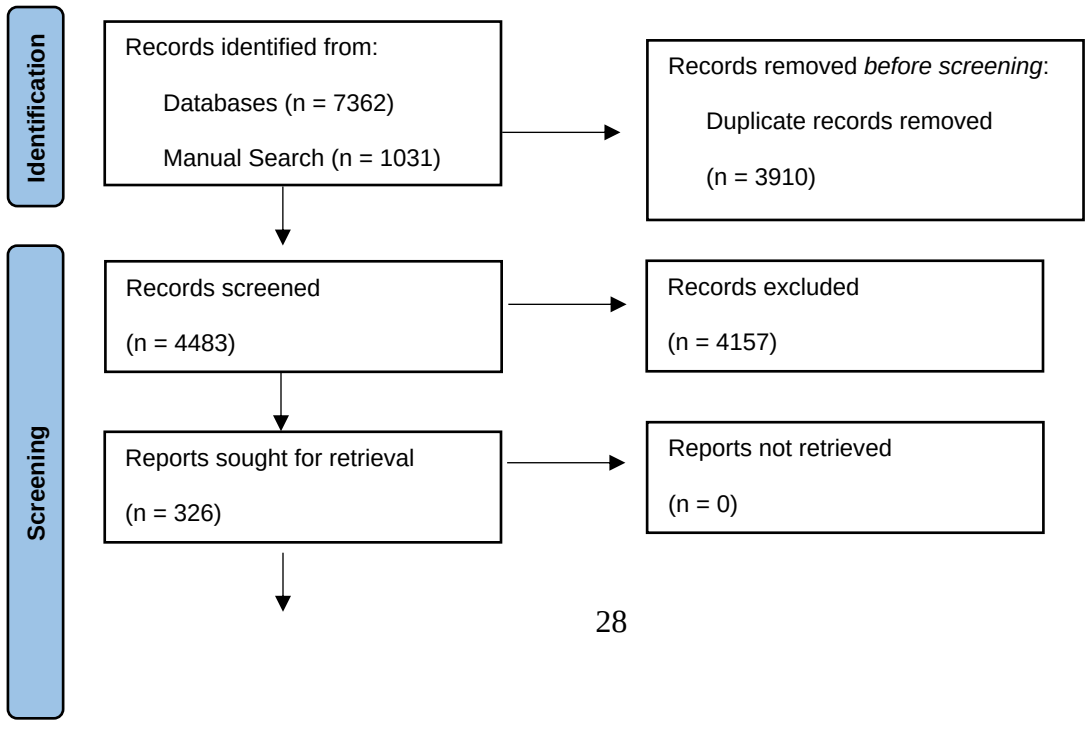
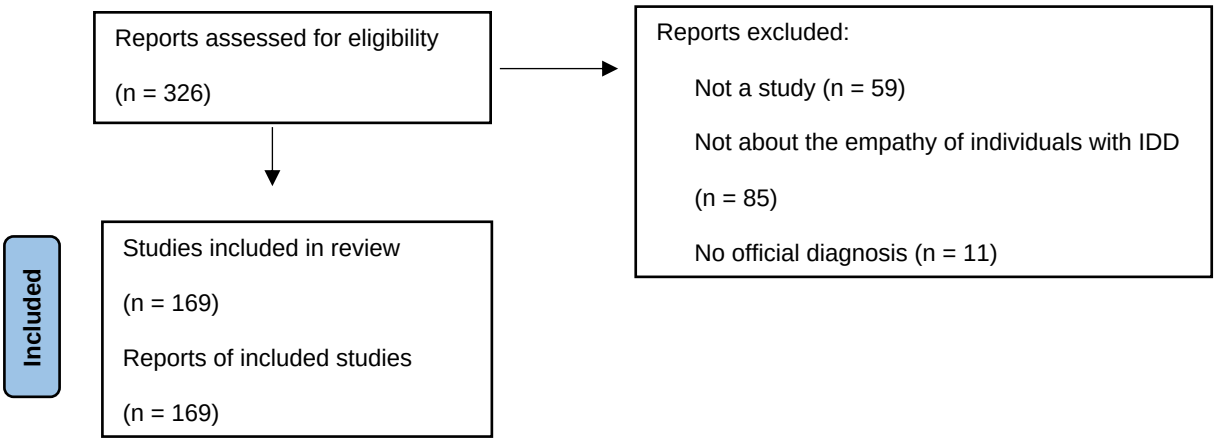


Figure 1 (cont'd)



General Study Characteristics

Of the 169 articles included in this review, 98.2% (n = 166) focused on individuals with ASD and only 3 (1.8%) included individuals with WS and/or DS. In total, there were 48,408 participants with ASD included across studies, whereas there were only 41 participants with WS and 34 participants with DS. These diagnoses were primarily determined through participant self-report to the research team. Overall, the sample sizes across most studies were generally small (e.g., 20s, 30s), with a few studies reporting sample sizes in the hundreds or above (e.g., Grove et al., 2014; Kästner et al., 2015; Sucksmith et al., 2013). Most studies (n = 126; 74.5%) included more males than females in their samples. Only 22 studies (13.0%) reported the race or ethnicity of their sample, with the majority of participants being White and non-Hispanic. The mean age for most samples was in the adolescent or adulthood range; a few studies recruited participants in younger age groups (e.g., toddlers) or in age groups above 50 years old.

In terms of setting, a majority of the studies were conducted in Western countries (e.g., United States, Canada, United Kingdom) and data were most often collected in a university research lab or similar university setting (*n* = 112; 65.5% of studies). A majority of the studies (*n*

= 147; 84.6%) used a group quasi-experimental or experimental design; a smaller number of studies used a single-case experimental design study (*n* = 11; 6.5%), qualitative methods (*n* = 5; 2.9%), or a mixed-methods approach (*n* = 2; 1.2%).

Research Question 1: Definition and Measurement of Empathy

All studies included some form of description or definition of empathy either in the introduction or method section of the article. Some studies provided general definitions of empathy, such as feeling concern for another person's distress and a desire to intervene (e.g., Campbell et al., 2015) and a contextually appropriate response to a person's display of emotion (e.g., Schrandt et al., 2009). Other studies, however, distinguished between cognitive and affective empathy and used various definitions to define these constructs. Examples of definitions for cognitive empathy include the capacity for self-other distinction (e.g., Bird et al., 2010), reflection about other people's mental states and explicit self-assessment of the individual's own emotions (e.g., Schulte-Rüther et al., 2014), and the ability to understand another person's emotional state (e.g., Dziobek et al., 2008). Affective empathy was defined in several ways, including the degree to which an individual experiences feelings of compassion toward another person's emotional state (e.g., Davis, 1980), sharing in the feelings of others (e.g., Peterson, 2014), and the drive to respond appropriately to another person's emotional state (e.g., Baron-Cohen, 2003).

Overall, 64 unique measures (including author-created measures) were used to assess empathy across the studies and standardized or psychometrically-sound measures were most often used (see Table 1 for overview of primary measures used). The two most frequently used measures were the Empathy Quotient (EQ; Baron-Cohen et al., 2004) and the Interpersonal Reactivity Index (IRI; Davis, 1980). The EQ is a 60-item self-report questionnaire with a Likert

format consisting of a list of statements about real life situations or experiences where empathy may be required (Baron-Cohen & Wheelwright, 2004). Unlike other measures of empathy, the EQ does not distinguish between cognitive or affective empathy.

Table 1

Overview of Top Measures Used to Assess Empathy

Name of Measure	Type of Measure	Type of Empathy Measured	Empathy Definition
Empathy Quotient (EQ; Baron-Cohen & Wheelwright, 2004)	Self-Report Parent proxy-report	Cognitive Empathy Affective Empathy	An individual's drive to identify another person's emotions and thoughts and to provide an appropriate emotional response to his or her emotional state. Both cognitive and affective co-occur and as such, the EQ provides a total empathy score.
Interpersonal Reactivity Index (IRI; Davis, 1980)	Self-report	Empathic Concern	The capacity to form an emotional response (e.g., warmth, compassion, concern to the emotional state of another person). The IRI consists of other subscales related to empathy including perspective taking, fantasy, and personal distress.
Griffith Empathy Measure (GEM; Dadds et al., 2008)	Parent proxy-report	Cognitive Empathy Affective Empathy	Cognitive empathy is understanding another's emotional state while affective empathy is experiencing and emotionally responding to another's emotional state. The GEM does provide sub-scale scores for cognitive and affective empathy.
Basic Empathy Scale (BES; Jolliffe & Farrington, 2006)	Self-report	Cognitive Empathy Affective Empathy	Cognitive empathy is defined as the understanding of another person's affective state and affective empathy is defined as the ability to feel an appropriate response when on is confronted with the mental state of another person. The BES focuses on four basic emotions (i.e., anger, fear, happiness, sadness).

Rather, the EQ provides a total score of empathy (max score = 80) with higher scores indicating higher displays of empathy. While Baron-Cohen and Wheelwright acknowledge that empathy consists of cognitive and affective components, they believe both components co-occur and cannot easily be distinguished from one another (Baron-Cohen & Wheelwright, 2004).

On the other hand, the IRI consists of four seven-item subscales including perspective-taking, empathic concern, personal distress, and fantasy, with responses set to a 5-point Likert scale (Davis, 1980). The perspective-taking sub-scale assesses an individual's ability to imagine the cognitive viewpoint of others. The fantasy sub-scale measures an individual's tendency to emotionally relate to fictional characters depicted in different media such as books and movies. The empathic concern subscale assesses an individual's capacity to form a response to another person's emotional state. Finally, the personal distress subscale measures the extent to which an individual forms a self-centered emotional response to another person's emotional state. Out of all the subscales, the perspective-taking and empathic concern subscales are considered the most appropriate approximations of cognitive and affective empathy, respectively (Davis, 1983).

Research Question 2: Reported Empathy Skills

Across studies, individuals with ASD performed lower on empathy-related measures compared to other groups (e.g., attention-deficit hyperactivity disorder, individuals without disabilities). On the EQ, individuals with ASD generally reported lower empathy scores compared to typically developing control groups. These lower EQ scores were often significantly correlated with higher scores on measures assessing for autism symptomatology such as the Autism Quotient (e.g., Paulus et al., 2013), indicating poorer empathy skills are related to more autistic symptoms. Sex differences were also reported in studies using the EQ, with some studies demonstrating that females with ASD reported significantly higher scores on the EQ (e.g., higher empathy skills) than males with ASD (e.g., Grove et al., 2015).

On the IRI, individuals with ASD were rated significantly lower than control groups on various sub-scales of empathy, including perspective-taking and empathic concern (e.g., Bos & Stokes, 2019; Rogers et al., 2007). Interestingly, several studies demonstrated that individuals

with ASD scored higher on the personal distress subscale of the IRI (e.g., Brewer et al., 2017; Hagenmuller et al., 2014; Minio-Paluello et al., 2009). This particular sub-scale is defined as being distressed over problematic interactions with others, suggesting that individuals with ASD may experience higher personal distress with social interactions compared to other groups. Similar results were reported in age groups as young as adolescence with a few studies reporting that adolescents with ASD scored significantly lower on the perspective-taking subscale but scored higher on the personal distress subscale of the IRI.

While many studies reported that individuals with ASD generally performed lower on empathy-related tasks, other studies reported more nuanced findings. A few studies highlighted that any differences in empathy observed between individuals with ASD and other groups may be related to challenges in cognitive empathy rather than affective empathy. For example, in their study of children with ASD, Deschamps et al. (2014) reported that both parents and teachers rated children with ASD lower on cognitive empathy compared to affective empathy and these differences remained when the children with ASD were also compared to a typically developing control group. Similar results were also reported for adults with ASD (e.g., Dziobek et al., 2008).

Few studies reported on the empathy skills of individuals with WS and DS. Of the three studies that did include these groups (n = 1 study for WS; n = 1 study included both ASD and DS; n = 1 study included both WS and DS), the findings indicate that individuals with WS and DS performed well on empathy-related tasks. For example, Plesa Skwerer & Tager-Flusberg (2016) demonstrated that both children with WS and DS consistently scored higher on an empathy-related task of helpfulness compared to a typically developing control group, who scored average ratings of overall empathy. However, Plesa Skwerer & Tager-Flusberg (2106) noted that while children with WS and DS displayed higher ratings of empathy, they also scored

lower on overall helpfulness, suggesting that higher displays of empathy may not necessarily translate to other social skills or outcomes.

Other studies reported interesting associations between empathy and various domains. In their study examining fetal testosterone, hypersociability, empathy skills, anxiety, and autistic symptoms of 25 individuals with WS, Osório et al. (2019) reported lower fetal testosterone was significantly associated with hypersociability and affective empathy while cognitive empathy was only marginally and negatively correlated with fetal testosterone. Finally, in their study examining how the familiarity of a person and emotional context may influence the empathic responding of children with ASD and DS, Hurdy & Slaughter (2009) reported that all participants (including a TD control group) were more likely to respond empathically to a familiar person; although, the nature of children's responses varied depending on emotional context.

Research Question 3: Reported Social Outcomes

Only a handful of studies (*n* = 36, 21.3%) about empathy also examined the social outcomes of individuals with ASD, and no studies included an examination of social outcomes for individuals with WS or DS. Of the 36 studies that included social outcomes of individuals with ASD, 77.8% examined social skills (*n* = 28), 22.2% examined friendship outcomes (*n* = 8), and 27.8% examined peer interactions (*n* = 10). Overall, studies reported poorer social outcomes for individuals with ASD compared to other groups. For instance, Alvarez-Fernandez et al. (2017) examined the perceived social supports (e.g., friends, family, and significant others) of 49 adults with ASD and reported lower ratings on friendship outcomes compared to other groups, including individuals with attention deficit hyperactivity disorder and individuals without disabilities. A few qualitative and mixed method studies also highlighted some key concerns

regarding social outcomes for individuals with ASD. Using a mixed method design, Senland and Higgins-D'Alessandro (2016) explored sociomoral reasoning, empathy, and challenging and supporting factors during the transition to adulthood for 22 young adults with ASD and reported that some participants admitted to struggling with perspective-taking, specifically when it comes to conflict resolution between friends and family.

Research Question 4: Relationship between Empathy and Social Outcomes

Of the few studies that examined social outcomes for individuals with ASD, even fewer studies explored the relationship between social outcomes and empathy (n = 14; 8.28%). Generally, these studies reported that empathy was significantly related to social outcomes across different age groups. Some studies reported on the role of empathy in challenging sociomoral situations (e.g., concerns about justice, rights, and welfare) that involved helping others. For example, in the same mixed methods study described above, Senland & Higgins-D'Alessandro (2016)'s results suggested that the control group were more likely than the ASD group to use perspective-taking and empathic concern to describe, reason, and reflect on challenging sociomoral situations. Other studies noted the mediating role of empathy skills (e.g., perspective-taking and empathic concern) on the individual's happiness and positive affect (e.g., Rueda et al., 2014). As with social outcomes, no studies included in this review reported on the relationship between empathy and social outcomes for individuals with WS or DS.

Discussion

Conducted to identify the extent of the research that has evaluated empathy skills and their relation to social outcomes for individuals with ASD, WS, and DS, this study reviewed the existing literature on empathy across the three diagnostic conditions. The results of this review demonstrate the advances made in our understanding of empathy and social outcomes for

individuals with ASD, WS, and DS while also highlighting areas for future research. Three main findings arose from this study.

First, although a large body of research has examined empathy skills and social outcomes for individuals with ASD, there is a need for additional research evaluating the empathy and social outcomes of individuals with WS and DS. The lack of research between empathy and social outcomes for individuals with WS and DS may be due to the friendly and personable social behavioral phenotype of these groups (e.g., Dykens, 2006; Fidler et al., 2005; Järvinen-Pasley et al., 2010; Jones et al., 2000), as there may be an assumption that such a behavioral phenotype would then correspond to positive social outcomes. However, given that the social outcomes of these groups are often described as poor (e.g., Esbensen et al., 2010; Porter et al., 2007), additional research is warranted to identify whether and how empathy skills are related to social outcomes for individuals with WS and DS.

Second, a majority of the studies in this systematic literature review reported that individuals with ASD experience challenges in empathy skills, whereas the relatively few studies to include individuals with WS and DS indicated they perform relatively well on empathy-related tasks and measures. Such differences in empathy skills between individuals with ASD and individuals with WS and DS may stem from differences in their social behavioral phenotypes. Given that individuals with ASD often experience impairments in various social domains, these deficits may extend to poorer empathy skills. In the general research literature, empathy skills are often described as interdependent with other important social skills such as social awareness, emotion regulation, and perspective-taking (Barr & Higgins-D'Alessandro, 2009; Decety & Jackson, 2004; Eisenberg, 2007). For individuals with ASD, impairments in

various social domains (e.g., perspective-taking) may negatively impact their empathy skills resulting in lower performance on different tasks and measures.

Additionally, several studies which used the IRI to assess the empathy skills of individuals with ASD demonstrated that both adults and adolescents with ASD reported greater personal distress over problematic interactions with others compared to typically developing groups. Such findings suggest that across age groups, individuals with ASD may experience higher levels of discomfort or anxiety in tense social situations, which may then impact their ability to empathize with others. These reports of greater personal distress coincide with a more current focus on reporting empathy skills from the lived experiences of the individuals with ASD. For example, in published personal accounts, individuals with ASD describe experiencing 'intense, uncontrollable empathy' (Williams, 1998, p. 59) and a 'hyperarousal of the empathic system…' (Elcheson et al., 2018, p. 189). Therefore, lower performances on empathy related tasks and measures may stem from greater distress or overstimulation for individuals with ASD rather than any actual deficits. Further research is warranted to examine the empathy skills of individuals with ASD from the perspective of their lived experiences.

The findings from the IRI also coincide with more recent research suggesting that rather than *lacking* empathy skills, individuals with ASD experience and express empathy *differently* than individuals without ASD (Mitchell et al., 2021). Referred to as the 'double empathy problem', more researchers are exploring differences, rather than deficits, in empathy skills between individuals with and without ASD (e.g., Crompton et al., 2019; Heasman & Gilliespie, 2019). This view differs from prominent theories which historically adopted a medical model and framed challenges in empathy for individuals with ASD as deficits (e.g., Baron-Cohen et al., 1985). As such, current measures of empathy may be inadequate as they aim to assess deficits

rather than differences in empathy skills between individuals with and without ASD. Thus, there is a need to develop measures that function to draw out and identify the empathy skills of individuals with ASD rather than solely focusing on potential challenges.

In contrast to those with ASD, individuals with WS and DS are reported to perform well on empathy-related tasks. This performance is not surprising, given that their social behavioral phenotypes are generally described as friendly and amicable in nature. Still, given the small number of studies to examine empathy in WS and DS, these results should be interpreted with caution and additional research is needed to better understand the relation between the behavioral phenotypes of these conditions and the poor social outcomes they experience.

Third, the use of self-report measures to assess empathy has important implications for interpretation and generalization of study findings. First, while self-report measures are quick and inexpensive, there are some limitations with their use. Self-report measures can be dependent on participants' perceptions of themselves and their ability to understand the questions that are being asked (Borgers & Hox, 2004). Given the widely held notion that individuals with ASD present with challenges in empathy, individuals with ASD may be influenced to report such challenges even when they do express or feel empathic concern towards others (Fletcher-Watson & Bird, 2020). Such a possibility may confound the interpretation and generalization of empathy skills for individuals with ASD, including any perceived improvements from intervention or treatment.

The use of other forms of measurement may assist in providing a more accurate picture of the empathy skills of individuals with IDD, including those with ASD. For example, given that younger age groups were underrepresented in this literature review and self-report measures from young children may be complicated by several confounding variables (Bryne, 1996),

researchers may rely on teacher- or parent-reported measures of empathy to better approximate the empathy skills of younger individuals with IDD. Teacher- and parent-reported measures can serve as proxies for younger age groups, particularly for identification of certain skills and abilities (Renk & Phares, 2004; Yoder & McDuffie, 2006) and are essential for intervention purposes to assess if certain skills or abilities are maintained and generalized within different settings and contexts (Yoder & McDuffie, 2006).

Beyond proxy-reports from teachers and parents, experimental measures of empathy such as behavioral or observational tasks may also provide a broader picture of the empathy skills of individuals with IDD. For example, used as a proxy to assess cognitive empathy, Channell and colleagues (2014) developed an emotion knowledge task for children with DS that measured the ability to accurately identify the emotional state of others by different social cues using video clips. Given the potential limitations of self-report measures for young children, more experimental measures may provide a more accurate representation of the empathy skills of children with IDD.

Limitations

While this systematic literature review describes and provides an overview of empathy skills in relation to social outcomes for individuals with ASD, WS, and DS over the past 15 years, there are several limitations to consider. Most notably, the current literature review did not examine the quality of the studies included in the final count; therefore, the methodological rigor of the final included articles is currently unknown. Additionally, given the differences in measurement and that not all included studies were interventions, the certainty or confidence in the body of evidence (e.g., effect sizes) was not examined in this literature review. Given that the aim of this literature review was to generally examine the empathy skills of individuals with

ASD, WS, and DS, only empathy skills before intervention implementation were considered for this review as well. Certainty assessments as outlined in the PRISMA statement (Page et al., 2021) would further strengthen interpretation of the findings in this systematic literature review. Other limitations include the exclusion of studies not written in English and not published in peer reviewed journals, which may have resulted in potentially missed studies (e.g., some articles were dissertations that included individuals with WS and DS but were not published in a peer reviewed journal and were excluded in the current literature review).

Future Directions

The findings from this review point to critical areas for future research. First, there is a need to recruit more representative samples. The studies included in this systematic literature review lacked representation of female participants and other IDD conditions such as WS and DS. Few studies reported on the race and ethnicity of their sample, and among those that did, most samples were majority White. In addition, most studies focused on older age groups such as adolescents and adults. Very few examined the same phenomenon with younger age groups. More representative samples in studies will ensure that the results can be generalized to other individuals within the population and help improve our overall understanding of empathy and social outcomes. Additionally, the lack of examination of empathy skills in relation to social outcomes, as demonstrated in the current review, indicates that further research is warranted to examine whether interventions targeting empathy skills can improve social outcomes for individuals with IDD (i.e., measuring the effects of the intervention beyond the immediate treatment or behavioral goals). A meta-analysis of interventions targeting empathy skills would further strengthen our knowledge on the effectiveness of these interventions on improving social outcomes such as friendships and romantic relationships for individuals with IDD.

This systematic literature review demonstrates that empathy plays a critical role in the development of positive social outcomes and related social skills for individuals with ASD. However, knowledge of the role of empathy in promoting positive social outcomes for individuals with WS and DS is limited. Further examination of empathy in the IDD population is warranted to ensure that individuals of all abilities have the skills necessary to achieve more positive social outcomes, including meaningful friendships and relationships. Given that friendships and relationships are critical to an individual's mental health and well-being (Hefner & Eisenberg, 2009; Wilkinson & Marmot, 2003), ensuring that individuals with IDD develop more positive social outcomes ultimately helps to promote a healthy quality of life.

APPENDICES

Appendix A Data Extraction Form for Reviewing Full-Text Articles

Empathy and Social Outcomes Literature Review: Data Extraction

The purpose of this literature review is to examine the current research on how empathy skill of those diagnosed with ASD, Down syndrome, and Williams syndrome are related to social outcomes (e.g., friendships). For each article, please use this form to extra the data we need to answer our research questions below.

(i) What are the reported empathy skills of individuals with ASD, DS, and WS?
(ii) In what ways is empathy defined and measured for each diagnostic group?
(iii) What are the reported social outcomes for individuals with ASD, DS, and WS?
(iv) Are correlations between empathy skills and social outcomes reported for each diagnostic group?

Generally speaking, at this stage of the literature review, you will need to review the entire article.

* Required

1. Who is screening this article? *

Mark only one oval.

- ◯ CJ
- ◯ EC
- ◯ EG

2. From which database are you rating this article? *

Mark only one oval.

- ◯ Education Full-Text
- ◯ PsychINFO (including PsycARTICLES)
- ◯ ERIC
- ◯ PubMed
- ◯ Sociological Abstracts
- ◯ Article for Training
- ◯ Journal of Autism and Developmental Disabilities
- ◯ Research in Developmental Disabilities
- ◯ Research in Autism Spectrum Disorders

3. Copy and paste the citation. TIP: Copy and paste article title in Google Scholar and use citation function (the one with quotation marks) and use the APA citation. *

4. Looking through the full-text article, is it a study (i.e., has an intro, methods, results, and discussion section)? Exclude other systematic literature reviews, meta-analyses, think pieces, opinion articles, or dissertations. *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

5. Carefully review the methods section of the article. Does the study measure the empathy of individuals with disabilities (e.g., cognitive empathy and affective empathy)? At this stage of the literature review, only articles that SPECIFICALLY state they measured for empathy should be included. Exclude articles focused on the empathy of others towards individuals with disabilities (e.g., parents, siblings, care staff, other peers, etc.), emotional disturbance (e.g., anxiety disorder, bipolar disorder, and conduct disorders), facial emotion recognition, and theory of mind. Also exclude studies that only used the brain to measure empathy (e.g., fMRI scans). *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe/Unsure

Sample Characteristics

6. What was the sample size? If a group design, please also include the control or typically developing group. Also exclude other conditions or groups not pertaining to this literature review (e.g., ADHD) for now. There will be a question later in the form regarding other conditions/groups. *

7. Did the authors report gender breakdown? If yes, report the number/percentage or another numerical value provided of males and females. If no, put N/A. If a group design, please also include the control or typically developing group. Also exclude other conditions or groups not pertaining to this literature review (e.g., ADHD) for now. There will be question later in the form regarding other conditions/groups. *

8. Did the authors report the race of the participants or mention diversity of the sample? (White, Black/AA, American Indian/Alaska Native, Asian, Native Hawaiian/Pacific Islander, Unknown) *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

9. What country did the study take place in? *

10. What setting was the study conducted in? *

Check all that apply.

- [ ] Research lab/center or other research university setting
- [ ] Clinic or Therapy setting
- [ ] Classroom/School
- [ ] Home/residence
- [ ] Online
- [ ] Unclear/Not explicitly stated
- [ ] Snail Mail
- [ ] Other: _____

11. What was the mean age of the participants? If not reported or not applicable, put N/A. If a group design, please also include the control or typically developing group. If possible, you can calculate mean age if study does not specify it. *

_____

_____

_____

_____

_____

12. What was the age range (e.g., 18-45, 10-15, etc.) If not reported or not applicable, put N/A. If a group design, please also include the control or typically developing group. Also exclude other conditions or groups not pertaining to this literature review (e.g., ADHD) for now. There will be question later in the form regarding other conditions/groups. If possible, you can determine age range if study does not specify it. *

_____

_____

_____

_____

_____

13. What is the diagnosis of the participants? *

Check all that apply.

- [ ] ASD
- [ ] Down syndrome
- [ ] Williams syndrome
- [ ] Other: _____

14. How was the diagnosis determined? *

Mark only one oval.

- ( ) Self-reported by participants (e.g., like in a demographics form or reported outside diagnosis like a clinical or genetic testing report)
- ( ) Diagnostic assessment/battery conducted by study team
- ( ) Multiple sources (e.g., combination of self report and diagnostic assessment by study team)
- ( ) Measured autistic traits/characteristics but not professionally or officially diagnosed
- ( ) Determined by special education placement (e.g., participants already receiving special education services under ASD category or intellectual disability category)
- ( ) Participants were diagnosed later in the study and they were reported in the results
- ( ) Participants were diagnosed later in the study but they were NOT reported in the results
- ( ) Other: _____

Skip to question 15

Study Design and Methods

15. What is the study design? *

Mark only one oval.

- ◯ Group Quasi-Experimental or Experimental Design (participants are allocated to different groups in the experiment like an experimental group vs. control group)
- ◯ Singe-Case Experimental Design (participant serves as his/her own control to account for individual differences compared to group design which accounts for averages)
- ◯ Qualitative research design (a systematic subjective approach used to describe life experiences and give them meaning using interviews, field notes, journals, logs, etc.)
- ◯ Mixed methods ("mixing" both quantitative like group experimental design and qualitative research and methods in one study to understand a research problem)
- ◯ Not Sure
- ◯ Other: _____

16. What type of measure or approach was used in the study to assess empathy? If more than one measure/approach, enter one at a time. You will prompted at the end of the section to indicate if more than one measure/approach was used in the study and if so, fill out information for each measure/approach. NOTE: Only report measures that specifically state it is assessing for empathy. Exclude measures that do not explicitly state empathy as one of their variables of interest (e.g., theory of mind tasks, facial recognition tasks). For single-case experimental design (SCED) articles, just focus on the dependent variable or the outcome measure. For SCED articles, ignore the independent variable or intervention even if it has an empathy component to it. *

Mark only one oval.

- ◯ Self-report
- ◯ Parent-report
- ◯ Teacher-report
- ◯ Behavioral/Observational Coding (e.g., observing students at lunchtime)
- ◯ Thematic analysis of codes (e.g., empathy is included as a theme, pattern, or code in the results section)
- ◯ Other: _____

17. How was the measure for empathy derived? *

Mark only one oval.

- ◯ Standardized/Psychometrically sound measure (e.g., Empathy Quotient)
- ◯ Researcher-created measure
- ◯ Both standardized and Research-created measure (generally for validity/reliability studies)
- ◯ Not applicable as the study used qualitative methods
- ◯ Other: _____

18. What type of empathy is addressed in the measure/approach? *

Mark only one oval.

- ◯ Cognitive Empathy: Understanding the emotional state of others
- ◯ Affective Empathy: Responding to the emotional state of others
- ◯ Both
- ◯ Not explicitly stated or unclear
- ◯ General empathy (i.e., article discusses empathy in general terms rather than breaking it down to different types or categories)
- ◯ Other: _____

19. What is the name of the measure for empathy? Please provide the citation if available. If created by the researchers, you may put "author-created". This is typically for standardized measures. Put N/A if not provided or not applicable. EX: Empathy Quotient (Baron-Cohen et al., 2004) *

_____

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_____

20. How was empathy defined? If the article does not report the definition used in the measure (typically in the method section), report any definitions referenced in the introduction section--you may just copy and paste. Please also indicate which section of the article (e.g., intro, methods) definition is from. If the article provides no definition at all, please put N/A. *

_____

_____

_____

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21. If reliability of the measure was reported (e.g., Cronbach's alpha for standardized measures or inter-rater reliability for behavioral observations/coding), put here. Put N/A if not provided or not applicable. *

22. Does the study have more than one measure or assessment of empathy? *

Mark only one oval.

- ◯ No *Skip to question 43*
- ◯ Yes
- ◯ Maybe

Second empathy measure/approach

Only fill out this section if the study used more than one measure or approach for empathy.

23. Indicate what other type of measure or approach was used in the study to assess empathy below. NOTE: Only report measures that specifically state it is assessing for empathy. Exclude measures that do not explicitly state empathy as one of their variables of interest (e.g., theory of mind tasks, facial recognition tasks). For single-case experimental design (SCED) articles, just focus on the dependent variable or the outcome measure. For SCED articles, ignore the independent variable or intervention even if it has an empathy component to it. *

Mark only one oval.

- ◯ Self-report
- ◯ Parent-report
- ◯ Teacher-report
- ◯ Behavioral/Observational Coding (e.g., observing students at lunchtime)
- ◯ Thematic analysis of codes (e.g., empathy is included as a theme, pattern, or code in the results section)
- ◯ Other: _____

24. How was this measure for empathy derived? *

Mark only one oval.

- ◯ Standardized/Psychometrically sound measure (e.g., Empathy Quotient)
- ◯ Researcher-created measure
- ◯ Both standardized and Research-created measure (generally for validity/reliability studies)
- ◯ Not applicable as the study used qualitative methods
- ◯ Other: _____

25. What type of empathy is addressed in this measure/approach? *

Mark only one oval.

- ◯ Cognitive Empathy: Understanding the emotional state of others
- ◯ Affective Empathy: Responding to the emotional state of others
- ◯ Both
- ◯ Not explicitly stated or unclear
- ◯ General empathy (i.e., article discusses empathy in general terms rather than breaking it down to different types or categories)
- ◯ Other: _____

26. What is the name for this measure for empathy? Please provide the citation if available. If created by the researchers, you may put "author-created". This is typically for standardized measures. Put N/A if not provided or not applicable. EX: Empathy Quotient (Baron-Cohen et al., 2004) *

_____

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27. How was empathy defined in this measure? If the article does not report the definition used in this measure (typically in the method section), report any definitions referenced in the introduction section--you may just copy and paste. Please also indicate which section of the article (e.g., intro, methods) definition is from. If the article provides no definition at all, please put N/A. *

_____

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_____

_____

_____

28. If reliability of the measure was reported (e.g., Cronbach's alpha for standardized measures or inter-rater reliability for behavioral observations/coding), put here. Put N/A if not provided or not applicable. *

_____

29. Does the study use another measure or assessment of empathy? *

Mark only one oval.

- ◯ No *Skip to question 43*
- ◯ Yes
- ◯ Maybe

Third empathy measure/approach

Only fill out this section if the study used a third measure or approach for empathy.

30. Indicate what other type of measure or approach was used in the study to assess empathy below. NOTE: Only report measures that specifically state it is assessing for empathy. Exclude measures that do not explicitly state empathy as one of their variables of interest (e.g., theory of mind tasks, facial recognition tasks). For single-case experimental design (SCED) articles, just focus on the dependent variable or the outcome measure. For SCED articles, ignore the independent variable or intervention even if it has an empathy component to it. *

Mark only one oval.

- ◯ Self-report
- ◯ Parent-report
- ◯ Teacher-report
- ◯ Behavioral/Observational Coding (e.g., observing students at lunchtime)
- ◯ Thematic analysis of codes (e.g., empathy is included as a theme, pattern, or code in the results section)
- ◯ Other: _____

31. How was this measure for empathy derived? *

Mark only one oval.

- ◯ Standardized/Psychometrically sound measure (e.g., Empathy Quotient)
- ◯ Researcher-created measure
- ◯ Both standardized and Research-created measure (generally for validity/reliability studies)
- ◯ Not applicable as the study used qualitative methods
- ◯ Other: _____

32. What type of empathy is addressed in this measure/approach? *

Mark only one oval.

- ◯ Cognitive Empathy: Understanding the emotional state of others
- ◯ Affective Empathy: Responding to the emotional state of others
- ◯ Both
- ◯ Not explicitly stated or unclear
- ◯ General empathy (i.e., article discusses empathy in general terms rather than breaking it down to different types or categories)
- ◯ Other: _____

33. What is the name for this measure for empathy? Please provide the citation if available. If created by the researchers, you may put "author-created". This is typically for standardized measures. Put N/A if not provided or not applicable. EX: Empathy Quotient (Baron-Cohen et al., 2004) *

_____

_____

_____

_____

_____

34. How was empathy defined in this measure? If the article does not report the definition used in this measure (typically in the method section), report any definitions referenced in the introduction section--you may just copy and paste. Please also indicate which section of the article (e.g., intro, methods) definition is from. If the article provides no definition at all, please put N/A. *

35. If reliability of the measure was reported (e.g., Cronbach's alpha for standardized measures or inter-rater reliability for behavioral observations/coding), put here. Put N/A if not provided or not applicable. *

36. Does the study use another measure or assessment of empathy? *

Mark only one oval.

- No *Skip to question 43*
- Yes
- Maybe

Fourth empathy measure/approach

Only fill out this section if the study used a fourth measure or approach for empathy.

37. Indicate what other type of measure or approach was used in the study to assess empathy below. NOTE: Only report measures that specifically state it is assessing for empathy. Exclude measures that do not explicitly state empathy as one of their variables of interest (e.g., theory of mind tasks, facial recognition tasks). For single-case experimental design (SCED) articles, just focus on the dependent variable or the outcome measure. For SCED articles, ignore the independent variable or intervention even if it has an empathy component to it. *

Mark only one oval.

- ◯ Self-report
- ◯ Parent-report
- ◯ Teacher-report
- ◯ Behavioral/Observational Coding (e.g., observing students at lunchtime)
- ◯ Thematic analysis of codes (e.g., empathy is included as a theme, pattern, or code in the results section)
- ◯ Other: _____

38. How was this measure for empathy derived? *

Mark only one oval.

- ◯ Standardized/Psychometrically sound measure (e.g., Empathy Quotient)
- ◯ Researcher-created measure
- ◯ Both standardized and Research-created measure (generally for validity/reliability studies)
- ◯ Not applicable as the study used qualitative methods
- ◯ Other: _____

39. What type of empathy is addressed in this measure/approach? *

Mark only one oval.

- ◯ Cognitive Empathy: Understanding the emotional state of others
- ◯ Affective Empathy: Responding to the emotional state of others
- ◯ Both
- ◯ Not explicitly stated or unclear
- ◯ General empathy (i.e., article discusses empathy in general terms rather than breaking it down to different types or categories)
- ◯ Other: _____

40. What is the name for this measure for empathy? Please provide the citation if available. If created by the researchers, you may put "author-created". This is typically for standardized measures. Put N/A if not provided or not applicable. EX: Empathy Quotient (Baron-Cohen et al., 2004) *

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41. How was empathy defined in this measure? If the article does not report the definition used in this measure (typically in the method section), report any definitions referenced in the introduction section--you may just copy and paste. Please also indicate which section of the article (e.g., intro, methods) definition is from. If the article provides no definition at all, please put N/A. *

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42. If reliability of the measure was reported (e.g., Cronbach's alpha for standardized measures or inter-rater reliability for behavioral observations/coding), put here. Put N/A if not provided or not applicable. *

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Study Results: Empathy

43. What are the reported outcomes for empathy? If the article is an intervention study, report empathy skills BEFORE implementation of intervention (e.g., baseline data). If the study used more than one measure of empathy, report the results from ALL measures here. You may copy and paste from the article. *

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44. Did this study report on any social outcomes (e.g., friendships, relationships, etc.)? *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe
- ◯ Other: _____

Study Results: Social Outcomes

45. What social outcome(s) were measured in the study? Check all that apply. *

Check all that apply.

- [ ] Friendship
- [ ] Romantic Relationship
- [ ] Victimization (e.g., bullying, rejection)
- [ ] Peer Interactions
- [ ] Family relations (e.g, sibling relationship)
- [ ] Social skills (e.g., turn-taking in conversation)
- [ ] Other: _____

46. What were the reported social outcome(s)? If the article is an intervention study, report the social outcomes BEFORE implementation of intervention. You may copy and paste from the article. *

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47. Was empathy and social outcomes related to each other in any way (e.g, correlations between empathy and social outcome variables)? If the study is an intervention, it is ok to report if empathy skills related to social outcomes BEFORE and/or AFTER intervention. *

Mark only one oval.

- ◯ Yes
- ◯ No *Skip to question 49*
- ◯ Other: _____

Study Results: Relation between empathy & social outcomes

48. If yes, what were the results of the relation between empathy and social outcomes? This can typically be found in the results or discussion section. You may copy and paste from the article. *

Additional Conditions/Groups

49. Was there another group/condition besides autism, Williams syndrome, Down syndrome, and a typically-developing control group reported in the study? *

Mark only one oval.

- Yes
- No
- Maybe/Unsure

More info about additional groups

50. What was the additional group or condition? If more than one, report all that were included in the study. *

51. What were the reported results for the additional group(s)/conditions(s)? You may copy and paste from the results section. *

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Appendix B Table 2: Overview of Studies Examining Empathy and Social Outcomes for Individuals with Intellectual and Developmental Disabilities

Authors	Sample	Type(s) of Empathy	Measure(s)	Results
Adler et al. (2015)	ASD: 17 TD: 24	Empathic embarrassment Empathic traits (e.g., empathic concern, personal distress)	"Baum-circle" (Koch & Harvey, 2012) Interpersonal Reactivity Index (Davis, 1980)	Empathic concern predicted empathic embarrassment for the TD control group while personal distress predicted empathic embarrassment for the ASD group.
Alkire et al. (2021)	ASD: 49 TD: 50	Affective Empathy	Abbreviated-version Cambridge Behavior Scale Empathy Quotient (Baron-Cohen et al., 2004)	ASD children's parents rated their children's social anxiety higher and Theory of Mind (ToM) subscales lower. Social symptom severity and verbal-cognitive ToM is negatively related in individuals with low levels of social anxiety.
Alvarez-Fernandez et al. (2017)	ASD: 41 TD: 69 ADHD: 69	Affective Empathy	Adapted empathy coding system (Young et al., 1999)	Lower empathy scores were found in the ASD group than the TD and ADHD groups. On the Multidimensional Scale of Perceived Social Supports-friends subscale, the ASD group scored lower than the TD and ADHD groups. The three test groups did not differ significantly in their cognitive empathy.

Table 2 (cont'd)

Anderson & Meints (2016)	ASD: 15	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Means scores on the EQ was 14.86 indicating lower empathy skills pre-intervention. There was a clear reduction of ASD traits following equine assisted activities; caregiver identity was not statistically significant.
Andrews et al. (2013)	ASD: 40 HFA: 9 PDD-NOS: 9	Communicating Empathy	Affection for Others Questionnaire (Sofronoff et al., 2013)	The communicating empathy subscale treatment (Tx) group had pre scores of 14.07 and post scores of 15.76. On the general affection questionnaire, the Tx group had pre scores of 41.86 and the control group had pre scores of 41.30. On the social competence portion of the questionnaire, the Tx group had pre scores of 5.67 and the control group had pre scores of 5.
Argott et al. (2017)	ASD: 4	Affective Empathy	Affection for Others Questionnaire (Sofronoff et al., 2013)	Three of the four participants did not display empathic responses that were complex. The fourth participant displayed an inconsistent response to joy, but not to pain or frustration.
Argott et al. (2008)	ASD: 3	Affective Empathy	Affective Situation Test (Asakawa & Matsuoka, 1087)	All three participants showed no unscripted empathic responding prior to intervention.
Auyeung et al. (2012)	TD: 1030 ASD: 213	Affective Empathy	Author-created	Children with ASD scored lower than TD girls and boys, on average, but did not show any variance between girls with ASD and boys with ASD.

Table 2 (cont'd)

Auyeung et al. (2009)	TD: 1256 ASD: 265	Affective Empathy	Author-created	There was a significant difference in test scores between typical boys and girls and the ASD group. Typical girls scored the highest, followed by typical boys, and then the ASD group.
Avirame et al. (2017)	ASD: 2	Empathic Concern	Interpersonal Reactivity Index (Davis, 1980)	Self-report questionnaires showed slight improvement in autistic symptoms and empathy IRI.
Baez et al. (2012)	TD: 15; ASD: 15	Affective Empathy Cognitive Empathy	Author-created Interpersonal Reactivity Index (1983)	TD adults scored lower than adults with ASD on Personal Distress and Perspective Taking subscales. No difference was found between the two groups on the Empathic concern and Fantasy subscales.
Balch & Ray (2015)	5 ASD	Affective Empathy	Author-created	Three of the five participants did not have change in their empathy throughout intervention, while the other two showed an increase.
Barnes et al. (2009)	ASD: 28 TD: 28	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	A significant correlation was found between verbal IQ and the level of mentalizing in film narratives for the ASD group, but not the control group, while the reverse pattern was found with a measure of self-reported cognitive and affective empathy.

Table 2 (cont'd)

Baron-Cohen et al. (2015)	ASD: 395 TD: 320	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Eyes test-Empathy Quotient and Eyes test-Autism Quotient (AQ) correlations were significant only in females with ASD.
Baron-Cohen & Wheelwright (2004)	ASD: 90 TD: 90	Affective Empathy Cognitive Empathy	Empathy Quotient (Author-created)	Females scored significantly higher than males on the EQ.
Baron-Cohen et al. (2005)	Asperger's syndrome: 31 HFA: 3 No Dx: 8	Affective Empathy Cognitive Empathy	Empathy Quotient (Author-created)	The ASD group scored much lower on the EQ and much lower on the AQ than the TD group. The ASD group's scores on the EQ were lower than the cut-off of 30.
Begeer et al. (2011)	Treatment: 19 ASD Waitlist: 17 ASD	Not explicitly stated	Index of Empathy for Children and Adolescents (Bryant, 1982)	Self-reported and parent-reported empathy and social skills did not show an effect of training.
Bellebaum et al. (2014)	ASD: 10 TD: 12	Affective Empathy	Author-created	Trait affective empathy, congruent state affective empathy, and incongruent state affective empathy did not vary significantly between the TD and ASD groups. Trait cognitive empathy was significantly lower in the ASD group than the TD group.
Bellini (2004)	ASD: 35 PDD-NOS: 6	Affective Empathy	Author-created	A curvilinear relationship was found between the Social Anxiety Scale for Adolescents and Social Skills Rating System Empathy subscales.

Table 2 (cont'd)

Bernhardt et al. (2014)	ASD: 16 TD: 16	Empathic Concern	Interpersonal Reactivity Index (Davis, 1980)	Analysis of IRI subscales showed that the ASD group did not differ from controls on the IRI subscales fantasy, empathic concern, and personal distress after correction for multiple comparisons. The ASD group did score significantly lower on the perspective taking subscale relative to controls.
Bethroz et al. (2008)	ASD: 16 TD: 410	Affective Sharing and Cognitive Attribution General Empathy	Author-created The Interpersonal Reactivity Index-empathic concern (French version) Empathy Quotient (Baron-Cohen et al., 2004)	EQ and IRI scores were equivalent to those of other studies. The EQ scores were similar to the scores in the report by Baron-Cohen et al.
Bird et al. (2010)	ASD: 18 TD: 18	Affective Empathy Cognitive Empathy General Empathy	Author-created Interpersonal Reactivity Index (Davis, 1980)	There was a negative correlation between the alexithymia questionnaire and IRI scores. This suggested the severity of the relationship between alexithymia and empathy.
Bos & Stokes (2019)	ASD: 24 TD: 24	Affective Empathy Cognitive Empathy	Author-created Interpersonal Reactivity Index (Davis, 1980)	The ASD group scored lower than the control group on the IRI subscales empathic concern and perspective taking. There was no relationship found between gender and IRI scores.

Table 2 (cont'd)

Brewer et al. (2017)	ASD: 163 TD: 80	Affective Empathy Cognitive Empathy	Author-created Interpersonal Reactivity Index (Davis, 1980)	On the IRI, the ASD group scored lower than the control group on the Perspective taking, Empathic concern, and Personal distress subscales.
Butean et al. (2014)	ASD: 26 TD: 37	Affective Empathy Cognitive Empathy	Author-created	76% of children with ASD scored lower than TD children on affective responses. No significant differences were found between the two groups in verbal empathic initiations and prosocial behaviors.
Campbell et al. (2015)	ASD: 38 TD: 31	Affective Empathy Cognitive Empathy	Author-created	High-risk toddlers and toddlers with ASD had lower empathic concern than low-risk toddlers.
Campbell et al. (2017)	HR: 59 LR: 90 ASD: 20	Affective Empathy Cognitive Empathy	Author-created	Low-risk toddlers had higher empathic concern than ASD and high-risk toddlers.
Cascia & Barr (2017)	ASD: 20	Affective Empathy Cognitive Empathy	Author-created Children's Empathy Quotient (Auyeung et al., 2009)	Parents rated their children's empathy and function skills higher than the children's teachers.
Cassidy et al. (2016)	ASD: 2871 TD: 10,706	Affective Empathy Cognitive Empathy	Author-created	Participants with ASD had self-reported empathy that was lower than TD participants.

Table 2 (cont'd)

Cheng et al. (2010)	ASD: 3	Empathic behaviors	Empathy Rating Scale (Lin, 2008)	Based on visual analysis results, the scores for the three participants varied during the baseline stage indicating slight differences in their initial behavior.
Courty et al. (2013)	TD: 15 ASD: 15	Affective Empathy Cognitive Empathy	Author-created Empathy Quotient (Baron-Cohen et al., 2004) Interpersonal Reactivity Index (Davis, 1980)	Participants with ASD scored higher on the IRI Personal Distress subscale than the TD group, but lower on the EQ and IRI Empathic Concern subscale.
De Coster et al. (2018)	ASD: 20 TD: 20	Trait Empathy Empathic Concern	Author-created Interpersonal Reactivity Index (Davis, 1980)	Adults with ASD showed increased empathic responses over time after being imitated.
Demurie et al. (2011)	ASD: 13 TD: 18	Affective Empathy Cognitive Empathy	Author-created	There was a significant difference between parent and self-reported empathy, with self-reported empathy much lower than parent-reported empathy.
DeNigris et al. (2018)	ASD: 22 TD: 15	Affective Empathy Cognitive Empathy	Author-created	Eleven of the fifteen ASD participants who had been bullied displayed cognitive empathy compared to seven of eleven mentors.

Table 2 (cont'd)

Deschamps (2014)	ASD: 22 TD: 29	Affective Empathy Cognitive Empathy	Author-created Griffith Empathy Measure (Dadds et al., 2008)	Teachers and parents rated the children with ASD lower on cognitive empathy than TD children, but the same on affective empathy. There was a negative relationship between cognitive empathy rated by parents and total SRS scores.
Dudas et al. (2017)	Full sample: ASD: 640 TD: 2081	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	There was a significant difference between scores of the TD and ASD groups on the EQ.
Dziobek et al. (2008)	ASD: 50 TD: 68	Affective Empathy Cognitive Empathy	Interpersonal Reactivity Index (Davis, 1980)	The TD individuals scored much higher on cognitive empathy than ASD participants. On the IRI, ASD participants did not score significantly differently than TD participants.
Evers et al. (2015)	ASD: 50 TD: 68	Victim Empathy	Victim Empathy Scale-Adapted (Beckett & Fisher, 1994)	Participants with higher empathy scores also scored higher on the Emotion Recognition Task.
Frolli et al. (2020)	ASD (experimental): 25 ASD (control): 25	Affective Empathy Cognitive Empathy	Basic Empathy Scale (Jolliffe & Farrington, 2006)	There was no difference in the scores between the two groups when baseline data was taken.

Table 2 (cont'd)

Gantman et al. (2021)	ASD: 17	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	During baseline data collection, the treatment group had an average score on the EQ that was higher than the delayed treatment group. A positive correlation was found between loneliness and depression and anxiety.
Garfinkel et al. (2016)	ASD: 20 TD: 20	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	AQ scores were significantly higher for the ASD participants than the TD participants, while their EQ scores were significantly lower.
Gleichgerrcht et al. (2013)	ASD: 36 TD: 36	Affective Empathy Cognitive Empathy	Child Empathy Questionnaire-Systemizing Questionnaire (Wakabayashi et al., 2006)	Empathy did not vary between the deontological and utilitarian responders.
Golan et al. (2007)	ASD: 50 TD: 26	Primarily victim empathy; some cognitive and affective aspects of empathy	The Impulsivity Venturesomeness Empathy–7 Questionnaire (French version)- derived from Mehrabian and Epstein's 27 Empathic Tendency Questionnaire	Deficit in the auditory domain, together with similar deficits in recognition of mental states from visual stimuli and from context, support the existence of an underlying mechanism for empathizing which is impaired in individuals with ASD.
Goldingay et al. (2015)	ASD: 7	Affective Empathy Cognitive Empathy	Social Skills Improvement System (Gresham & Elliot, 2008)	The average score for empathy on the Social Skills Improvement System for participants was 11.8. The study found that an early pretend play intervention may help with participants' flexible thinking, self-regulation, and empathy.

Table 2 (cont'd)

Gonzalez-Gada et al. (2013)	ADHD: 22 ASD: 23 TD: 21	Affective Empathy Cognitive Empathy	Children's Empathy Quotient (Auyeung et al., 2009)	The participants with ASD scored an average of 19.72 (SD = 8.74) on the Empathy Quotient.
Greenberg et al. (2018)	Discovery: 671,606 with 36,648 ASD Validation: 14,354 with 226 ASD	Affective Empathy Cognitive Empathy	Children's Empathy Quotient (Auyeung et al., 2009)	TD males and females scored higher on the EQ and Sensory Perception Quotient than males and females with ASD.
Greimel et al. (2010)	ASD: 15 TD: 15	Affective Empathy Cognitive Empathy	Chinese version of Griffith Empathy Measure (Wei & Su, 2019)	The male participants with ASD showed the lowest empathy out of all participants.
Groen et al. (2015)	ASD: 42 TD: 685	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Females scored higher on the EQ than males. Participants with ASD were found to score lower on the EQ than TD participants.
Grove et al. (2013)	ASD: 363 Parents of ASD participants: 439 TD: 232	Affective Empathy Cognitive Empathy	Coding system based on previous work (Young et al., 1999; McDonald & Messinger, 2012)	The participants with ASD scored lower on empathy than the control group. A negative correlation was found between empathizing and systemizing, with a larger negative difference found in those with ASD.
Grove et al. (2014)	ASD: 363 TD: 232	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Muncer et al.'s model of the EQ was the best fit for the data found.

Table 2 (cont'd)

Grove et al. (2015)	ASD: 363 TD: 232	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Individuals with ASD scored lower on the EQ and higher on the Systemizing Quotient than TD individuals. TD males scored the highest on the EQ while males with ASD scored the lowest.
Gu et. al (2015)	ASD: 17 TD: 17	Affective Empathy Cognitive Empathy	Dutch version of Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Lower EQ scores and higher alexithymia were found in the ASD group than the TD group.
Guivarch et al. (2017)	ASD: 6	Affective Empathy Cognitive Empathy	Dutch-version of Empathizing-Systemizing questionnaire (Auyeung et al., 2008)	The baseline EQ scores ranged from 2 to 13.
Hadjikhani et al. (2014)	ASD: 36 TD: 31	Affective Empathy Cognitive Empathy	Emotion Attribution to Self (Burnett et al., 2009)	ASD participants scored lower on both affective and cognitive empathy than TD participants. There was a positive correlation between brain activation and affective empathy in participants with ASD.
Hagenmuller et al. (2014)	ASD: 29 TD: 28	Affective Empathy Cognitive Empathy	Empathic Accuracy Task (Ickes et al., 1990)	Empathic concern and perspective-taking scores were lower for participants with ASD.

Table 2 (cont'd)

Hall et al. (2012)	ASD: 12 TD: 12	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Males and females showed a different relationship between social brain activation and empathy, with males showing a positive whole brain correlation between left IFC activation and empathy scores during approachability judgements which was not seen in females.
Hardstaff (2014)	ASD: 1	Affective Empathy Cognitive Empathy	Empathy Continuum (Strayer, 1993)	Empathy may be a way to show critical thinking skills through taking an evaluative approach to characters' behavior.
Hillier et al. (2007)	ASD: 13	Affective Empathy Cognitive Empathy	Empathy for Pain Paradigm (Singer et al, 2004)	There were no significant differences in score for those who participated in the Aspirations program and those who did not. On 17 of 25 questions, responses were higher after Aspirations. Those with ASD have lower social skills, resulting in lower cognitive empathy.
Hirvelä & Helkama (2011)	ASD: 41 TD: 139	Affective Empathy Cognitive Empathy	Interpersonal Reactivity Index (Davis, 1980)	ASD participants scored lower on both the affective and cognitive empathy subscales than the TD participants, as well as the perspective taking and fantasy subscales.
Hobson et al. (2009)	ASD: 20 TD: 14	Affective Empathy Cognitive Empathy	Empathy Questionnaire (Baron-Cohen et al., 2005)	Only 2 of 20 ASD participants responded to the drawing compared to 11 of 14 TD participants.

Table 2 (cont'd)

Holopainen et al. (2019)	ASD Treatment: 72 ASD Waitlist: 63	Trait Empathy	The Me Scale II (Chang, 2011)	No difference was found between parent-reported empathy and empathic responsiveness.
Horwitz et al. (2016)	ASD: 249 ADHD: 34 Depressive Disorder: 59 Schizophrenia: 21	Reduced Empathy	Adult Social Behavior Questionnaire (ASBQ; Author-created)	Adults with ASD scored higher on the ASBQ than other groups - TD, ADHD, schizophrenia, and adults with depressive disorder.
Hudry & Slaughter (2009)	ASD: 26 DS: 15 TD: 54	Affective Empathy Cognitive Empathy	Empathy Questionnaire (Overgaauw et al., in preparation)	Participants with ASD showed the most comfort to their caregiver compared to other children and unknown adults. TD participants also comforted their caregiver and the other child, but the unknown adult less so.
Jermakow & Brzezicka (2016)	Anorexia Nervosa: 11 ASD: 10 TD: 60	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004) Interpersonal Reactivity Index (Davis, 1980)	The Anorexia Nervosa group differed significantly from the ASD group in empathy level and ToM, exhibiting results similar to the comparison group.
Johnson et al. (2009)	ASD: 20 TD: 22	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	The TD group was found to have higher EQ scores than the ASD group. There was a correlation found between parent and children's ratings for empathy: the lower the parent score, the lower the child score.

Table 2 (cont'd)

Jones et al. (2010)	ASD: 21 TD: 31	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Participants with ASD rated their fear significantly higher than the TD group.
Kästner et al. (2015)	ASD: 148 ASD schizophrenia: 137 Non-ASD schizophrenia: 168 TD: 97	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	AQ and EQ were not found to vary dependent on ADOS diagnosis. AQ and EQ performed at chance level in the prediction of ASD.
Kember & Williams (2021)	ASD: 41 TD: 343	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	EQ scores were significantly correlated with autism symptomatology with lower sores on the EQ relating to higher scores on autism traits.
Kirchner, et al. (2011)	ASD: 20 TD: 21	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	In the face identity task, participants with ASD had a more difficult time correctly identifying the emotions than the TD participants.
Koch et al. (2016)	ASD: 31	Affective Empathy Cognitive Empathy General Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004) The Emotional Empathy Scale (EES; Caruso and Mayer, 1998)	Scores on the EES did not vary between the control group and the treatment group. Social skills, however, did show a significant difference between the two groups, with the treatment group having a greater increase in their social skills.

Table 2 (cont'd)

Koegel et al. (2016)	ASD: 3	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	In the baseline data collection, the participants showed appropriate empathy 0%, 5.6%, and 37%, respectively.
Koehne et al. (2016)	ASD: 51	Affective Empathy Cognitive Empathy	Interpersonal Reactivity Index (Davis, 1980)	Participants scored an average of 14 on the empathic concern portion of the IRI.
Koehne et al. (2016)	ASD: 20 TD: 22	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	On both cognitive and affective empathy, ASD participants rated themselves lower than the TD participants.
Komeda et al. (2019)	ASD: 22 TD: 20	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	In stories with TD characters, both the ASD and TD participants had higher empathic responses than in stories with ASD characters. ASD participants showed higher empathic responses in stories with ASD characters than the TD participants. Decreased empathy was linked with social skills and attention to detail.
Krajmer et al. (2011)	ASD: 50 TD: 79	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Older individuals with ASD scored the lowest on the EQ than other participants. Younger TD and participants with ASD scored the same on the EQ.
Kubota et al. (2020)	ASD: 18 TD: 20	Affective Empathy Cognitive Empathy	Interpersonal Reactivity Index (Davis, 1980)	The ASD group had lower scores than control group on perspective taking and empathic concern subscales.

Table 2 (cont'd)

Kuo et al. (2014)	ASD: 55 TD: 29	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	There was a significant difference between the ASD and TD groups' empathic scores. On the social awareness subscale, the ASD group scored higher than the other participants. As expression towards others becomes more appropriate for the situation, social ability increases, as well.
Lai et al. (2011)	ASD: 62	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	Females had higher self-reported AQ scores while the EQ scores for both males and females with ASD were similar.
Larson et al. (2015)	ASD (no psychosis): 71 ASD (psychosis): 64	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	The ASD-Psychosis group scored significantly lower on full scale IQ scores and higher empathizing bias scores than the ASD-No Psychosis group.
Lawson et al. (2004)	ASD: 18 TD: 89	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	The TD females scored the highest on the EQ, followed by the TD males, then by the males with ASD.

Table 2 (cont'd)

Lawson & Walsh (2007)	ASD: 2	Affective Empathy Cognitive Empathy	N/A	Data were collected on participant's responses to empathy questions to 20 pictures and 20 real life situations in the classroom. Participant A emitted 15 correct responses to, "what happened?" 14 correct responses to, "How does the person feel?" and 5 correct responses to "What could you do to help?" during the pre-probe session of pictures. Participant B emitted 11 correct responses to, "What happened?" 14 correct responses to, "How does the person feel?" and 9 correct responses to, "What could you do to help?" during the pre-probe session of picture
Lepage et al. (2009)	TD: 100 ASD: 23	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	The group of participants with ASD scored lower on the EQ-F than the TD group, with women scoring the highest. AQ scores were also lower for the group of participants with ASD than the TD group, with men scoring higher than women.
Lever & Geurts (2018)	ASD: 237 TD: 198	Affective Empathy Cognitive Empathy	Interpersonal Reactivity Index (Davis, 1980)	Participants with ASD had lower scores on the perspective taking and fantasy subscales than the TD group and similar scores on the empathic concern subscale.

Table 2 (cont'd)

Levin et al. (2015)	ASD: 15	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	The scores of the participants with ASD on the EQ were much lower than the scores of the TD participants.
Libero et al. (2014)	ASD: 27 TD: 23	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	There was a significant correlation between the emotion condition and EQ for participants with ASD, while there was not a significant difference between the two for TD participants.
Lombardo et al. (2007)	ASD: 30 TD: 30	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004) Interpersonal Reactivity Index (Davis, 1980) Emotional Contagion Scale (ECS; Doherty, 1997)	On the EQ, IRI, and ECS, participants with ASD scored lower than the TD participants. Participants with ASD had more difficulty remembering words used to describe themselves.
Lombardo et al. (2012)	1 case study compared to previous data of study with 30 ASD and 30 TD	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004) Interpersonal Reactivity Index (Davis, 1980) Emotional Contagion Scale (Doherty, 1997)	The case study individual had lower EQ and IRI scores compared to both the TD group and the ASD group. Their score on the Self Reference Effect paradigm was also worse than the other two groups, with social-cognition having the biggest difference between the groups.
Malhotra (2019)	ASD: 1	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	Following intervention, the participant had an increase in their EQ score.

Table 2 (cont'd)

Mastrominico et al. (2018)	73	Affective Empathy Cognitive Empathy Empathic concern	Empathy Quotient (Baron-Cohen et al., 2004) Empathic concern subscale of Interpersonal Reactivity Index (Davis, 1983)	The treatment group had increased scores in all components of the tests while the control group had increased scores in the empathy and affective empathy.
Mathersul et al. (2013)	ASD: 28 TD: 31	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	Participants with ASD had significantly lower cognitive and affective empathy scores than the control group. There was a significant negative correlation between skin conductance levels and cognitive and affective empathy for participants with ASD.
Mathersul et al. (2013)	ASD: 40 TD: 33	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	The individuals with ASD had lower empathy scores than the TD participants. Cognitive empathy was influenced by the "think," "do," and "say" probes.
Mazza et al. (2014)	ASD: 15 TD: 15	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004) Multifaceted Empathy Test (Dziobek et al., 2008)	There was a statistically significant correlation between the participants with ASD and positive and negative cognitive empathy. There was also a statistically significant correlation between the participants with ASD and negative affective empathy, but no correlation with positive affective empathy.

Table 2 (cont'd)

Mazza et al. (2020)	ASD: 10 TD: 10	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	Participants with ASD had lower overall scores on the EQ than the TD group. There was not a significant correlation found between the conditions in the Golden Beauty task and empathy tests.
McDonald & Messenger (2012)	ASD: 13 TD: 25	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	Children who were later diagnosed with ASD had lower empathic responses than children who were not diagnosed with ASD. They were, however, found to progress with their empathy skills at the same speed as the TD children.
McDonald et al. (2017)	Low risk/no ASD: 30 High risk/no ASD: 36 ASD: 12	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004) Empathy & Prosocial Response Subscale of the Conscience Questionnaire (Kochanska et al., 1994)	Higher IQ was found to be associated with higher empathy in participants. No significant correlation was found between empathy and gender. A significant positive correlation was found between visible distress and empathic concern.
McVey et al. (2016)	Experimental ASD: 24 Waitlist Control ASD: 23	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	Participants showed improvement in their social responses, empathy, and social anxiety over the course of the experiment.

Table 2 (cont'd)

Melvin et al. (2020)	ASD: 10	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	The participants were found to understand cognitive empathy, but the offenders lacked affective empathy and empathy for their victims. One participant improved in victim empathy, but not significantly.
Mensi et al. (2018)	ASD: 58	Affective Empathy Cognitive Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	The majority of ASD patients have low levels of empathy according to both parents' points of view; noteworthy, mothers and fathers are highly concordant in this respect. Children's levels of empathy negatively correlate with many behavioral problems, both internalizing and externalizing.
Metcalfe et al. (2019)	ASD: 27 TD: 27	Cognitive Empathy Emotional Reactivity	Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers et al., 2011)	A diagnosis of ASD was correlated with the AQ and QCAE, but beyond diagnosis, they do not provide much information.
Minio-Paluello et al. (2009)	ASD: 16 TD: 20	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen et al., 2004) Interpersonal Reactivity Index (IRI; Davis, 1996)	On the IRI Personal Distress subscale, no difference was found between the group with ASD and the TD group. The participants with ASD scored lower on the EQ and IRI than the TD group.
Montgomery et al. (2016)	HF-ASD: 43 Asperger's: 43	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen et al., 2004)	The two groups of participants did not have any difference in their empathy, and empathy did not differ between males and females among either group.

Table 2 (cont'd)

Moriwaki et al. (2011)	ASD: 24 TD: 24	Parallel Empathy Reactive Empathy	Affective Situation Test (AST; Asakawa& Matsuoka, 1987)	Parallel empathy scores were not significantly different between the TD group and group with ASD. Reactive empathy was lower in participants with ASD than TD participants.
Mul et al. (2018)	ASD: 26 TD: 26	Communicating Empathy Affective Empathy	Empathy Quotient (Baron-Cohen et al., 2004) Multifaceted Empathy Test (Dziobek et al., 2008)	Participants with ASD scored lower on cognitive empathy than TD participants, but their affective empathy was similar. Participants with ASD who had alexithymia scored lower on empathy than those who did not have alexithymia.
Murphy et al. (2007)	Group One: 7 Group Two: 8	Victim Empathy	Victim Empathy Scale-Adapted (VES-A; Beckett & Fisher 1994)	Participants' attitudes, sexual knowledge, and victim empathy improved from the beginning to the end of the experiment.
Murray et al. (2017)	ASD: 20 TD: 20	Empathic Concern	Interpersonal Reactivity Index (Davis, 1980)	The participants rated themselves on empathic concern and fantasizing, with the two groups rating themselves similarly in the two categories. The participants with ASD rated themselves significantly higher on the personal distress subscale.

Table 2 (cont'd)

Myles et al. (2007)	ASD: 156	Empathic Abilities	Empathy Quotient (Lawrence et al., 2004)	No differences were found between males and females, with both groups scoring lower than average in empathy. The only delay found between the participants with ASD and TD individuals was in social interaction.
Oberman (2009)	ASD: 13 TD: 13	Empathic abilities/behavior	Empathy Quotient (Rogers et al., 2007) Basic Emotional Empathy Scale (Mehrabian, 1996)	The group with ASD had lower empathy and ToM scores than the TD group.
Osório et al. (2019)	WS: 25 TD: 25	Cognitive Empathy Affective Empathy	Griffith Empathy Measure (Dadds et al., 2008)	Both cognitive and affective empathy scores were correlated with 2D:4D in the group with WS.
Park et al. (2012)	ASD: 111 Siblings: 98 TD: 51	Cognitive Empathy Affective Empathy	Empathy Quotient for Adolescents (Baron-Cohen et. al, 2012)	Females had higher overall EQ-C scores than males for the TD group, but no difference was found between genders in participants with ASD.
Patil et al. (2016)	ASD: 17 TD: 17	Empathic Accuracy State Empathy	Empathy Quotient for adults (Lawrence et al., 2004) Multifaceted Empathy Test (Dziobek et al., 2008)	Alexithymia was associated with increased harmful actions and lower empathic concern in participants with ASD.
Paulus et al. (2013)	ASD: 32 TD: 32	Trait Empathy	German version of the E-Scale (Leibetseder et al., 2007)	Trait empathy was significantly correlated with autistic symptoms, with participants with ASD having lower trait empathy.

Table 2 (cont'd)

Pepper et al. (2019)	ASD: 60 TD: 26	Cognitive Empathy Affective Empathy	Empathy Quotient for Children (Baron-Cohen et. al, 2009)	The participants with ASD had lower scores on all subscales of the EQ than the TD participants. On the social skills subscale, participants with ASD showed more impairment than the TD participants.
Pepper et al. (2018)	ASD: 53 EP: 51 SAD: 64 TD: 31	Cognitive Empathy Affective Empathy	Empathy Quotient- Children's Version (Auyeung et al., 2004)	There was a significant difference in EQ scores between the participants with ASD and the TD group.
Peterson (2014)	ASD: 37 TD preschool: 20 TD primary school: 19	Empathic Concern	Empathy subscale from Children's Behavior Questionnaire (Rothbart et al., 2001)	Teacher-reported empathy suggested that children with ASD had lower empathy than TD children, but these differences were not linked to ToM development.
Peterson et al. (2015)	Study 1 - ASD: 34 TD: 41 Study 2 - ASD 33 TD: 31	Empathic Concern	Empathy subscale of the Multisource Assessment of Social Competence Scale (Junttila et al., 2006)	Participants with ASD were found to have lower empathy than TD participants. Older children with ASD were less empathetic, likely because of a lack of motivation to assist other people and not understanding how to help them out.
Petrides et al. (2011)	ASD: 30 TD: 43	Empathic Concern	Empathy task (Zahn-Waxler et al., 1992)	TD participants had higher social awareness than participants with ASD. Participants with better sociomoral outcomes were more likely to use perspective taking.

Table 2 (cont'd)

Plesa Skwerer & Tager-Flusberg (2016)	WS: 16 DS: 15 TD: 18	Empathic Concern	Interpersonal Reactivity Index (Davis, 1983)	On empathic concern, participants with WS had the highest ranking, followed by participants DS and then TD participants. Participants with WS and DS had higher empathy scores than helpfulness.
Ponnet et al. (2004)	ASD: 19 TD: 19	Empathic Accuracy	Empathic Accuracy Task (Ickes, 1997; Ickes et al., 1990a; Marangoni et al., 1995)	Video 1 targets had more thoughts and feelings than video 2 and no significant differences in scores were found between the two groups.
Ponnet et al. (2008)	ASD: 22 TD: 22	Empathic Accuracy	Empathic Accuracy Task (Ickes, 1990)	There was a positive correlation between IQ score and accuracy on video 1 for participants. Empathy was correlated with IQ score; the higher the IQ, the higher the empathy.
Ponnet et al. (2005)	PDD-NOS: 11 TD: 11	Empathic Accuracy	Empathic Accuracy Task (Ickes, 1990)	There was no significant difference between the empathic accuracy for PDD-NOS and TD participants.
Pouw et al. (2013)	ASD: 67 TD: 66	Empathic Responsiveness	German version of the E-Scale (Leibetseder et al., 2007)	Self-reported aggression and anger did not vary between the two groups. Participants with ASD self-rated themselves lower on empathic responsiveness than TD participants.

Table 2 (cont'd)

Rabin et al. (2018)	Immediate intervention: 20 Delayed intervention control: 21	Empathic social initiation General Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004) Social Skills Improvement System (Gresham & Elliott, 2008)	Pre-intervention, participants had an average EQ score of 32.44.
Radtke et al. (2019)	Chronic Depression: 31 ASD: 27 TD: 31	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Participants with ASD had the lowest empathy scores of the three groups, followed by the Chronic Depression group and the TD group had the highest scores. On the AQ, the participants with ASD scored the highest.
Riedel et al. (2014)	ASD: 57 TD: 56 Other psychiatric disorders: 66	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	A strong correlation was found between the AQ and EQ; the higher the score on the AQ, the lower the EQ score.
Rieffe et al. (2021)	ASD: 69 TD: 124	Cognitive Empathy Affective Empathy	Griffith Empathy Measure (Dadds et al., 2008)	Young participants with ASD showed the least empathy. No gender differences were found.
Rigby et al. (2016)	ASD: 16 TD: 16	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Participants with ASD had lower EQ scores. The participants with lower EQ looked at faces for less time.
Rigby et al. (2018)	ASD: 16 TD: 16	General Empathy	Index of Empathy for Children and Adolescents (Bryant, 1982)	The participants with ASD scored lower on empathy than the other participants.

Table 2 (cont'd)

Robinson & Elliott (2016)	Adult ASD group: 3 Adolescent ASD group: 3	General Empathy	Interpersonal Reactivity Index (Davis, 1983)	Emotion regulation, empathy, self-reflection, and mental representation were strongly correlated.
Rogers et al. (2007)	ASD: 21 TD: 21	Empathic Concern	Interpersonal Reactivity Index (Davis 1983)	On the cognitive empathy scales, there was a statistically significant difference between the participants with ASD and TD group. On the affective empathy scales, there was no difference.
Roy et al. (2013)	Only ADHD: 45 ADHD & later ASD: 8	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	The eight participants diagnosed with both ADHD and ASD had lower EQ scores than the participants who were diagnosed with only ADHD.
Rudra et al. (2016)	ASD: 25 TD: 26	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	A statistically significant negative correlation was found between scores on the AQ and EQ.
Rueda et al. (2015)	ASD: 38 TD: 38	Empathic Concern	Interpersonal Reactivity Index (Davis, 1980; Davis, 1983)	A positive correlation was found between Perspective Taking and Empathic Concern. Self-reported cognitive empathy in participants showed that participants with ASD have lower cognitive empathy than TD.

Table 2 (cont'd)

Rueda et al. (2014)	ASD: 42 TD: 44	Empathic Concern	Interpersonal Reactivity Index (Davis, 1980)	Participants with ASD scored lower on the Perspective Taking and Empathic Concern subscales of the IRI than the TD participants. There was a positive correlation between happiness, positive affect, affective balance, and the empathic variables.
Russ et al. (2020)	ASD: 134 TD: 39	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	The group with ASD reported fewer traits of empathy than the TD group. Empathy was positively correlated with emotion regulation. The two groups did not differ in emotion evaluation.
Samson & Hegenloh (2010)	ASD: 19 TD: 109	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	TD participants had higher empathizing and lower systemizing scores than the participants with ASD. There was a difference in humor processing found between the two groups, thought to be affected by cognitive flexibility, central coherence, and local bias.
Santiesteban et al. (2021)	ASD: 21 TD: 45	Empathic Response Empathic Concern	Continuous Affective Rating and Empathic Response (CARER) Task (extension of the Empathic Accuracy Task; e.g. Ickes et al. 1990; Zaki et al. 2008) Interpersonal Reactivity Index (Davis, 1980)	Participants with ASD showed affective empathy when taking their alexithymia into account and they can share the same emotional state as others even if they struggle to infer their affective state.

Table 2 (cont'd)

Schaller & Rauth (2017)	ASD: 23 TD: 22	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Participants with ASD did not differ in systemizing from the TD participants, but they had lower empathy.
Scheeren et al. (2013)	High ADOS group: 56 Low ADOS group: 95 TD: 50	General Empathy Empathic Responsiveness	Interpersonal Reactivity Index (Davis, 1980) Author-created	Sadness had the most empathic responses, followed by happiness and pain. The older participants showed more empathy than the younger participants.
Schneider et al. (2013)	ASD: 18 TD: 16	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	The participants with ASD scored lower on the EQ, on average, by 17 points than TD participants.
Schneider et al. (2013)	ASD: 28 TD: 28	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Control groups gave empathic responses 20% more often than participants with ASD.
Schrandt et al. (2009)	ASD: 4	General Empathy Empathic Concern	Interpersonal Reactivity Index (Davis, 1980) Author-created	During baseline, there was very little response from participants to empathy situations.
Schulte-Rüther et al. (2011)	ASD: 18 TD: 18	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	EQ scores were correlated with responses during the self-task.
Schulte-Rüther et al. (2014)	ASD: 27 TD: 27	Affective Empathy Cognitive Empathy Empathic Abilities	Author-created Bryant Index of Empathy for children/adolescents (Bryant, 1982)	Participants with ASD were able to identify the emotions of others, but they struggled with having a reaction to these emotions.

Table 2 (cont'd)

Schulte-Rüther et al. (2017)	ASD: 18 TD: 18	General Empathy Empathic Ability	Interpersonal Reactivity Index (Davis, 1980) Griffith Empathy Measure (Dadds et al., 2008)	Parents of children with ASD rated their children as less empathetic than those with TD children.
Schwarz et al. (2011)	ASD: 45 TD: 50	Empathic Concern	Interpersonal Reactivity Index (Davis, 1983)	Lower empathy scores were associated with higher AQ scores, indicating that individuals with ASD have lower empathy.
Schwenck et al. (2012)	Conduct Disorder (CD) + Callous Unemotional Traits (CU): 36 CD-CU (w/o Callous Unemotional Traits: 34 ASD: 55 TD: 67	Cognitive Empathy Affective Empathy	Video Sequence Task in style of empathy response task (ERT; Ricard & Kamberk-Kilicci,1995)	Older children scored higher on emotion recognition than younger children. Post-hoc tests indicated that participants of the ASD group had more problems taking the perspective of the protagonist of the films than all other groups.
Senland & Higgins-D'Alessandro (2013)	HF-ASD: 16 TD: 16	General Empathy Empathic Concern	Interpersonal Reactivity Index (Davis, 1983) Author-created	Empathic concern did not vary between the two groups, but participants with ASD had higher personal distress. Moral reasoning was lower for participants with ASD than TD.

Table 2 (cont'd)

Senland & Higgins-D'Alessandro (2016)	ASD: 22 TD: 22	General Empathy Empathic Concern	Interpersonal Reactivity Index (Davis, 1983)	The two groups scored similarly on Empathic Concern. TD participants scored higher on Perspective Taking participants with ASD scored higher on the Personal Distress subscale.
"Sex Offender Treatment" (2010)	ASD: 4	Victim Empathy	Victim Empathy Scale (Beckett & Fisher 1994) – Adapted	Victim empathy did not change as expected, likely due to lack of participants at follow-up.
Shi et al. (2020)	ASD: 11 Early-onset schizophrenia (EOS): 20 TD: 26	Cognitive Empathy Affective Empathy	Griffith Empathy Measure (GEM; Dadds et al., 2008)	GEM scores were significantly lower for participants with ASD and EOS than TD participants. Cognitive empathy varied between the groups, but affective empathy did not.
Silani et al. (2008)	ASD: 15 TD: 15	Cognitive Empathy Affective Empathy Empathic Concern	Empathy Quotient (Baron-Cohen & Wheelwright, 2004) Interpersonal Reactivity Index (Davis, 1983)	There was a significant correlation between EQ and Perspective-Taking subscale of the IRI.
Sivaraman (2017)	ASD: 2	General Empathy	Interpersonal Reactivity Index (Davis, 1983)	During baseline, both participants had low empathy.
Soorya et al. (2015)	Tx group: 35 Control: 34	Empathic Concern	Interpersonal Reactivity Index (Davis, 1983)	There were significant improvements for participants on empathic responding, but not for social cognitive outcomes.

Table 2 (cont'd)

Stauder et al. (2011)	ASD: 25 TD: 25	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	The TD participants scored higher on the EQ than the participants with ASD. There was no difference between genders.
Strunz et al. (2017)	Online ASD: 198 Outpatient ASD: 31	Emotional Empathy Cognitive Empathy	Multidimensional Social Competence Scale (author-created) Mental State Perception sub-scale of the Cognitive and Emotional Empathy Questionnaire (Savage et al. 2010)	The participants did not vary in their cognitive empathy. Social support did not affect relationship status.
Sucksmith et al. (2013)	ASD: 329 ASD parent: 310 TD: 187	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Mother-reported empathy was lower than father-reported empathy. Participants with ASD were less likely to correctly identify emotions than TD participants.
Tavassoli et al. (2018)	ASD: 68 Sensory Processing Conditions (SPC): 79 TD: 63	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	The participants with ASD had lower EQ and Systemizing Quotient scores than the TD participants. On the EQ, girls scored higher than boys.
Thaler et al. (2018)	ASD: 16 TD: 16	Empathic Concern	Interpersonal Reactivity Index (Davis, 1983)	Participants with ASD had lower Empathic Concern and higher Personal Distress than TD participants.

Table 2 (cont'd)

Trimmer et al. (2017)	ASD: 25 TD: 25	Empathic Concern	Parent-adapted Interpersonal Reactivity Index (Davis, 1980)	Participants with ASD scored lower on the Empathic Concern and Perspective Taking subscales.
Verschuur et al. (2019)	Study 1= ASD: 13 parent/child pairs Study 2= 13 parent/child pairs	Victim Empathy	Victim Empathy Scale--Adapted (Beckett & Fisher, 1994)	The study 1 participants had baseline empathy from 0 to 0.75, while study 2 participants had baseline from0 to 0.15.
Vuori et al. (2017)	Treatment group= Child: 121 Mothers: 117 Fathers: 86 Teachers: 97 TD group= Child: 318 Parent: 299 Teachers:14	Cognitive Empathy Affective Empathy	Parent-adapted Questionnaire of Cognitive & Affective Empathy (Reniers et al., 2011)	Participants in the intervention group had more disruptive and impulsive behavior. Parents of the participants reported increased antisocial behavior among their children in the intervention group.
Wagels et al. (2020)	ASD: 32 TD: 40	Empathic Concern	Interpersonal Reactivity Index (Davis, 1980)	On the IRI, males with ASD scored the lowest, while TD females scored the highest. On the empathy scale, the same two groups scored the highest and lowest.
Wakabayashi et al. (2007)	ASD adults: 48 Company employees: 137 University students: 1250	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	The participants with ASD scored significantly lower on the EQ than the TD participants. Males scored lower than females on the tests.

Table 2 (cont'd)

Wang et al. (2019)	ASD: 30 TD: 39	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	There was a significant difference in scores on the EQ and Systemizing Quotient (SQ), with TD participants scoring higher on the EQ and lower on the Systemizing Quotient.
Wheelwright et al. (2006)	ASD: 125 TD: 1761	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	The participants' sex affected the scores on the EQ, with females scoring higher than males.
Williams & Cameron (2017)	Overall sample: 1391 ASD sub-sample: 326	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	The EQ correlated with the actions and feelings questionnaire
Yager & Iarocci (2013)	ASD: 135 TD: 48	Empathic Concern	Multidimensional Social Competence Scale (MSCS; Author-Created)	Higher scores on the MSCS were correlated with more friends amongst participants. Seven relatively distinct domains of social competence were identified including social motivation, social inferencing, demonstrating empathic concern, social knowledge, verbal conversation skills, nonverbal sending skills, and emotion regulation.
Yoshimura et al. (2018)	ASD: 10	Cognitive Empathy Affective Empathy	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	The mismatch field (MMF) has been used as a neurophysiological marker for the automatic detection of changes in auditory stimuli. The change in MMF and change in the EQ were significantly correlated.

Table 2 (cont'd)

Ziemans et al. (2019)	ASD: 53 TD: 29	Parallel empathy & Reactive empathy	TEIQue v. 1.50 (Petrides, 2009)	The TD group had significantly higher cognitive empathy scores than the group with ASD, and this stayed true as cognitive alexithymia was added as a covariate. The participants with ASD had higher cognitive alexithymia scores.

Note. Some measures were noted as 'N/A' or 'Not applicable' because the study did not use a specific measure to assess for empathy (e.g., studies used qualitative coding of thematic codes to explore empathy). ASD = Autism spectrum disorder; TD = Typically developing; WS = Williams syndrome; DS = Down syndrome; ADHD = Attention-Deficit/Hyperactivity Disorder; HFA = High functioning autism; PDD-NOS = Pervasive developmental disorder-Not otherwise specified; EQ = Empathy Quotient; IRI = Interpersonal Reactivity Index; SRS = Social Responsiveness Scale; AQ = Autism Quotient.

REFERENCES

REFERENCES

*Adler, N., Dvash, J., & Shamay-Tsoory, S. G. (2015). Empathic embarrassment accuracy in autism spectrum disorder. *Autism Research, 8*(3), 241-249. doi:10.1002/aur.1439

*Alkire, D., Warnell, K. R., Kirby, L. A., Moraczewski, D., & Redcay, E. (2021). Explaining variance in social symptoms of children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 51*(4), 1249-1265. doi:10.1007/s10803-020-04598-x

*Alvarez-Fernandez, S., Brown, H. R., Zhao, Y., Raithel, J. A., Bishop, S. L., Kern, S. B., ... & Di Martino, A. (2017). Perceived social support in adults with autism spectrum disorder and attention-deficit/hyperactivity disorder. *Autism Research, 10*(5), 866-877. doi:10.1002/aur.1735

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

*Anderson, S., & Meints, K. (2016). Brief report: The effects of equine-assisted activities on the social functioning in children and adolescents with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 46*(10), 3344-3352. doi:10.1007/s10803-016-2869-3

*Andrews, L., Attwood, T., & Sofronoff, K. (2013). Increasing the appropriate demonstration of affectionate behavior, in children with Asperger syndrome, high functioning autism, and PDD-NOS: A randomized controlled trial. *Research in Autism Spectrum Disorders, 7*(12), 1568-1578. doi:10.1016/j.rasd.2013.09.010

*Argott, P. J., Townsend, D. B., & Poulson, C. L. (2017). Acquisition and generalization of complex empathetic responses among children with autism. *Behavior Analysis in Practice, 10*(2), 107-117. doi:10.1007/s40617-016-0171-7

*Argott, P., Townsend, D. B., Sturmey, P., & Poulson, C. L. (2008). Increasing the use of empathic statements in the presence of a non-verbal affective stimulus in adolescents with autism. *Research in Autism Spectrum Disorders, 2*(2), 341-352. doi:10.1016/j.rasd.2007.08.004

*Auyeung, B., Allison, C., Wheelwright, S., & Baron-Cohen, S. (2012). Brief report: development of the adolescent empathy and systemizing quotients. *Journal of Autism and Developmental disorders, 42*(10), 2225-2235. doi:10.1007/s10803-012-1454-7

*Auyeung, B., Wheelwright, S., Allison, C., Atkinson, M., Samarawickrema, N., & Baron-Cohen, S. (2009). The children's empathy quotient and systemizing quotient: Sex differences in typical development and in autism spectrum conditions. *Journal of Autism and Developmental Disorders, 39*(11), 1509-1521. doi:10.1007/s10803-009-0772-x

*Avirame, K., Stehberg, J., & Todder, D. (2017). Enhanced cognition and emotional recognition and reduced obsessive compulsive symptoms in two adults with high-functioning autism as a result of deep Transcranial Magnetic Stimulation (dTMS): a case report. *Neurocase, 23*(3-4), 187-192. doi:10.1080/13554794.2017.1361451

*Baez, S., Rattazzi, A., Gonzalez-Gadea, M. L., Torralva, T., Vigliecca, N., Decety, J., ... & Ibanez, A. (2012). Integrating intention and context: assessing social cognition in adults with Asperger syndrome. *Frontiers in Human Neuroscience, 6*, 1-21. doi:10.3389/fnhum.2012.00302

*Balch, J., & Ray, D. C. (2015). Emotional assets of children with autism spectrum disorder: A single-case therapeutic outcome experiment. *Journal of Counseling & Development, 93*(4), 429-439. doi:10.1002/jcad.12041

*Barnes, J. L., Lombardo, M. V., Wheelwright, S., & Baron-Cohen, S. (2009). Moral dilemmas film task: A study of spontaneous narratives by individuals with autism spectrum conditions. *Autism Research, 2*(3), 148-156. doi:10.1002/aur.79

Baron-Cohen, S. (2003). *The essential difference: Men, women, and the extreme male brain.* Penguin.

*Baron-Cohen, S., Bowen, D. C., Holt, R. J., Allison, C., Auyeung, B., Lombardo, M. V., ... & Lai, M. C. (2015). The "reading the mind in the eyes" test: complete absence of typical sex difference in~ 400 men and women with autism. *PloS one, 10*(8), e0136521. doi:10.1371/journal.pone.0136521

Baron-Cohen, S., Leslie, A. M., & Frith, U. (1985). Does the autistic child have a "theory of mind"? *Cognition, 21*, 37–46. https://doi.org/10.1016/0010-0277(85)90022-8

*Baron-Cohen, S., & Wheelwright, S. (2004). The empathy quotient: an investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. *Journal of Autism and Developmental Disorders, 34*(2), 163-175. doi:10.1023/B:JADD.0000022607.19833.00

*Baron-Cohen, S., Wheelwright, S., Robinson, J., & Woodbury-Smith, M. (2005). The adult Asperger assessment (AAA): a diagnostic method. *Journal of Autism and Developmental Disorders, 35*(6), 807-819. doi:10.1007/s10803-005-0026-5

Barr, J. J., & Higgins-D'Alessandro, A. (2009). How adolescent empathy and prosocial behavior change in the context of school culture: a two-year longitudinal study. *Adolescence, 44*(176).

Beadle-Brown, J., Murphy, G., & Wing, L. (2006). The Camberwell cohort 25 years on: Characteristics and changes in skills over time. *Journal of Applied Research in Intellectual Disabilities, 19*(4), 317-329.

*Begeer, S., Gevers, C., Clifford, P., Verhoeve, M., Kat, K., Hoddenbach, E., & Boer, F. (2011). Theory of mind training in children with autism: A randomized controlled trial. *Journal of Autism and Developmental Disorders*, *41*(8), 997-1006. doi:10.1007/s10803-010-1121-9

*Bellebaum, C., Brodmann, K., & Thoma, P. (2014). Active and observational reward learning in adults with autism spectrum disorder: relationship with empathy in an atypical sample. *Cognitive Neuropsychiatry*, *19*(3), 205-225. doi:10.1080/13546805.2013.823860

*Bellini, S. (2004). Social skill deficits and anxiety in high-functioning adolescents with autism spectrum disorders. *Focus on Autism and other Developmental Disabilities*, *19*(2), 78-86. doi:10.1177/10883576040190020201

*Bernhardt, B. C., Valk, S. L., Silani, G., Bird, G., Frith, U., & Singer, T. (2014). Selective disruption of sociocognitive structural brain networks in autism and alexithymia. *Cerebral Cortex*, *24*(12), 3258-3267. doi:10.1093/cercor/bht182

*Bethroz, S., Wessa, M., Kedia, G., Wicker, B., & Grèzes, J. (2008). Cross-cultural validation of the empathy quotient in a French-speaking sample. *The Canadian Journal of Psychiatry*, *53*(7), 469-477. doi:10.1177/070674370805300712

*Bird, G., Silani, G., Brindley, R., White, S., Frith, U., & Singer, T. (2010). Empathic brain responses in insula are modulated by levels of alexithymia but not autism. *Brain*, *133*(5), 1515-1525. doi:10.1093/brain/awq060

Bittles A. H., Bower C., Hussain R., & Glasson E. J. (2006). The four ages of Down syndrome. *European Journal of Public Health*, *17*(2), 221–5. https://doi.org/10.1093/eurpub/ckl103

*Bos, J., & Stokes, M. A. (2019). Cognitive empathy moderates the relationship between affective empathy and wellbeing in adolescents with autism spectrum disorder. *European Journal of Developmental Psychology*, *16*(4), 433-446. doi:10.1080/17405629.2018.1444987

*Brewer, N., Young, R. L., & Barnett, E. (2017). Measuring theory of mind in adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *47*(7), 1927-1941. doi:10.1007/s10803-017-3080-x

Bryne, B. (1996). *Measuring self-concept across the life span: Issues and instrumentation.* American Psychological Association.

*Butean, I., Costescu, C., & Dobrean, A. (2014). Differences between empathic responses in children with autism spectrum disorder and typically developing children. *Journal of Evidence-Based Psychotherapies*, *14*(2), 197-209.

Byrd, R. (2002). *Report to the Legislature on the principle findings from the epidemiological of autism in California: A comprehensive pilot study.* University of California Davis, MIND Institute. http://www.ucdmc.ucdavis.edu/mindinstitute/html/news/autismreport.htm.

*Campbell, S. B., Leezenbaum, N. B., Schmidt, E. N., Day, T. N., & Brownell, C. A. (2015). Concern for another's distress in toddlers at high and low genetic risk for autism spectrum disorder. *Journal of Autism and Developmental Disorders, 45*(11), 3594-3605. doi:10.1007/s10803-015-2505-7

*Campbell, S. B., Moore, E. L., Northrup, J., & Brownell, C. A. (2017). Developmental changes in empathic concern and self-understanding in toddlers at genetic risk for autism spectrum disorder. *Journal of Autism and Developmental Disorders, 47*(9), 2690-2702. doi:10.1007/s10803-017-3192-3

*Cascia, J., & Barr, J. J. (2017). Associations among vocabulary, executive function skills and empathy in individuals with autism spectrum disorder. *Journal of Applied Research in Intellectual Disabilities, 30*(4), 627-637. doi:10.1111/jar.12257

*Cassidy, S., Hannant, P., Tavassoli, T., Allison, C., Smith, P., & Baron-Cohen, S. (2016). Dyspraxia and autistic traits in adults with and without autism spectrum conditions. *Molecular Autism, 7*(1), 1-6. doi:10.1186/s13229-016-0112-x

Cebula, K. R., & Wishart, J. G. (2008). Social cognition in children with Down syndrome. *International Review of Research in Mental Retardation, 35*, 43–86. https://doi.org/10.1016/S0074-7750(07)35002-7

Cederland, M., Hagberg, B., Billstedt, E., Gillberg, C., & Gillberg, C. (2008). Asperger syndrome and autism: A comparative longitudinal follow-up study more than 5 years after original diagnosis. *Journal of Autism and Developmental Disorders, 38*, 72–85. https://doi.org/10.1007/s10803-007-0364-6

Channell, M. M., Conners, F. A., & Barth, J. M. (2014). Emotion knowledge in children and adolescents with Down syndrome: A new methodological approach. *American Journal on Intellectual and Developmental Disabilities, 119*(5), 405-421. https://doi.org/10.1352/1944-7558-119.5.405

*Cheng, Y., Chiang, H. C., Ye, J., & Cheng, L. H. (2010). Enhancing empathy instruction using a collaborative virtual learning environment for children with autistic spectrum conditions. *Computers & Education, 55*(4), 1449-1458. doi:10.1016/j.compedu.2010.06.008

Chow, C. M., Ruhl, H., & Buhrmester, D. (2013). The mediating role of interpersonal competence between adolescents' empathy and friendship quality: A dyadic approach. *Journal of Adolescence, 36*(1), 191-200. https://doi.org/10.1016/j.adolescence.2012.10.004

Clark, K. E., & Ladd, G. W. (2000). Connectedness and autonomy support in parent-child relationships: Links to children's socioemotional orientation and peer relationships. *Developmental Psychology, 36*(4), 485–498. https://doi.org/10.1037/0012-1649.36.4.485

*Courty, A., Maria, A. S., Lalanne, C., Ringuenet, D., Vindreau, C., Chevallier, C., ... & Berthoz, S. (2013). Levels of autistic traits in anorexia nervosa: a comparative psychometric study. *BMC psychiatry, 13*(1), 1-9. doi:10.1186/1471-244X-13-222

Cramer, D., & Jowett, S. (2010). Perceived empathy, accurate empathy, and relationship satisfaction in heterosexual couples. *Journal of Social and Personal Relationships, 27*(3), 327-349. https://doi.org/10.1177/0265407509348384

Crompton, C. J., Ropar, D., Evans-Williams, C. V., Flynn, E. G., & Fletcher-Watson, S. (2019). Autistic peer-to-peer information transfer is highly effective. *Autism, 24*(7), 1704–1712. https://doi.org/ 10.1177/1362361320919286

Dadds, M. R., Hunter, K., Hawes, D. J., Frost, A. D. J., Vassallo, S., Bunn, P., Merz, S., & Masry, Y. E. (2008). A measure of cognitive and affective empathy in children using parent ratings. *Child Psychiatry and Human Development, 39*(2), 111-122. https://doi.org/10.1007/s10578-007-0075-4

Damon, W., Lerner, R. M., & Eisenberg, N. (Eds.). (2006). *Handbook of Child Psychology, Social, Emotional, and Personality Development.* John Wiley & Sons.

Davies, M., Udwin, O., & Howlin, P. (1998). Adults with William syndrome: Preliminary study of social, emotional, and behavioural difficulties. *The British Journal of Psychiatry, 172*, 273–276. https://doi.org/10.1192/bjp.172.3.273.

Davis, M. H. (1980). *Interpersonal reactivity index*. American Psychological Association.

Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology, 44*, 113–126. https://doi.org/10.1037/0022-3514.44.1.113

Davis, M. H. (1996). *Empathy: A Social Psychological Approach. Social Psychology Series*. Westview Press.

Davis, M. H., & Kraus, L. A. (1991). Dispositional empathy and personal relationships. In W. H. Jones, & D. Perlman (Eds.). *Advances in Personal Relationships* (Vol. 3, pp. 75–115). Jessica Kingsley Publishers.

*De Coster, L., Wiersema, J. R., Deschrijver, E., & Brass, M. (2018). The effect of being imitated on empathy for pain in adults with high-functioning autism: Disturbed self–other distinction leads to altered empathic responding. *Autism*, *22*(6), 712-727. doi:10.1177/1362361317701268

Decety, J., & Jackson, P. L. (2004). The functional architecture of human empathy. *Behavioral and Cognitive Neuroscience Reviews*, 3(2), 71-100. doi:10.1177/1534582304267187

*Demurie, E., De Corel, M., & Roeyers, H. (2011). Empathic accuracy in adolescents with autism spectrum disorders and adolescents with attention-deficit/hyperactivity disorder. *Research in Autism Spectrum Disorders, 5*(1), 126-134. doi:10.1016/j.rasd.2010.03.002

*DeNigris, D., Brooks, P. J., Obeid, R., Alarcon, M., Shane-Simpson, C., & Gillespie-Lynch, K. (2018). Bullying and identity development: Insights from autistic and non-autistic college students. *Journal of Autism and Developmental Disorders*, *48*(3), 666-678. doi:10.1007/s10803-017-3383-y

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

de Waal, F. B. M. (2008). Putting the altruism back into altruism: The evolution of empathy. *Annual Review of Psychology, 59*, 279-300. https://doi.org/10.1146/annurev.psych.59.103006.093625

de Wied, M., Branje, S. J. T., & Meeus, W. H. J. (2007). Empathy and conflict resolution in friendship relations among adolescents. *Aggressive Behavior, 33*(1), 48-55. https://doi.org/10.1002/ab.20166

Duan, C., & Hill, C. E. (1996). The current state of empathy research. *Journal of Counseling Psychology, 43*(3), 261–274. https://doi.org/10.1037/0022-0167.43.3.261

*Dudas, R. B., Lovejoy, C., Cassidy, S., Allison, C., Smith, P., & Baron-Cohen, S. (2017). The overlap between autistic spectrum conditions and borderline personality disorder. *PLoS One, 12*(9), e0184447. doi:10.1371/journal.pone.0190727

Dykens, E. M. (2006). Toward a positive psychology of mental retardation. *American Journal of Orthopsychiatry, 76*, 185-193. https://doi.org/10.1037/0002-9432.76.2.185.

Dykens, E. M. (2000). Annotation: Psychopathology in children with intellectual disability. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 41*(4), 407–417. https://doi.org/10.1111/1469-7610.00626

Dykens, E. M., & Rosner, B. A. (1999). Refining behavioral phenotypes: Personality--Motivation in Williams and Prader-Willi syndromes. *American Journal on Intellectual and Developmental Disabilities, 104*(2), 158-169. https://doi.org/10.1352/0895-8017(1999)104<0158:RBPPIW>2.0.CO;2

*Dziobek, I., Rogers, K., Fleck, S., Bahnemann, M., Heekeren, H. R., Wolf, O. T., & Convit, A. (2008). Dissociation of cognitive and emotional empathy in adults with Asperger

syndrome using the Multifaceted Empathy Test (MET). *Journal of Autism and Developmental Disorders, 38*(3), 464-473. doi:10.1007/s10803-007-0486-x

Eisenberg, N. (2007). Empathy-related responding: Its role in positive development and socialization correlates. In R. K. Silbereisen & R. M. Lerner (Eds.), *Approaches to Positive Youth Development* (pp. 75-91). Sage Publications Ltd.

Eisenberg, N., Eggum, N. D., & Giunta, L. D. (2010). Empathy-related responding: Associations with prosocial behavior, aggression, and intergroup relations. *Social Issues and Policy Review, 4*(1), 143-180. https://doi.org/10.1111/j.1751-2409.2010.01020.x

Elcheson, J., Stewart, C., Lesko, A., Willey, L. H., Craft, S., Purkis, Y., & Campbell, M. (2018). *Spectrum women: Walking to the beat of autism.* Jessica Kingsley.

Esbensen, A. J., Bishop, S., Seltzer, M. M., Greenberg, J. S., & Taylor, J. L. (2010). Comparisons between individuals with autism spectrum disorders and individuals with down syndrome in adulthood. *American Journal on Intellectual and Developmental Disabilities, 115*(4), 277-290. https://doi.org/10.1352/1944-7558-115.4.277

*Evers, K., Steyaert, J., Noens, I., & Wagemans, J. (2015). Reduced recognition of dynamic facial emotional expressions and emotion-specific response bias in children with an autism spectrum disorder. *Journal of autism and developmental disorders*, *45*(6), 1774-1784. doi: 10.1007/s10803-014-2337-x

Fidler, D. J., & Nadel, L. (2007). Education and children with Down syndrome: Neuroscience, development, and intervention. *Developmental Disabilities Research Reviews, 13*(3), 262-271. https://doi.org/10.1002/mrdd.20166

Fidler, D. J., Hepburn, S., Mankin, G., & Rogers, S. (2005). Praxis skills in young children with Down syndrome, other developmental disabilities, and typically developing children. *American Journal of Occupational Therapy, 59*, 129-138. https://doi.org/10.5014/ajot.59.2.129

Fink, E., Begeer, S., Hunt, C., & de Rosnay, M. (2014). False-belief understanding and social preference over the first 2 years of school: A longitudinal study. *Child Development, 85*(6), 2389-2403. https://doi.org/10.1111/cdev.12302

Fisher, M.H., Josol, C.K., & Shivers, C.M. (2020). An examination of social skills, friendship quality, and feelings of loneliness for adults with Williams syndrome. *Journal of Autism and Developmental Disorders, 50,* 3649-3660. doi:10.1007/s10803-020-04416-4

Fletcher-Watson, S., & Bird, G. (2020). Autism and empathy: What are the real links? *Autism, 24*, 3-6. https://doi.org/10.1177/1362361319883506

*Frolli, A., Ricci, M. C., Tortorelli, F. A., Cavallaro, A., Valenzano, L., Rega, A., ... & Corrivetti, G. (2020). Emotional education in early onset schizophrenia and asperger's syndrome. *Behavioral Sciences, 10*(9), 131. doi:10.3390/bs10090131

*Gantman, A., Kapp, S. K., Orenski, K., & Laugeson, E. A. (2012). Social skills training for young adults with high-functioning autism spectrum disorders: A randomized controlled pilot study. *Journal of autism and developmental disorders, 42*(6), 1094-1103. doi:10.1007/s10803-011-1350-6

*Garfinkel, S. N., Tiley, C., O'Keeffe, S., Harrison, N. A., Seth, A. K., & Critchley, H. D. (2016). Discrepancies between dimensions of interoception in autism: Implications for emotion and anxiety. *Biological psychology, 114*, 117-126. doi:10.1016/j.biopsycho.2015.12.003

Gaudion, K., Hall, A., & Myerson, J. (2014). Design and wellbeing: bridging the empathy gap between neurotypical designers and autistic adults. *Design for Sustainable Wellbeing and Empowerment*, 61–77. Retrieved from https://researchonline.rca.ac.uk/id/eprint/1715

Gerdes, K. E., & Segal, E. (2011). Importance of empathy for social work practice: Integrating new science. *Social Work, 56*(2), 141-148. https://doi.org/10.1093/sw/56.2.141

Gilchrist, A., Green, J., Cox, A., Burton, D., Rutter, M., & Le Couteur, A. (2001). Development and current functioning in adolescents with Asperger syndrome: A comparative study. *Journal of Child Psychology and Psychiatry, 42*(2), 227–240. https://doi.org/10.1111/1469-7610.00714

*Gleichgerrcht, E., Torralva, T., Rattazzi, A., Marenco, V., Roca, M., & Manes, F. (2013). Selective impairment of cognitive empathy for moral judgment in adults with high functioning autism. *Social cognitive and affective neuroscience, 8*(7), 780-788. doi:10.1093/scan/nss067

*Golan, O., Baron-Cohen, S., Hill, J. J., & Rutherford, M. (2007). The 'Reading the Mind in the Voice' test-revised: a study of complex emotion recognition in adults with and without autism spectrum conditions. *Journal of autism and developmental disorders, 37*(6), 1096-1106. doi:10.1007/s10803-006-0252-5

*Goldingay, S., Stagnitti, K., Sheppard, L., McGillivray, J., McLean, B., & Pepin, G. (2015). An intervention to improve social participation for adolescents with autism spectrum disorder: Pilot study. *Developmental neurorehabilitation, 18*(2), 122-130. doi:10.3109/17518423.2013.855275

*Gonzalez-Gadea, M. L., Baez, S., Torralva, T., Castellanos, F. X., Rattazzi, A., Bein, V., ... & Ibanez, A. (2013). Cognitive variability in adults with ADHD and AS: disentangling the roles of executive functions and social cognition. *Research in developmental disabilities, 34*(2), 817-830. doi:10.1016/j.ridd.2012.11.009

*Greenberg, D. M., Warrier, V., Allison, C., & Baron-Cohen, S. (2018). Testing the empathizing–systemizing theory of sex differences and the extreme male brain theory of autism in half a million people. *Proceedings of the National Academy of Sciences*, *115*(48), 12152-12157. doi:10.1073/pnas.1811032115

*Greimel, E., Schulte-Rüther, M., Kircher, T., Kamp-Becker, I., Remschmidt, H., Fink, G. R., ... & Konrad, K. (2010). Neural mechanisms of empathy in adolescents with autism spectrum disorder and their fathers. *Neuroimage*, *49*(1), 1055-1065. doi:10.1016/j.neuroimage.2009.07.057

*Groen, Y., Fuermaier, A. B. M., Den Heijer, A. E., Tucha, O., & Althaus, M. (2015). The empathy and systemizing quotient: The psychometric properties of the Dutch version and a review of the cross-cultural stability. *Journal of Autism and Developmental Disorders*, *45*(9), 2848-2864. doi:10.1007/s10803-015-2448-z

*Grove, R., Baillie, A., Allison, C., Baron-Cohen, S., & Hoekstra, R. A. (2015). Exploring the quantitative nature of empathy, systemising and autistic traits using factor mixture modelling. *The British Journal of Psychiatry*, *207*(5), 400-406. doi:10.1192/bjp.bp.114.155101

*Grove, R., Baillie, A., Allison, C., Baron-Cohen, S., & Hoekstra, R. A. (2014). The latent structure of cognitive and emotional empathy in individuals with autism, first-degree relatives, and typical individuals. *Molecular autism*, *5*(1), 1-10. doi:10.1186/2040-2392-5-42

*Grove, R., Baillie, A., Allison, C., Baron-Cohen, S., & Hoekstra, R. A. (2013). Empathizing, systemizing, and autistic traits: Latent structure in individuals with autism, their parents, and general population controls. *Journal of abnormal psychology*, *122*(2), 600. doi:10.1037/a0031919

*Gu, X., Eilam-Stock, T., Zhou, T., Anagnostou, E., Kolevzon, A., Soorya, L., ... & Fan, J. (2015). Autonomic and brain responses associated with empathy deficits in autism spectrum disorder. *Human brain mapping*, *36*(9), 3323-3338. doi:10.1002/hbm.22840

*Guivarch, J., Murdymootoo, V., Elissalde, S. N., Salle-Collemiche, X., Tardieu, S., Jouve, E., & Poinso, F. (2017). Impact of an implicit social skills training group in children with autism spectrum disorder without intellectual disability: A before-and-after study. *PloS one*, *12*(7), e0181159. doi:10.1371/journal.pone.0181159

*Hadjikhani, N., Zürcher, N. R., Rogier, O., Hippolyte, L., Lemonnier, E., Ruest, T., ... & Prkachin, K. M. (2014). Emotional contagion for pain is intact in autism spectrum disorders. *Translational psychiatry*, *4*(1), e343-e343. doi:10.1038/tp.2013.113

*Hagenmuller, F., Rössler, W., Wittwer, A., & Haker, H. (2014). Empathic resonance in Asperger syndrome. *Research in Autism Spectrum Disorders*, *8*(7), 851-859. doi:10.1016/j.rasd.2014.04.008

*Hall, J., Philip, R. C., Marwick, K., Whalley, H. C., Romaniuk, L., McIntosh, A. M., ... & Lawrie, S. M. (2012). Social cognition, the male brain, and the autism spectrum. *PLoS One, 7*(12), e49033. doi:10.1371/journal.pone.0049033

*Hardstaff, S. (2014). “Maybe he's on the toy train”: empathising and systemising in an encounter with David Macaulay's Black and White. *Literacy*, *48*(2), 80-85. doi: 10.1111/lit.12033

Heasman, B., & Gillespie, A. (2019). Neurodivergent intersubjectivity: Distinctive features of how autistic people create shared understanding. *Autism*, *23*, 910–921. https://doi.org/10.1177/ 1362361318785172

Hefner, J., & Eisenberg, D. (2009). Social support and mental health among college students. *American Journal of Orthopsychiatry, 79*(4), 491-499. doi:10.1037/a0016918

*Hillier, A., Fish, T., Cloppert, P., & Beversdorf, D. Q. (2007). Outcomes of a social and vocational skills support group for adolescents and young adults on the autism spectrum. *Focus on autism and other developmental disabilities*, *22*(2), 107-115. doi:10.1177/10883576070220020201

Hillier, L. W., Fulton, R. S., Fulton, L. A., Graves, T. A., Pepin, K. H., Wagner-McPherson, C., Layman, D., Maas, J., Jaeger, S., Walker, R., Wylie, K., Sekhon, M., Becker, M. C., O’Laughlin, M. D., Schaller, M. E., Fewell, G. A., Delehaunty, K. D., Miner, T. L., Nash, W. E.…Wilson, R. K. (2003). The DNA sequence of human chromosome 7. *Nature, 424*(6945), 157–164. https://doi.org/10.1038/nature01782.

*Hirvelä, S., & Helkama, K. (2011). Empathy, values, morality, and Asperger’s syndrome. *Scandinavian journal of psychology*, *52*(6), 560-572. doi:10.1111/j.1467-9450.2011.00913.x

*Hobson, J. A., Harris, R., García-Pérez, R., & Hobson, R. P. (2009). Anticipatory concern: A study in autism. *Developmental Science*, *12*(2), 249-263. doi:10.1111/j.1467-7687.2008.00762.x

*Holopainen, A., de Veld, D. M., Hoddenbach, E., & Begeer, S. (2019). Does theory of mind training enhance empathy in autism?. *Journal of autism and developmental disorders*, *49*(10), 3965-3972. doi:10.1007/s10803-018-3671-1

*Horwitz, E. H., Schoevers, R. A., Ketelaars, C. E. J., Kan, C. C., Van Lammeren, A. M. D. N., Meesters, Y., ... & Hartman, C. A. (2016). Clinical assessment of ASD in adults using self-and other-report: psychometric properties and validity of the Adult Social Behavior Questionnaire (ASBQ). *Research in Autism Spectrum Disorders*, *24*, 17-28. doi:10.1016/j.rasd.2016.01.003

Howlin, P. (2005). Outcomes in autism spectrum disorders. In F. R. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds.), *Handbook of autism and pervasive developmental disorders, Vol. 1: Diagnosis, development, neurobiology* (3rd ed., pp. 201–220). Wiley & Sons Inc.

Howlin, P., Moss, P., Savage, S., & Rutter, M. (2013). Social outcomes in mid- to later adulthood among individuals diagnosed with autism and average nonverbal IQ as children. *Journal of the American Academy of Child & Adolescent Psychiatry, 52*(6), 572-581. https://doi.org/10.1016/j.jaac.2013.02.017

*Hudry, K., & Slaughter, V. (2009). Agent familiarity and emotional context influence the everyday empathic responding of young children with autism. *Research in Autism Spectrum Disorders*, *3*(1), 74-85. doi:10.1016/j.rasd.2008.04.004

Hughes, C., Carter, E. W., Hughes, T., Bradford, E., & Copeland, S. R. (2002). Effects of instructional versus non-instructional roles on the social interactions of high school students. *Education and Training in Mental Retardation and Developmental Disabilities, 37*(2), 146-162. Retrieved from http://www.jstor.org/stable/23879824

Innamorati, M., Ebisch, S. J. H., Gallese, V., Saggino, A., & Urgesi, C. (2019). A bidimensional measure of empathy: Empathic Experience Scale. *PLoS ONE, 14*(4), 1-19. https://doi.org/10.1371/journal.pone.0216164

Järvinen-Pasley, A., Adolphs, R., Yam, A., Hill, K. J., Grichanik, M., Reilly, J., ... & Bellugi, U. (2010). Affiliative behavior in Williams syndrome: social perception and real-life social behavior. *Neuropsychologia, 48*(7), 2110-2119. doi:10.1016/j.neuropsychologia.2010.03.032

Jawaid, A., Riby, D. M., Owens, J., White, S. W., Tarar, T., & Schulz, P. E. (2012). 'Too withdrawn' or 'too friendly': Considering social vulnerability in two neuro-developmental disorders. *Journal of Intellectual Disability Research, 56*(4), 335-350. https://doi.org/10.1111/j.1365-2788.2011.01452.x

*Jermakow, N., & Brzezicka, A. (2016). How autistic are anorectic females? Similarities and differences between anorexia nervosa and autism spectrum disorders. *Clinical Neuropsychiatry, 13*(4-5), 53-59.

*Johnson, S. A., Filliter, J. H., & Murphy, R. R. (2009). Discrepancies between self-and parent-perceptions of autistic traits and empathy in high functioning children and adolescents on the autism spectrum. *Journal of autism and developmental disorders*, *39*(12), 1706-1714. doi:10.1007/s10803-009-0809-1

Jolliffe, D., & Farrington, D. P. (2006). Development and validation of the Basic Empathy Scale. *Journal of Adolescence*, *29*(4), 589-611. https://doi.org/10.1016/j.adolescence.2005.08.010

*Jones, A. P., Happé, F. G., Gilbert, F., Burnett, S., & Viding, E. (2010). Feeling, caring, knowing: different types of empathy deficit in boys with psychopathic tendencies and autism spectrum disorder. *Journal of Child Psychology and Psychiatry, 51*(11), 1188-1197. doi:10.1111/j.1469-7610.2010.02280.x

Jones, W., Bellugi, U., Lai, Z., Chiles, M., Reilly, J., Lincoln, A., & Adolphs, R. (2000). II. Hypersociability in Williams syndrome. *Journal of Cognitive Neuroscience, 12*(Supplement 1), 30–46. https://doi.org/10.1162/089892900561968

*Kästner, A., Begemann, M., Michel, T. M., Everts, S., Stepniak, B., Bach, C., ... & Ehrenreich, H. (2015). Autism beyond diagnostic categories: characterization of autistic phenotypes in schizophrenia. *BMC psychiatry*, *15*(1), 1-12. doi:10.1186/s12888-015-0494-x

*Kember, S. M., & Williams, M. N. (2021). Autism in Aotearoa: Is the RAADS-14 a valid tool for a New Zealand population?. European Journal of Psychological Assessment, *37*(3), 1-32.

Keogh, B. K., Bernheimer, L. P., & Guthrie, D. (2004). Children with developmental delays twenty years later: Where are they? How are they?. *American Journal on Mental Retardation, 109*(3), 219-230. doi:10.1352/08958017(2004)109<219:CWDDTY>2.0.CO;2

*Kirchner, J. C., Hatri, A., Heekeren, H. R., & Dziobek, I. (2011). Autistic symptomatology, face processing abilities, and eye fixation patterns. *Journal of autism and developmental disorders*, *41*(2), 158-167. doi:10.1007/s10803-010-1032-9

*Koch, S. C., Mehl, L., Sobanski, E., Sieber, M., & Fuchs, T. (2016). Fixing the mirrors: A feasibility study of the effects of dance movement therapy on young adults with autism spectrum disorder. *Autism*, *19*(3), 338-350. doi:10.1177/1362361314522353

*Koegel, L. K., Ashbaugh, K., Navab, A., & Koegel, R. L. (2016). Improving empathic communication skills in adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *46*(3), 921-933. doi:10.1007/s10803-015-2633-0

*Koehne, S., Behrends, A., Fairhurst, M. T., & Dziobek, I. (2016). Fostering social cognition through an imitation-and synchronization-based dance/movement intervention in adults with autism spectrum disorder: a controlled proof-of-concept study. *Psychotherapy and psychosomatics*, *85*(1), 27-35. doi:10.1159/000441111

*Koehne, S., Hatri, A., Cacioppo, J. T., & Dziobek, I. (2016). Perceived interpersonal synchrony increases empathy: insights from autism spectrum disorder. *Cognition, 146*, 8-15. doi:10.1016/j.cognition.2015.09.007

*Komeda, H., Kosaka, H., Fujioka, T., Jung, M., & Okazawa, H. (2019). Do individuals with autism spectrum disorders help other people with autism spectrum disorders? An

investigation of empathy and helping motivation in adults with autism spectrum disorder. *Frontiers in psychiatry*, *10*, 376. doi:10.3389/fpsyt.2019.00376

*Krajmer, P., ŠPAJDEL, M., Celec, P., & Ostatnikova, D. (2011). Relationship between Salivary Testosterone Levels and Empathizing/Systemizing in Slovak Boys with Asperger Syndrome. *Studia Psychologica*, *53*(3).

*Kubota, M., Fujino, J., Tei, S., Takahata, K., Matsuoka, K., Tagai, K., ... & Higuchi, M. (2020). Binding of dopamine D1 receptor and noradrenaline transporter in individuals with autism spectrum disorder: A PET Study. *Cerebral Cortex*, *30*(12), 6458-6468. doi:10.1093/cercor/bhaa211

*Kuo, C. C., Liang, K. C., Tseng, C. C., & Gau, S. S. F. (2014). Comparison of the cognitive profiles and social adjustment between mathematically and scientifically talented students and students with Asperger's syndrome. *Research in Autism Spectrum Disorders*, *8*(7), 838-850. doi:10.1016/j.rasd.2014.04.004

*Lai, M. C., Lombardo, M. V., Pasco, G., Ruigrok, A. N., Wheelwright, S. J., Sadek, S. A., ... & Baron-Cohen, S. (2011). A behavioral comparison of male and female adults with high functioning autism spectrum conditions. *PloS one*, *6*(6), e20835. doi:10.1371/journal.pone.0020835

*Larson, F. V., Lai, M. C., Wagner, A. P., MRC AIMS Consortium, Baron-Cohen, S., & Holland, A. J. (2015). Testing the 'extreme female brain' theory of psychosis in adults with autism spectrum disorder with or without co-morbid psychosis. *PLoS One*, *10*(6), e0128102. doi:10.1371/journal.pone.0128102

Lawrence, E. J., Shaw, P., Baker, D., Baron-Cohen, S., & David, A. S. (2004). Measuring empathy: Reliability and validity of the Empathy Quotient. *Psychological Medicine, 34*(5), 911-920. https://doi.org/10.1017/S0033291703001624

*Lawson, J., Baron-Cohen, S., & Wheelwright, S. (2004). Empathising and systemising in adults with and without Asperger syndrome. *Journal of autism and developmental disorders*, *34*(3), 301-310. doi:10.1023/B:JADD.0000029552.42724.1b

*Lawson, T. R., & Walsh, D. (2007). The effects of observational training on the acquisition of reinforcement for listening. *Journal of Early and Intensive Behavior Intervention*, *4*(2), 430. doi:10.1037/h0100383

*Lepage, J. F., Lortie, M., Taschereau-Dumouchel, V., & Théoret, H. (2009). Validation of French-Canadian versions of the Empathy Quotient and Autism Spectrum Quotient. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, *41*(4), 272. doi:10.1037/a0016248

*Lever, A. G., & Geurts, H. M. (2018). Is older age associated with higher self-and other-rated ASD characteristics?. *Journal of Autism and Developmental Disorders*, *48*(6), 2038-2051. doi:10.1007/s10803-017-3444-2

*Levin, I. P., Gaeth, G. J., Foley-Nicpon, M., Yegorova, V., Cederberg, C., & Yan, H. (2015). Extending decision making competence to special populations: a pilot study of persons on the autism spectrum. *Frontiers in Psychology*, *6*, 539. doi:10.3389/fpsyg.2015.00539

Levy, A., & Perry, A. (2011). Outcomes in adolescents and adults with autism: A review of the literature. *Research in Autism Spectrum Disorders, 5*(4), 1271-1282. https://doi.org/10.1016/j.rasd.2011.01.023

*Libero, L. E., Stevens Jr, C. E., & Kana, R. K. (2014). Attribution of emotions to body postures: An independent component analysis study of functional connectivity in autism. *Human brain mapping, 35*(10), 5204-5218. doi:10.1002/hbm.22544

*Lombardo, M. V., Chakrabarti, B., Lai, M. C., & Baron-Cohen, S. (2012). Self-referential and social cognition in a case of autism and agenesis of the corpus callosum. *Molecular autism*, *3*(1), 1-15. doi:10.1186/2040-2392-3-14

*Lombardo, M. V., Barnes, J. L., Wheelwright, S. J., & Baron-Cohen, S. (2007). Self-referential cognition and empathy in autism. *PloS one*, *2*(9), e883. doi:10.1371/journal.pone.0000883

*Malhotra, B. (2019). Art therapy with puppet making to promote emotional empathy for an adolescent with autism. *Art Therapy*, *36*(4), 183-191. doi:10.1080/07421656.2019.1645500

*Mastrominico, A., Fuchs, T., Manders, E., Steffinger, L., Hirjak, D., Sieber, M., ... & Koch, S. C. (2018). Effects of dance movement therapy on adult patients with autism spectrum disorder: A randomized controlled trial. *Behavioral Sciences*, *8*(7), 61. doi:10.3390/bs8070061

*Mathersul, D., McDonald, S., & Rushby, J. A. (2013). Autonomic arousal explains social cognitive abilities in high-functioning adults with autism spectrum disorder. *International Journal of Psychophysiology*, *89*(3), 475-482. doi:10.1016/j.ijpsycho.2013.04.014

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

Matson, J. L., & Horovitz, M. (2010). Stability of autism spectrum disorders symptoms over time. *Journal of Developmental and Physical Disabilities, 22*, 331–342. https://doi.org/10.1007/s10882-010-9188-y

* Mazza, M., Pino, M. C., Mariano, M., Tempesta, D., Ferrara, M., De Berardis, D., Masedu, F., & Valenti, M. (2014). Affective and cognitive empathy in adolescents with autism spectrum disorder. *Frontiers in Human Neuroscience, 8*, 1-6. doi:10.3389/fnhum.2014.00791

*Mazza, M., Pino, M. C., Vagnetti, R., Peretti, S., Valenti, M., Marchetti, A., & Di Dio, C. (2020). Discrepancies between explicit and implicit evaluation of aesthetic perception ability in individuals with autism: a potential way to improve social functioning. *BMC psychology*, *8*(1), 1-15. doi:10.1186/s40359-020-00437-x

*McDonald, N. M., & Messinger, D. S. (2012). Empathic responding in toddlers at risk for an autism spectrum disorder. *Journal of autism and developmental disorders*, *42*(8), 1566-1573. doi:10.1007/s10803-011-1390-y

*McDonald, N. M., Murphy, H. G., & Messinger, D. S. (2017). Empathic responding in preschool-aged children with familial risk for autism. *Autism Research, 10*(10), 1621-1628. doi:10.1002/aur.1819

*McVey, A. J., Dolan, B. K., Willar, K. S., Pleiss, S., Karst, J. S., Casnar, C. L., ... & Van Hecke, A. V. (2016). A replication and extension of the PEERS® for young adults social skills intervention: Examining effects on social skills and social anxiety in young adults with autism spectrum disorder. *Journal of autism and developmental disorders*, *46*(12), 3739-3754. doi:10.1007/s10803-016-2911-5

*Melvin, C. L., Langdon, P. E., & Murphy, G. H. (2020). "They're the hardest group to treat, that changes the least". Adapted sex offender treatment programmes for individuals with Autism Spectrum Disorders: Clinician views and experiences. *Research in developmental disabilities*, *105*, 103721. doi:10.1016/j.ridd.2020.103721

Mendelson, J. L., Gates, J. A., & Lerner, M. D. (2016). Friendship in school-age boys with autism spectrum disorders: A meta-analytic summary and developmental, process-based model. *Psychological Bulletin, 142*(6), 601–622. https://doi.org/10.1037/bul0000041

*Mensi, M. M., Gasparini, L., Chiappedi, M., Guerini, F. R., Orlandi, M., Rogantini, C., & Balottin, U. (2018). Empathy and behavior in children affected by Autism Spectrum Disorders. *Minerva pediatrica*. doi:10.23736/S0026-4946.18.05228-3

*Metcalfe, D., McKenzie, K., McCarty, K., & Pollet, T. V. (2019). Emotion recognition from body movement and gesture in children with Autism Spectrum Disorder is improved by situational cues. *Research in developmental disabilities*, *86*, 1-10. doi:10.1016/j.ridd.2018.12.008

Mervis, C. B., & John, A. E. (2010). Cognitive and behavioral characteristics of children with Williams syndrome. *American Journal of Medical Genetics Part C, 154C*, 229-248. https://doi.org/10.1002/ajmg.c.30263

*Minio-Paluello, I., Baron-Cohen, S., Avenanti, A., Walsh, V., & Aglioti, S. M. (2009). Absence of embodied empathy during pain observation in Asperger syndrome. *Biological psychiatry, 65*(1), 55-62. doi:10.1016/j.biopsych.2008.08.006

Mitchell, P., Sheppard, E., & Cassidy, S. (2021). Autism and the double empathy problem: Implications for development and mental health. *British Journal of Developmental Psychology, 39*(1), 1-18.

*Montgomery, C. B., Allison, C., Lai, M. C., Cassidy, S., Langdon, P. E., & Baron-Cohen, S. (2016). Do adults with high functioning autism or Asperger syndrome differ in empathy and emotion recognition?. *Journal of autism and developmental disorders, 46*(6), 1931-1940. doi:10.1007/s10803-016-2698-4

*Moriwaki, A., Ito, R., & Fujino, H. (2011). Characteristics of empathy for friendship in children with high-functioning autism spectrum disorders. *The Japanese Journal of Special Education, 48*(6), 593-604. doi:10.6033/tokkyou.48.593

*Mul, C. L., Stagg, S. D., Herbelin, B., & Aspell, J. E. (2018). The feeling of me feeling for you: Interoception, alexithymia and empathy in autism. *Journal of Autism and Developmental Disorders, 48*(9), 2953-2967. doi:10.1007/s10803-018-3564-3

*Murphy, G., Powell, S., Guzman, A. M., & Hays, S. J. (2007). Cognitive-behavioural treatment for men with intellectual disabilities and sexually abusive behaviour: a pilot study. *Journal of Intellectual Disability Research, 51*(11), 902-912. doi:10.1111/j.1365-2788.2007.00990.x

*Murray, K., Johnston, K., Cunnane, H., Kerr, C., Spain, D., Gillan, N., ... & Happé, F. (2017). A new test of advanced theory of mind: The "Strange Stories Film Task" captures social processing differences in adults with autism spectrum disorders. *Autism Research, 10*(6), 1120-1132. doi:10.1002/aur.1744

*Myles, B. S., Lee, H. J., Hudson, J., Smith, S. M., Tien, K. C., Chou, Y. C., & Swanson, T. C. (2007). A large-scale study of the characteristics of Asperger syndrome. *Education and Training in Developmental Disabilities*, 448-459.

*Oberman, L. M., Winkielman, P., & Ramachandran, V. S. (2009). Slow echo: facial EMG evidence for the delay of spontaneous, but not voluntary, emotional mimicry in children with autism spectrum disorders. *Developmental science, 12*(4), 510-520. doi:10.1111/j.1467-7687.2008.00796.x

*Osório, A. A. C., do Egito, J. H. T., Martins, G. C., Kim, C. A., Honjo, R. S., Sampaio, A. D. C. S., ... & Teixeira, M. C. T. V. (2019). Associations between fetal testosterone and pro–social tendencies, anxiety and autistic symptoms in Williams syndrome: a preliminary study. *International Journal of Developmental Disabilities, 65*(2), 82-88. doi:10.1080/20473869.2017.1376163

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Systematic reviews, 10*(1), 1-11. doi:10.1186/s13643-021-01626-4

*Park, S., Cho, S. C., Cho, I. H., Kim, B. N., Kim, J. W., Shin, M. S., ... & Yoo, H. J. (2012). Sex differences in children with autism spectrum disorders compared with their unaffected siblings and typically developing children. *Research in Autism Spectrum Disorders*, *6*(2), 861-870. doi:10.1016/j.rasd.2011.11.006

*Patil, I., Melsbach, J., Hennig-Fast, K., & Silani, G. (2016). Divergent roles of autistic and alexithymic traits in utilitarian moral judgments in adults with autism. *Scientific reports*, *6*(1), 1-15. doi:10.1038/srep23637

*Paulus, F. M., Kamp-Becker, I., & Krach, S. (2013). Demands in reflecting about another's motives and intentions modulate vicarious embarrassment in autism spectrum disorders. *Research in developmental disabilities*, *34*(4), 1312-1321. doi:10.1016/j.ridd.2013.01.009

*Pepper, K. L., Demetriou, E. A., Park, S. H., Boulton, K. A., Hickie, I. B., Thomas, E. E., & Guastella, A. J. (2019). Self-reported empathy in adults with autism, early psychosis, and social anxiety disorder. *Psychiatry research*, *281*, 112604. doi:10.1016/j.psychres.2019.112604

*Pepper, K. L., Demetriou, E. A., Park, S. H., Song, Y. C., Hickie, I. B., Cacciotti-Saija, C., ... & Guastella, A. J. (2018). Autism, early psychosis, and social anxiety disorder: understanding the role of social cognition and its relationship to disability in young adults with disorders characterized by social impairments. *Translational psychiatry*, *8*(1), 1-11. doi:10.1038/s41398-018-0282-8

*Peterson, C. (2014). Theory of mind understanding and empathic behavior in children with autism spectrum disorders. *International Journal of Developmental Neuroscience*, *39*, 16-21. doi:10.1016/j.ijdevneu.2014.05.002

*Peterson, C. C., Slaughter, V., & Brownell, C. (2015). Children with autism spectrum disorder are skilled at reading emotion body language. *Journal of experimental child psychology*, *139*, 35-50. doi:10.1016/j.jecp.2015.04.012

*Petrides, K. V., Hudry, K., Michalaria, G., Swami, V., & Sevdalis, N. (2011). A comparison of the trait emotional intelligence profiles of individuals with and without Asperger syndrome. *Autism*, *15*(6), 671-682. doi:10.1177/1362361310397217

*Plesa Skwerer, D., & Tager-Flusberg, H. (2016). Empathic responsiveness and helping behaviours in young children with Williams syndrome. *Journal of Intellectual Disability Research*, *60*(10), 1010-1019. doi:10.1111/jir.12302

*Ponnet, K., Buysse, A., Roeyers, H., & De Clercq, A. (2008). Mind-reading in young adults with ASD: does structure matter?. *Journal of Autism and Developmental Disorders*, *38*(5), 905-918. doi:10.1007/s10803-007-0462-5

*Ponnet, K., Buysse, A., Roeyers, H., & De Corte, K. (2005). Empathic accuracy in adults with a pervasive developmental disorder during an unstructured conversation with a typically developing stranger. *Journal of Autism and Developmental Disorders*, *35*(5), 585-600. doi:10.1007/s10803-005-0003-z

*Ponnet, K. S., Roeyers, H., Buysse, A., De Clercq, A., & Van Der Heyden, E. (2004). Advanced mind-reading in adults with Asperger syndrome. *Autism*, *8*(3), 249-266. doi:10.1177/1362361304045214

Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., ... & Duffy, S. (2006). Guidance on the conduct of narrative synthesis in systematic reviews. *A product from the ESRC methods programme Version*, *1*(1), b92.

Porter, M. A., Coltheart, M., & Langdon, R. (2007). The neuropsychological basis of hypersociability in Williams and Down syndrome. *Neuropsychologia*, *45*(12), 2839–3849. https://doi.org/10.1016/j.neuropsychologia.2007.05.006

*Pouw, L. B., Rieffe, C., Oosterveld, P., Huskens, B., & Stockmann, L. (2013). Reactive/proactive aggression and affective/cognitive empathy in children with ASD. *Research in developmental disabilities*, *34*(4), 1256-1266. doi:10.1016/j.ridd.2012.12.022

*Rabin, S. J., Israel-Yaacov, S., Laugeson, E. A., Mor-Snir, I., & Golan, O. (2018). A randomized controlled trial evaluating the Hebrew adaptation of the PEERS® intervention: Behavioral and questionnaire-based outcomes. *Autism Research*, *11*(8), 1187-1200. doi:10.1002/aur.1974

*Radtke, M., Wieczoreková, D., Normann, C., Humpolicek, P., Brakemeier, E. L., Bubl, E., ... & Riedel, A. (2019). Exploring autistic traits in adults with chronic depression: A clinical study. *Research in Autism Spectrum Disorders*, *65*, 34-45. doi:10.1016/j.rasd.2019.04.006

Renk, K., & Phares, V. (2004). Cross-informant ratings of social competence in children and adolescents. *Clinical Psychology Review*, *24*(2), 239-254. doi:10.1016/j.cpr.2004.01.004

Ricard, M., & Kamberk-Kilicci, M. (1995). Children's empathic responses to emotional complexity. *International Journal of Behavioural Development, 18*, 211– 225.

*Riedel, A., Suh, H., Haser, V., Hermann, I., Ebert, D., Riemann, D., ... & Hölzel, L. P. (2014). Freiburg Questionnaire of linguistic pragmatics (FQLP): psychometric properties based on a psychiatric sample. *BMC psychiatry*, *14*(1), 1-10. doi:10.1186/s12888-014-0374-9

*Rieffe, C., O'Connor, R., Bülow, A., Willems, D., Hull, L., Sedgewick, F., ... & Blijd-Hoogewys, E. (2021). Quantity and quality of empathic responding by autistic and non-autistic adolescent girls and boys. *Autism, 25*(1), 199-209. doi:10.1177/1362361320956422

*Rigby, S. N., Stoesz, B. M., & Jakobson, L. S. (2018). Empathy and face processing in adults with and without autism spectrum disorder. *Autism Research, 11*(6), 942-955. doi:10.1002/aur.1948

*Rigby, S. N., Stoesz, B. M., & Jakobson, L. S. (2016). Gaze patterns during scene processing in typical adults and adults with autism spectrum disorders. *Research in Autism Spectrum Disorders, 25*, 24-36. doi:10.1016/j.rasd.2016.01.012

Roberts, W., Strayer, J., & Denham, S. (2014). Empathy, anger, guilt: Emotions and prosocial behaviour. *Canadian Journal of Behavioural Science / Revue canadienne des sciences du comportement, 46*(4), 465–474. https://doi.org/10.1037/a0035057

*Robinson, A., & Elliott, R. (2016). Brief report: An observational measure of empathy for autism spectrum: A preliminary study of the development and reliability of the client emotional processing scale. *Journal of Autism and Developmental Disorders, 46*(6), 2240-2250. doi:10.1007/s10803-016-2727-3

*Rogers, K., Dziobek, I., Hassenstab, J., Wolf, O. T., & Convit, A. (2007). Who cares? Revisiting empathy in Asperger syndrome. *Journal of autism and developmental disorders, 37*(4), 709-715. doi:10.1007/s10803-006-0197-8

Rossetti, Z., Lehr, D., Lederer, L., Pelerin, D., & Huang, S. (2015). Parent perceptions of time spent meaningfully by young adults with pervasive support needs. *Research and Practice for Persons with Severe Disabilities, 40*, 3-19. https://doi.org/10.1177/1540796914566714.

*Roy, M., D Ohlmeier, M., Osterhagen, L., Prox-Vagedes, V., & Dillo, W. (2013). Asperger syndrome: a frequent comorbidity in first diagnosed adult ADHD patients?. *Psychiatria Danubina, 25*(2), 0-141.

*Rudra, A., Ram, J. R., Loucas, T., Belmonte, M. K., & Chakrabarti, B. (2016). Bengali translation and characterisation of four cognitive and trait measures for autism spectrum conditions in India. *Molecular Autism, 7*(1), 1-8. doi:10.1186/s13229-016-0111-y

*Rueda, P., Fernández-Berrocal, P., & Baron-Cohen, S. (2015). Dissociation between cognitive and affective empathy in youth with Asperger Syndrome. *European Journal of Developmental Psychology, 12*(1), 85-98. doi:10.1080/17405629.2014.950221

*Rueda, P., Fernández-Berrocal, P., & Schonert-Reichl, K. A. (2014). Perspective-taking and empathic concern as mediators for happiness and positive affect in adolescents with and

without asperger syndrome. *Journal of Developmental and Physical Disabilities*, *26*(6), 717-735. doi:10.1007/s10882-014-9391-3

*Russ, V., Kovshoff, H., Brown, T., Abbott, P., & Hadwin, J. A. (2020). Exploring the role of empathy in understanding the social-cognitive profile for individuals referred for Autism Spectrum Disorders assessment in adulthood. *Journal of autism and developmental disorders*, *50*(5), 1470-1478. doi:10.1007/s10803-018-3693-8

*Samson, A. C., & Hegenloh, M. (2010). Stimulus characteristics affect humor processing in individuals with Asperger syndrome. *Journal of Autism and Developmental Disorders*, *40*(4), 438-447. doi:10.1007/s10803-009-0885-2

*Santiesteban, I., Gibbard, C., Drucks, H., Clayton, N., Banissy, M. J., & Bird, G. (2021). Individuals with autism share others' emotions: evidence from the continuous affective rating and empathic responses (CARER) task. *Journal of Autism and Developmental Disorders*, *51*(2), 391-404. doi:10.1007/s10803-020-04535-y

*Schaller, U., & Rauh, R. (2017). What difference does it make? Implicit, explicit, and complex social cognition in autism spectrum disorders. *Journal of Autism & Developmental Disorders*, *47*(4). doi:10.1007/s10803-016-3008-x

*Scheeren, A. M., Koot, H. M., Mundy, P. C., Mous, L., & Begeer, S. (2013). Empathic responsiveness of children and adolescents with high-functioning autism spectrum disorder. *Autism Research*, *6*(5), 362-371. doi:10.1002/aur.1299

*Schneider, D., Slaughter, V. P., Bayliss, A. P., & Dux, P. E. (2013). A temporally sustained implicit theory of mind deficit in autism spectrum disorders. *Cognition*, *129*(2), 410-417. doi:10.1016/j.cognition.2013.08.004

*Schneider, K., Regenbogen, C., Pauly, K. D., Gossen, A., Schneider, D. A., Mevissen, L., ... & Schneider, F. (2013). Evidence for gender-specific endophenotypes in high-functioning autism spectrum disorder during empathy. *Autism Research*, *6*(6), 506-521. doi:10.1002/aur.1310

*Schrandt, J. A., Townsend, D. B., & Poulson, C. L. (2009). Teaching empathy skills to children with autism. *Journal of Applied Behavior Analysis*, *42*(1), 17-32. doi:10.1901/jaba.2009.42-17

*Schulte-Rüther, M., Greimel, E., Markowitsch, H. J., Kamp-Becker, I., Remschmidt, H., Fink, G. R., & Piefke, M. (2011). Dysfunctions in brain networks supporting empathy: an fMRI study in adults with autism spectrum disorders. *Social neuroscience*, *6*(1), 1-21. doi:10.1080/17470911003708032

*Schulte-Rüther, M., Greimel, E., Piefke, M., Kamp-Becker, I., Remschmidt, H., Fink, G. R., ... & Konrad, K. (2014). Age-dependent changes in the neural substrates of empathy in

autism spectrum disorder. *Social cognitive and affective neuroscience*, *9*(8), 1118-1126. doi:10.1093/scan/nst088

*Schulte-Rüther, M., Otte, E., Adigüzel, K., Firk, C., Herpertz-Dahlmann, B., Koch, I., & Konrad, K. (2017). Intact mirror mechanisms for automatic facial emotions in children and adolescents with autism spectrum disorder. *Autism Research*, *10*(2), 298-310. doi:10.1002/aur.1654

*Schwarz, E., Guest, P. C., Rahmoune, H., Wang, L., Levin, Y., Ingudomnukul, E., ... & Bahn, S. (2011). Sex-specific serum biomarker patterns in adults with Asperger's syndrome. *Molecular psychiatry*, *16*(12), 1213-1220. doi:10.1038/mp.2010.102

*Schwenck, C., Mergenthaler, J., Keller, K., Zech, J., Salehi, S., Taurines, R., ... & Freitag, C. M. (2012). Empathy in children with autism and conduct disorder: Group-specific profiles and developmental aspects. Journal of Child Psychology and Psychiatry, *53*(6), 651-659. doi:10.1111/j.1469-7610.2011.02499.x

Selman, R. (1980). *The growth of interpersonal understanding*. Academic Press.

*Senland, A. K., & Higgins-D'Alessandro, A. (2016). Sociomoral reasoning, empathy, and meeting developmental tasks during the transition to adulthood in autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *46*(9), 3090-3105. doi:10.1007/s10803-016-2849-7

*Senland, A. K., & Higgins-D'Alessandro, A. (2013). Moral reasoning and empathy in adolescents with autism spectrum disorder: Implications for moral education. *Journal of Moral Education*, *42*(2), 209-223. doi:10.1080/03057240.2012.752721

*Sex Offender Treatment Services Collaborative–Intellectual Disabilities (SOTSEC-ID). (2010). Effectiveness of group cognitive-behavioural treatment for men with intellectual disabilities at risk of sexual offending. *Journal of Applied Research in Intellectual Disabilities*, *23*(6), 537-551. doi:10.1111/j.1468-3148.2010.00560.x

Shattuck, P. T., Seltzer, M. M., Greenberg, J. S., Orsmond, G. I., Bolt, D., Kring, S., Lounds, J., & Lord, C. (2007). Change in autism symptoms and maladaptive behaviors in adolescents and adults with an autism spectrum disorder. *Journal of Autism and Developmental Disorders, 37*, 1735–1747. https://doi.org/10.1007/s10803-006-0307-7

Shea, V., & Mesibov, G. B. (2005). Adolescents and adults with autism. In F. R. Volkmar, R. Paul, A. Klin, & D. Cohen (Eds.), *Handbook of autism and pervasive developmental disorders, Vol. 1: Diagnosis, development, neurobiology* (3rd ed., pp. 288–311). Wiley & Sons Inc.

Sherman, S. L., Allen, E. G., Bean, L. H., & Freeman S. B. (2007). Epidemiology of Down syndrome. *Developmental Disabilities Research Reviews*, *13*(3), 221-227. https://doi.org/10.1002/mrdd.20157

*Shi, L. J., Zhou, H. Y., Wang, Y., Shen, Y. M., Fang, Y. M., He, Y. Q., ... & Chan, R. C. (2020). Altered empathy-related resting-state functional connectivity in adolescents with early-onset schizophrenia and autism spectrum disorders. *Asian Journal of Psychiatry, 53*, 102167. doi:10.1016/j.ajp.2020.102167

*Silani, G., Bird, G., Brindley, R., Singer, T., Frith, C., & Frith, U. (2008). Levels of emotional awareness and autism: an fMRI study. *Social neuroscience, 3*(2), 97-112. doi:10.1080/17470910701577020

*Sivaraman, M. (2017). Using multiple exemplar training to teach empathy skills to children with autism. *Behavior Analysis in Practice*, *10*(4), 337-346. doi:10.1007/s40617-017-0183-y

Smith, R. L., & Rose, A. J. (2011). The "cost of caring" in youth's friendships: Considering associations among social perspective taking, co-rumination, and empathetic distress. *Developmental Psychology, 47*(6), 1792–1803. https://doi.org/10.1037/a0025309

Soenens, B., Duriez, B., Vansteenkiste, M., & Goossens, L. (2007). The intergenerational transmission of empathy-related responding in adolescence: The role of maternal support. *Personality and Social Psychology Bulletin, 33*(3), 299–311. https://doi.org/10.1177/0146167206296300

*Soorya, L. V., Siper, P. M., Beck, T., Soffes, S., Halpern, D., Gorenstein, M., ... & Wang, A. T. (2015). Randomized comparative trial of a social cognitive skills group for children with autism spectrum disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, *54*(3), 208-216. doi:10.1016/j.jaac.2014.12.005

*Stauder, J. E. A., Cornet, L. J. M., & Ponds, R. W. H. M. (2011). The extreme male brain theory and gender role behaviour in persons with an autism spectrum condition. *Research in Autism Spectrum Disorders*, *5*(3), 1209-1214. doi:10.1016/j.rasd.2011.01.008

*Strunz, S., Schermuck, C., Ballerstein, S., Ahlers, C. J., Dziobek, I., & Roepke, S. (2017). Romantic relationships and relationship satisfaction among adults with Asperger syndrome and high-functioning autism. *Journal of Clinical Psychology*, *73*(1), 113-125. doi:10.1002/jclp.22319

*Sucksmith, E., Allison, C., Baron-Cohen, S., Chakrabarti, B., & Hoekstra, R. A. (2013). Empathy and emotion recognition in people with autism, first-degree relatives, and controls. *Neuropsychologia*, *51*(1), 98-105. doi:10.1016/j.neuropsychologia.2012.11.013

Sullivan, K., Winner, E., & Tager-Flusberg, H. (2003). Can adolescents with Williams syndrome tell the difference between lies and jokes? *Developmental Neuropsychology*, *23*, 85–103. https://doi.org/10.1080/87565641.2003.9651888.

Swearer, S. M. (Ed.). (2010). Assessment of bullying/victimization: The problem of comparability across studies and across methodologies. In S. R. Jimerson, S. M. Swearer,

& D. L. Espelage (Eds.), *Handbook of Bullying in Schools: An International Perspective* (pp. 305–327). Routledge/Taylor & Francis Group.

*Tavassoli, T., Miller, L. J., Schoen, S. A., Brout, J. J., Sullivan, J., & Baron-Cohen, S. (2018). Sensory reactivity, empathizing and systemizing in autism spectrum conditions and sensory processing disorder. *Developmental cognitive neuroscience*, *29*, 72-77. doi:10.1016/j.dcn.2017.05.005

*Thaler, H., Skewes, J. C., Gebauer, L., Christensen, P., Prkachin, K. M., & Jegindø Elmholdt, E. M. (2018). Typical pain experience but underestimation of others' pain: Emotion perception in self and others in autism spectrum disorder. *Autism*, *22*(6), 751-762. doi:10.1177/1362361317701269

Thurman, A. J., & Fisher, M. H. (2015). The Williams syndrome social phenotype: Disentangling the contributions of social interest and social difficulties. *International Review of Research in Developmental Disabilities, 49*, 191–227. https://doi.org/10.1016/bs.irrdd.2015.06.002.

*Trimmer, E., McDonald, S., & Rushby, J. A. (2017). Not knowing what I feel: Emotional empathy in autism spectrum disorders. *Autism*, *21*(4), 450-457. doi:10.1177/1362361316648520

*Verschuur, R., Huskens, B., & Didden, R. (2019). Effectiveness of parent education in pivotal response treatment on pivotal and collateral responses. *Journal of autism and developmental disorders, 49*(9), 3477-3493. doi:10.1007/s10803-019-04061-6

*Vuori, M., Autti-Rämö, I., Junttila, N., Vauras, M., & Tuulio-Henriksson, A. (2017). Discrepancies between self-and adult-perceptions of social competence in children with neuropsychiatric disorders. *Child: care, health, and development*, *43*(5), 670-678. doi:10.1111/cch.12406

*Wagels, L., Schneider, I., Menke, S., Ponge, A. K., Kohn, N., Schneider, F., & Habel, U. (2020). Autism and reactions to provocation in a social and non-social context. *Journal of Autism and Developmental Disorders*, *50*(2), 402-414. doi:10.1007/s10803-019-04257-w

Waite, J., Heald, M., Wilde, L., Woodcock, K., Wellham, A., Adams, D., & Oliver, C. (2014). The importance of understanding the behavioural phenotypes of genetic syndromes associated with intellectual disability. *Paediatrics and Child Health, 24*(10), 468-472. https://doi.org/10.1016/j.paed.2014.05.002

*Wakabayashi, A., Baron-Cohen, S., Uchiyama, T., Yoshida, Y., Kuroda, M., & Wheelwright, S. (2007). Empathizing and systemizing in adults with and without autism spectrum conditions: Cross-cultural stability. *Journal of autism and developmental disorders*, *37*(10), 1823-1832. doi:10.1007/s10803-006-0316-6

*Wang, Y., Xiao, Y., Li, Y., Chu, K., Feng, M., Li, C., ... & Ke, X. (2019). Exploring the relationship between fairness and 'brain types' in children with high-functioning autism spectrum disorder. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 88*, 151-158. doi:10.1016/j.pnpbp.2018.07.008

*Wheelwright, S., Baron-Cohen, S., Goldenfeld, N., Delaney, J., Fine, D., Smith, R., ... & Wakabayashi, A. (2006). Predicting autism spectrum quotient (AQ) from the systemizing quotient-revised (SQ-R) and empathy quotient (EQ). *Brain research, 1079*(1), 47-56. doi:10.1016/j.brainres.2006.01.012

Wilkinson, R. G., & Marmot, M. (Eds.). (2003). *Social determinants of health: the solid facts.* World Health Organization.

Williams, D. (1998). *Autism and sensing: The unlost instinct.* Jessica Kingsley.

*Williams, J. H., & Cameron, I. M. (2017). The actions and feelings questionnaire in autism and typically developed adults. *Journal of Autism and Developmental Disorders, 47*(11), 3418-3430. doi:10.1007/s10803-017-3244-8

*Yager, J., & Iarocci, G. (2013). The development of the multidimensional social competence scale: A standardized measure of social competence in autism spectrum disorders. *Autism Research, 6*(6), 631-641. doi:10.1002/aur.1331

Yoder, P. J., & McDuffie, A. (2006). Treatment of joint attention in children with disabilities. In T. Charman, & W. Stone (Eds.), *Social & communication in autism spectrum disorders: Early identification, diagnosis, & intervention* (pp. 117–142). Guilford.

*Yoshimura, Y., Kikuchi, M., Hiraishi, H., Hasegawa, C., Hirosawa, T., Takahashi, T., ... & Minabe, Y. (2018). Longitudinal changes in the mismatch field evoked by an empathic voice reflect changes in the empathy quotient in autism spectrum disorder. *Psychiatry Research: Neuroimaging, 281*, 117-122. doi:10.1016/j.pscychresns.2018.05.003

*Ziermans, T., de Bruijn, Y., Dijkhuis, R., Staal, W., & Swaab, H. (2019). Impairments in cognitive empathy and alexithymia occur independently of executive functioning in college students with autism. *Autism, 23*(6), 1519-1530. doi:10.1177/1362361318817

CHAPTER 3

Exploring The Relationship between Empathy and Social Skills for Individuals with Different Forms of Intellectual and Developmental Disabilities

Much of the current research on individuals with intellectual and developmental disabilities (IDD) evaluates these heterogeneous disabilities as a single group. Others, however, have highlighted the critical importance of considering the etiology of different disorders and its role in the strengths and challenges observed across and within IDD conditions. The relationship between etiology and behavior is often referred to as "behavioral phenotypes" (Dykens et al., 2000). One important principle regarding behavioral phenotypes is the observance of probabilistic rather than deterministic outcomes (when a genetic disorder determines the outcome for every individual diagnosed with the syndrome; Dykens, 1995). Probabilistic outcomes mean that a group of individuals with a specific genetic condition are more likely to exhibit a "characteristic" or "typical" behavioral feature relative to those without the condition (Dykens, 1995, p. 523). Identifying and understanding these probabilistic outcomes and how they impact other aspects of the individuals' lives could help to inform the development of interventions to address unique challenges experienced by individuals with specific IDD conditions.

Understanding the pathways between genes and behavior can inform our understanding of the social difficulties individuals with different forms of IDD experience, including for example social exploitation, poor friendship qualities, and social skills deficits (Waite et al., 2014). Specifically, although individuals with several forms of IDD experience poor social outcomes, the pathways, or reasons that lead to these outcomes may differ across disability conditions. These inter-group differences may give rise to intervention considerations and

recommendations that may be unique for a specific IDD group. Acknowledgement of the variation of pathways to similar outcomes within the IDD population allows practitioners and researchers to develop appropriate interventions for different IDD groups while accounting for individual and group-specific characteristics.

Empathy (i.e., the ability to understand and respond to the emotional state of others) is one general area of concern for individuals with IDD (de Wied et al., 2007). Overall, individuals with IDD have been reported to have impairments in empathy skills. Generally, empathy can be described as two sub-components: cognitive empathy and affective empathy. Cognitive empathy refers to a person's understanding of another person's emotions while affective empathy refers to how that person shares in or experiences the other person's emotional state (Hoffman, 2001). Although neurological research suggests that these two sub-constructs of empathy may be governed by separate brain systems (Nummenmaa et al., 2008; Shamay-Tsoory et al., 2009), cognitive and affective empathy are considered interdependent in that a person cannot express the same emotional state of another person without the ability to first identify the emotion accurately (Behrends et al., 2012).

While lower levels of empathy are consistently reported for individuals with IDD, these skills may vary across specific IDD groups such as autism spectrum disorder (ASD), Williams syndrome (WS), and Down syndrome (DS). For instance, individuals with ASD seemingly have more difficulties with understanding and identifying the emotions of others (i.e., cognitive empathy) compared to the expression of empathy (i.e., affective empathy; Blair, 2008; Frith, 2012; Smith, 2009). In contrast, individuals with DS display strong cognitive empathy skills, as they are more attentive to facial expressions and engage in positive affect (Kasari et al., 2003). Individuals with WS also seem to display strong empathy skills and are described as having

higher cognitive empathy, particularly due to their heightened sensitivity to the emotional needs of others (Jones et al., 2000).

Specific social skills may also be crucial to understanding and expressing empathy toward others (Nugent & Halvorson, 1995; Koegel et al., 2016; Hill, 2009). In fact, empathy itself can also be defined and understood as a specific social and communication skill (Riggio et al., 1989). An individual who can successfully understand and express empathy toward others demonstrates competency in verbal communication and social role playing (Riggio, 1986). Specifically, empathy is particularly important during childhood and adolescence due to its role in the development and maintenance of friendships (Allemand et al., 2015; Eisenberg et al., 2006). While childhood friendships are mainly centered around concrete and quantitative constructs (e.g., sharing of toys), adolescent friendships emphasize more abstract constructs such as empathy (Eisenberg et al., 2006; Hoffman, 2000).

Given the relationship between empathy and social skills in the general population, it is critical to examine the same relationship for various IDD groups. If empathy skills and social skills are similar or different across different IDD conditions, it is critical to identify any observed differences to account for those differences in future interventions. That is, identifying what differences may lead to one outcome or the other will provide a deeper understanding of what to address in interventions for each diagnostic group. Current examination of the research literature (Josol, [Chapter 2]) suggests that few studies have examined the relationship between empathy and social skills for individuals with WS and DS; however, some studies report that empathy skills are significantly related to various social domains including helpfulness, perspective-taking, displaying concern for others, and positive affect for individuals with ASD (e.g., Rueda et al., 2014; Senland & Higgins-D'Alesandro).

Purpose of Current Study

Given the relationship between empathy and social skills in the general population, there is a serious need to examine the same phenomenon with the IDD population. To achieve this aim, etiology must be considered, as specific characteristics or traits of certain IDD group may also affect the relation of empathy to various social skills. The examination of group differences accounts for such etiological factors and will aid in designing interventions that are unique and prevalent to a specific IDD group. The current study was conducted to examine the specific relationship of empathy and social skills for individuals with ASD, WS, and DS as well as to assess for any differences across groups (including a typically developing [TD] control group). The research questions for the current study were (a) Do parent ratings of empathy and social skills differ between individuals with ADS, WS, DS, and TD?; (b) Are empathy skills and social skills related to each other for individuals with ASD, WS, DS, and TD ?; and (c) Are there differences in the relationship between empathy skills and social skills between groups?

Method

Sample

Participants with IDD were recruited through various programs and organizations throughout the United States that support individuals and families with ASD, WS, and DS. Specifically, participants and their families with ASD were recruited from organizations such as Autism Speaks, the Simons Foundation Powering Autism Research (SPARK), and the Autism Alliance of Michigan (AAOM). Participants and their families with WS were recruited through local chapters of the Williams Syndrome Association, one of the largest organizations for Williams syndrome in the United States, as well as through the Williams Syndrome Associations Research Registry. Participants and their families with DS were recruited through local chapters

of the Down Syndrome Association, such as the Capital Area Down Syndrome Association, and through DS-Connect, a national Down syndrome registry. Finally, to serve as a control group, participants without IDD and their families were recruited from elementary and middle schools primarily in the Midwest region of the United States and through various parent listservs.

Specifically, after obtaining approval from the institutional review board, a recruitment email describing the study and containing a link to a sign-up form was sent to the listservs of most of these programs and organizations. For large national organizations such as SPARK and DS-Connect, the research team applied for access to their recruitment services. Upon approval of both applications, the research team worked closely with the administrative team for SPARK and DS-Connect to recruit potential participants from their large database systems consisting of hundreds of individuals with their respective disabilities and their families interested in learning about research opportunities throughout the United States. Initial recruitment focused on recruiting adolescent participants with IDD (i.e., 10-15 years old) given that empathy plays an increasingly important role in social relationships (e.g., friendships) in adolescence (Eisenberg et al., 2006; Hoffman, 2000). However, due to difficulties recruiting participants in this narrow age range, the age requirement was reduced to include individuals as young as eight years old.

For individuals with ASD, WS, or DS to be included in the present study, potential participants and families were asked to complete an initial screening form to confirm (a) the age of the child participant (i.e., 8-15 years old); (b) willingness to provide educational or medical records (e.g., an individualized education program [IEP], Section 504 plan, or genetic testing report) confirming diagnosis of ASD, WS, or DS; (c) ability to verbally communicate and hear due to the online nature of the study; and (d) the ability to attend to several computer tasks with

accommodations, if necessary. Due to the nature of the computer tasks, individuals with severe to profound intellectual disability were excluded.

Parents of individuals without IDD (i.e., the TD group) were also asked to complete an initial screening form to assess for the following inclusion criteria: (a) child participant must be between 8-15 years of age; (b) caregivers report that the child does not have an educational or medical record indicating IDD (e.g., no IEP, Section 504 plan, or genetic testing report); (c) child is able to verbally communicate and hear due to the online nature of the study; and (d) the ability to attend to several computer tasks with accommodations if necessary. All TD participants were expected to have average intellectual functioning.

The final sample (N = 120) included 30 individuals diagnosed with ASD (mean age = 10.73 years) and their caregivers, 30 individuals diagnosed with WS (mean age = 12.07 years) and their caregivers, 30 individuals with DS (mean age = 11.53 years) and their caregivers, and 30 TD individuals (mean age = 10.90 years) and their caregivers (see Table 3 for more demographic characteristics of the participants). Caregivers were 111 females and 9 males with educational levels ranging from some high school to a professional/graduate degree and annual incomes ranging from $15,000 to over $100,000.

Table 3

Participant Characteristics

	Total	ASD	WS	DS	TD	X^2/ F
Mean age (years)	11.30	10.73	12.07	11.53	10.90	2.54
Sex[a]						10.56*
% male	58.3	83.3	53.3	50.0	46.7	
% female	41.7	16.7	46.7	50.0	53.3	
Race						1.59
% White	70.0	63.3	73.3	66.7	76.7	
% Other	30.0	36.7	26.7	33.3	23.3	

Table 3 (cont'd)

Services (%)						
Occupational Therapy	56.7	56.7	76.7	93.3	0.00	60.54*
Physical Therapy	28.3	16.7	50.0	46.7	0.00	25.78*
Speech Language Pathology	67.5	70.0	90.0	100.0	10.0	66.67*
Behavioral Services	19.2	50.0	16.7	10.0	0.00	27.27*
Psychiatry	19.2	33.3	20.0	6.7	16.7	7.05*
Social Skills Training	30.0	43.4	43.4	30.0	3.30	15.24*
None	21.7	10.0	0.00	0.00	76.7	72.47*
Special Education Services (%)	73.3	86.7	100.0	100.0	6.7	92.73*
NIHTB-Cognitive Battery						
Picture Vocabulary Test	38.26	44.77	29.97	25.77	48.68	12.49**
Picture Sequence Memory Test	38.41	43.69	32.97	31.52	45.67	20.77**

Note. ASD = Autism Spectrum Disorder; WS = Williams syndrome; DS = Down syndrome; TD = Typically developing; NIHTB = NIH Toolbox.
*$p < .05$ **$p < .01$.
[a]ASD group had more males than WS, DS, or TD

Measures

To measure empathy skills, caregivers were asked to complete the children's version of the Empathy Quotient (EQ-C; Auyeung et al., 2009). The EQ-C consists of 27 items with response options from definitely agree to definitely disagree and provides an overall total score (max score = 54) with lower scores indicating poorer empathy skills. Within the EQ, empathy is defined as "the drive to identify another person's emotions and thoughts and respond to these with an appropriate emotion" (Baron-Cohen & Wheelwright, 2004; p. 361). While the EQ was originally intended for individuals with ASD (Baron-Cohen & Wheelwright, 2004; Hillier et al., 2007), it has been effectively used with individuals with intellectual disability in previous research (Hockley & Langdon, 2015; Woodard, 2009). For the EQ-C in the current study, Cronbach's α was .45 for the total sample, .37 for the ASD group, .55 for the WS group, .64 for the DS group, and .51 for the TD group.

To measure social skills parents were asked to complete the Social Responsiveness Scale-Second Edition (SRS-2; Constantino & Gruber, 2005), a parent-report measure that assesses the presence and severity of social impairment. The SRS-2 consists of five subscales including social awareness (i.e., aware of what others are thinking and feeling), social cognition (e.g., ability to identify when something is unfair), social communication (i.e., ability to communicate feelings to others), social motivation (e.g., confidence when socializing with others), and autistic mannerisms (e.g., demonstrates an unusual narrow range of interests). For the purposes of this study, only the social awareness, social cognition, social motivation, and social communication subscales were used for data analysis. The SRS-2 has been used with various IDD populations both in research and clinical practice (e.g., Constantino et al., 2004; Fisher et al., 2020; Sturm et al., 2017) with good to excellent psychometrics properties demonstrated in United States samples (Bölte et al., 2008). For the current study, Cronbach's α for the social awareness subscale was .72 for the total sample, .58 for the ASD group, .47 for the WS group, .12 for the DS group, and .47 for the TD group. On the social cognition subscale, Cronbach's α was .86 for the total sample, .80 for the ASD group, .70 for the WS group, .21 for the DS group, and .55 for the TD group. For the social communication subscale, Cronbach's α was .93 for the total sample, .91 for the ASD group, .80 for the WS group, .65 for the DS group, and .75 for the TD group. On the social motivation subscale, Cronbach's α was .83 for the total sample, .67 for the ASD group, .54 for the WS group, .70 for the DS group, and .84 for the TD group. Higher scores on the SRS-2 indicate more challenges in social and communication skills.

Due to the variation in cognitive ability likely to be observed across the ASD, WS, DS, and TD groups, child participants completed the iPad-based National Institutes of Health Toolbox Cognitive Battery (NIHTB-CB) recommended for ages 7 and over consisting of tests to

measure various cognitive domains such as executive functioning, attention, episodic memory, language processing speed, and working memory (Gershon et al., 2013; Weintraub et al., 2013). For the purposes of this study, only two of the tests that can be remotely administered were used, including the Picture Vocabulary Test and Picture Sequence Memory Test. The NIHTB-CB has been demonstrated to be a reliable and valid test battery for both children and young adults with IDD (Hessl et al., 2016; Shields et al., 2020).

Procedures

After administration of the initial screening form, informed consent was obtained by all child participants and their caregivers who met the inclusion criteria. Due to the COVID-19 pandemic, data were exclusively collected through online data collection methods. All caregiver-reported measures were sent as a survey via REDCap, a secure web-based software platform designed to support data collection for research studies (Harris et al., 2009). REDCap was also used to store all other data for the present study including participant demographics and scores on child measures. The NIHTB-CB is housed under the NIH Toolbox®, a comprehensive set of neuro-behavioral measurements that can assess for cognitive, emotional, sensory, and motor functions from an iPad (Hodes et al., 2013) which allows for remote administration via screen sharing using Zoom (Zoom Video Communications Inc., 2016). Another feature of the NIH Toolbox® is the ability to collect participant data through the application on the iPad and export to other data management programs such as REDCap. As such, the NIHTB-CB was administered live with the child participant over Zoom with a HIPAA Business Associate Agreement via screen sharing with responses safely exported to and stored in REDCap. As compensation for their time and effort, participants and their caregivers received an Amazon gift card upon completion of the study.

Data Analysis

Preliminary data analysis procedures included checking the distribution of the variables (e.g., assessing skewness and kurtosis), multicollinearity of the variables, homogeneity of variance between groups, and calculating Cronbach alphas to verify the reliability of all scales and subscales within the sample study.

First, a one-way ANOVA was conducted to determine if mean scores on the EQ-C and SRS-2 subscales differed across groups. A multiple-group path analysis (Muthén & Muthén, 2012) was then conducted to assess the relationship between empathy and social skills as well as whether differences in empathy and social skills were statistically significant across the four groups. The Picture Vocabulary Test and Picture Sequence Memory Test from the NIHTB-CB and child age served as covariates in the models. Criteria for acceptable model fit included the comparative fit index (CFI) and the Tucker-Lewis fit index (TLI), which was greater than (or equal to) .90; chi-square ($\chi 2$)/ degrees of freedom (*df)*, which was lower than 2; and root mean square error of approximation (RMSEA) of .08 or less (Bryne, 2016; Hu & Bentler, 1999). The chi-square test for variance or difference was used to compare the mediation models in the multi-group path analysis (Tabachnick & Fidell, 2007).

Results

Preliminary Analyses

First, univariate analyses were conducted to check the score distributions of the study variables. A visual inspection of histograms for each variable demonstrated fairly normal distributions for some variables and non-normal distributions for others. An additional inspection of normal Q-Q plots demonstrated a normal distribution for most variables. The skewness and kurtosis of all variables were within the range of -1 to 1; however, the Picture Sequence Memory

Test had a skewness value of 1.437 and a kurtosis value of 2.384. Tests of normality including the Kolmogorov-Smirnov Test and the Shapiro-Wilk test indicated that only the EQ-C met assumptions of a normal distribution.

Group Differences in Empathy and Social Skills

First, examining empathy skills across groups, the one-way ANOVA was statistically significant (F (3, 116) = 22.87, $p < .001$) with a large effect size ($\eta^2 = .372$), suggesting that about 37% of the variance of mean scores on the EQ-C was due to differences in group condition (see Table 4 for the means and standard deviations of mean scores on the EQ-C for each group).

Table 4

Mean Scores and Standard Deviations for Each Group

Variable	ASD	WS	DS	TD	*F*
EQ-C	18.53 (8.50)	25.20 (8.31)	27.00 (7.00)	35.60 (8.32)	22.87**
SRS-2					
Total Score	70.67 (10.31)	60.63 (6.99)	56.13 (4.57)	44.23 (4.64)	72.95**
Social Awareness	67.33 (9.53)	61.17 (8.23)	56.13 (5.39)	46.50 (6.40)	40.71**
Social Cognition	69.37 (10.73)	66.50 (8.31)	58.03 (5.14)	43.70 (4.42)	69.18**
Social Communication	69.20 (11.67)	58.97 (7.85)	55.83 (5.32)	43.70 (4.50)	53.73**
Social Motivation	62.20 (8.33)	47.70 (5.72)	48.70 (7.56)	46.10 (7.56)	33.07**

Note. ASD = Autism spectrum disorder; WS = Williams syndrome; DS = Down syndrome; TD = Typically developing; EQ-C = Children's version of the Empathy Quotient; SRS-2 = Social Responsiveness Scale-2nd edition.
**$p < .01$.

Additional post-hoc analyses were conducted using Bonferroni adjusted alpha levels of .0125 to specifically determine which groups differed from each other. Results of the post-hoc

analyses indicated that mean scores on the EQ-C for the ASD group were significantly lower compared to the WS (*M* = -6.67, *SE* = 2.08), DS (*M* = -8.47, *SE* = 2.08), and TD (*M* = -17.07, *SE* = 2.08) groups. The WS group (*M* = -10.04, *SE* = 2.08) and the DS group (*M* = -8.60, *SE* = 2.08) also reported lower scores on the EQ-C compared to the TD group.

Next, examining social skills across groups, the one-way ANOVA was statistically significant (F (3, 116) = 72.95, $p < .001$) with a large effect size ($\eta^2 = .654$) suggesting that about 65% of the variance of mean scores on the SRS-2 was due to differences in group condition (see Table 4 for the means and standard deviations of total t-scores on the SRS-2 for each group). Additional post-hoc analyses were conducted using Bonferroni adjusted alpha levels of .0125 to specifically determine which groups differed from each other. Results of the post-hoc analyses indicated that mean scores on the SRS-2 for the ASD group were significantly higher compared to the WS (*M* = 10.03, *SE* = 1.81), DS (*M* = 14.53, *SE* = 1.81), and TD (*M* = 26.43, *SE* = 1.81) groups. The WS group (*M* = 16.40, *SD* = 1.81) and the DS group (*M* = 11.90, *SD* = 1.81) also reported higher scores on the SRS-2 compared to the TD group.

There were similar patterns of responding for the social awareness and social communication subscales of the SRS-2 (see Table 4 for scores). In terms of social cognition, the one-way ANOVA was statistically significant (F (3, 116) = 69.18, $p < .001$) with a large effect size ($\eta^2 = .641$) suggesting that about 64% of the variance of mean scores on the SRS-2 social cognition subscale was due to differences in group condition. Results of the post-hoc analyses indicated that mean scores on the social cognition subscale of the SRS-2 for the ASD group were significantly higher compared to the DS (*M* = 11.33, *SE* = 1.96), and TD (*M* = 25.67, *SE* = 1.96) groups. Scores for the WS group were also significantly higher than the DS (*M* = 8.57, *SE* = 1.96) and the TD group (*M* = 22.80, *SE* = 1.96), but the ASD and WS groups did not differ from

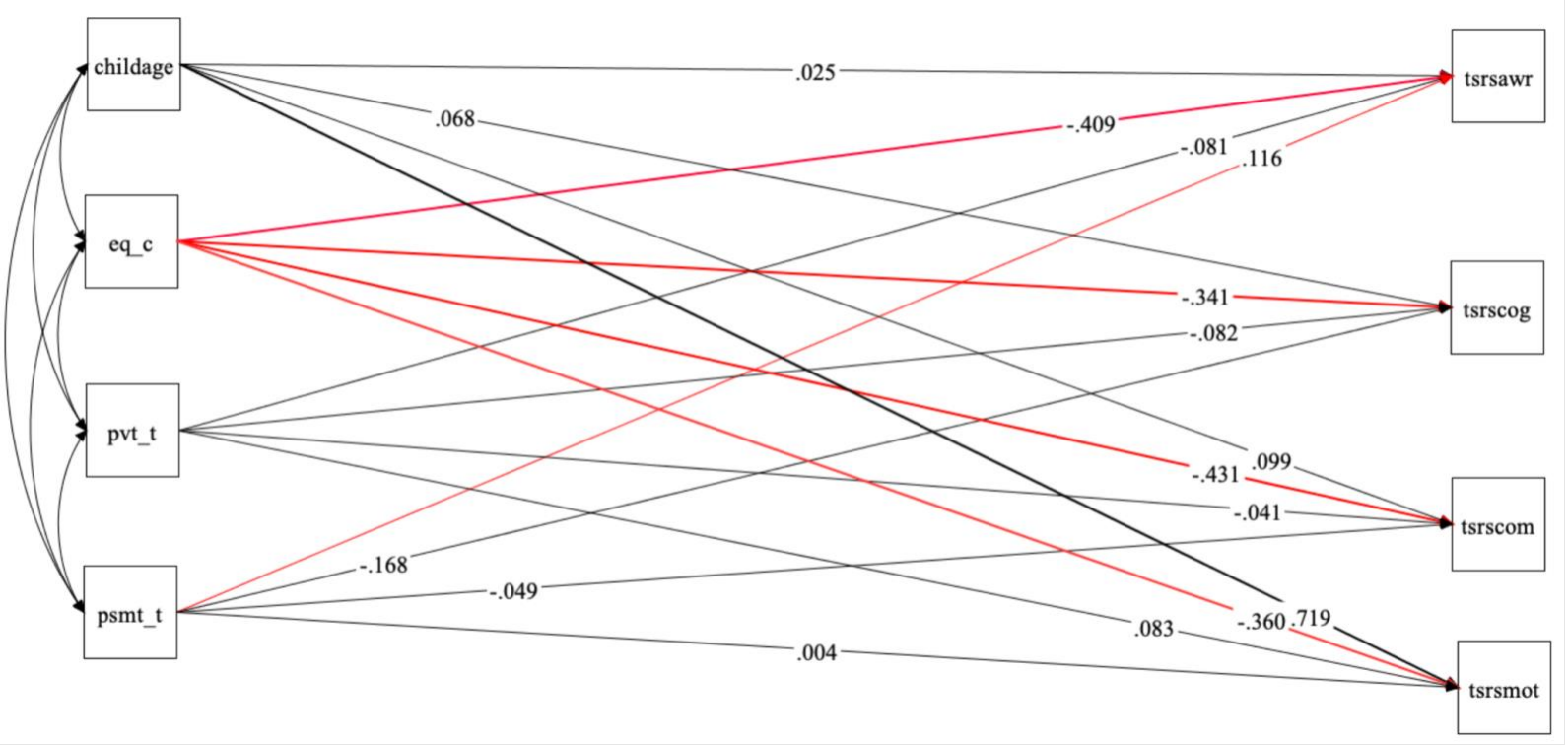
each other. Finally, the DS group scored significantly higher than the TD group (M = 14.33, SE = 1.96). In terms of social motivation, the one-way ANOVA was statistically significant (F (3, 116) = 33.07, $p < .001$) with a large effect size ($\eta^2 = .461$) suggesting that about 46% of the variance of mean scores on the SRS-2 social motivation subscale was due to differences in group condition. Results of the post-hoc analyses indicated that mean scores on the social motivation subscale of the SRS-2 for the ASD group were significantly higher compared to the WS (M = 14.50, SE = 1.83), the DS (M = 13.50, SE = 1.83), and TD (M = 16.10, SE = 1.83) groups. There were no differences in scores between the WS, DS, and TD group (see Table 4 for scores).

Relationship between Empathy and Social Skills Across Groups

Two models for the four groups were compared to test cross-group variance: (a) an unconditional model with no equality constraints (no constraints across the groups) and (b) a constrained model where all parameters were constrained to be equal between the four groups. Then the fits of the two models were compared using the chi-square difference test. If the chi-square test for difference is significant, then structural paths for the four groups are non-invariant. The unconditional model provided an acceptable fit to the data ($\chi 2(88) = 383.33$, CFI = .980, RMSEA = .071), whereas the constrained model did not provide an adequate fit with the data ($\chi 2(48) = 89.51$, CFI = .859, RMSEA = 0.175) indicating that restricting the parameters to be equal resulted in a decrease in model fit. As such, coefficients in the path model were freed separately for certain groups one at a time (see Figures 2, 3, 4, and 5 for significant pathways in the model for each group) based on an examination of larger modification indexes until acceptable fit was reached (see Table 5).

Figure 2

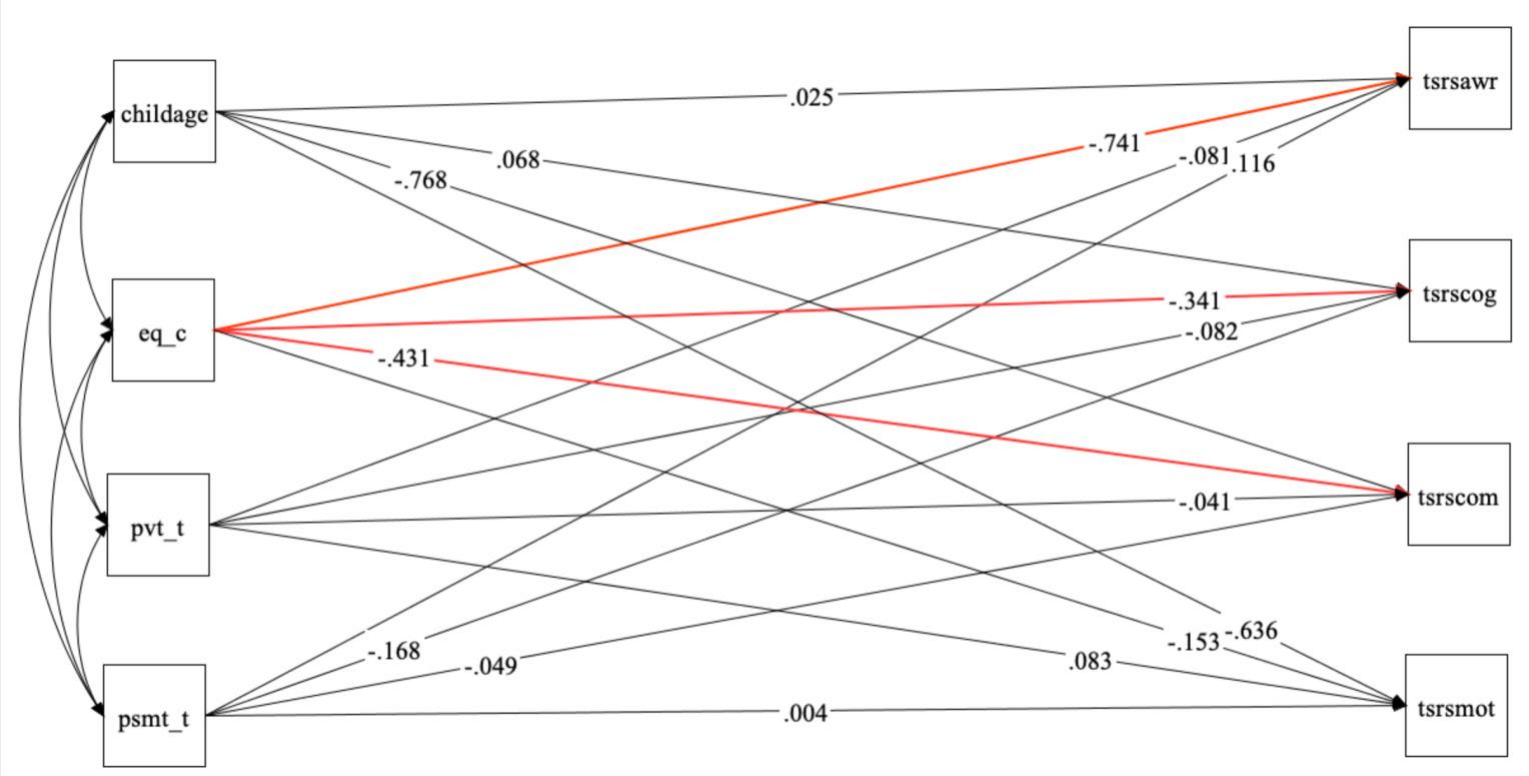
Results from the multiple group path analysis for ASD group



Note: Red arrows indicate statistically significant relationships ($p < .001$). ASD = Autism Spectrum Disorder; EQ-C = Children's version of Empathy Quotient; PVT_T = T-scores of Picture Vocabulary Test; PSMT_T = T-scores of Picture Sequence Memory Test; TSRSAWR = T-scores of social awareness subscale of Social Responsiveness Scale-Second Edition (SRS-2); TSRSCOG = T-scores of social cognition subscale of SRS-2; TSRSCOM = T-scores of social communication subscale of SRS-2; TSRSMOT = T-scores of social motivation subscale of SRS-2.

Figure 3

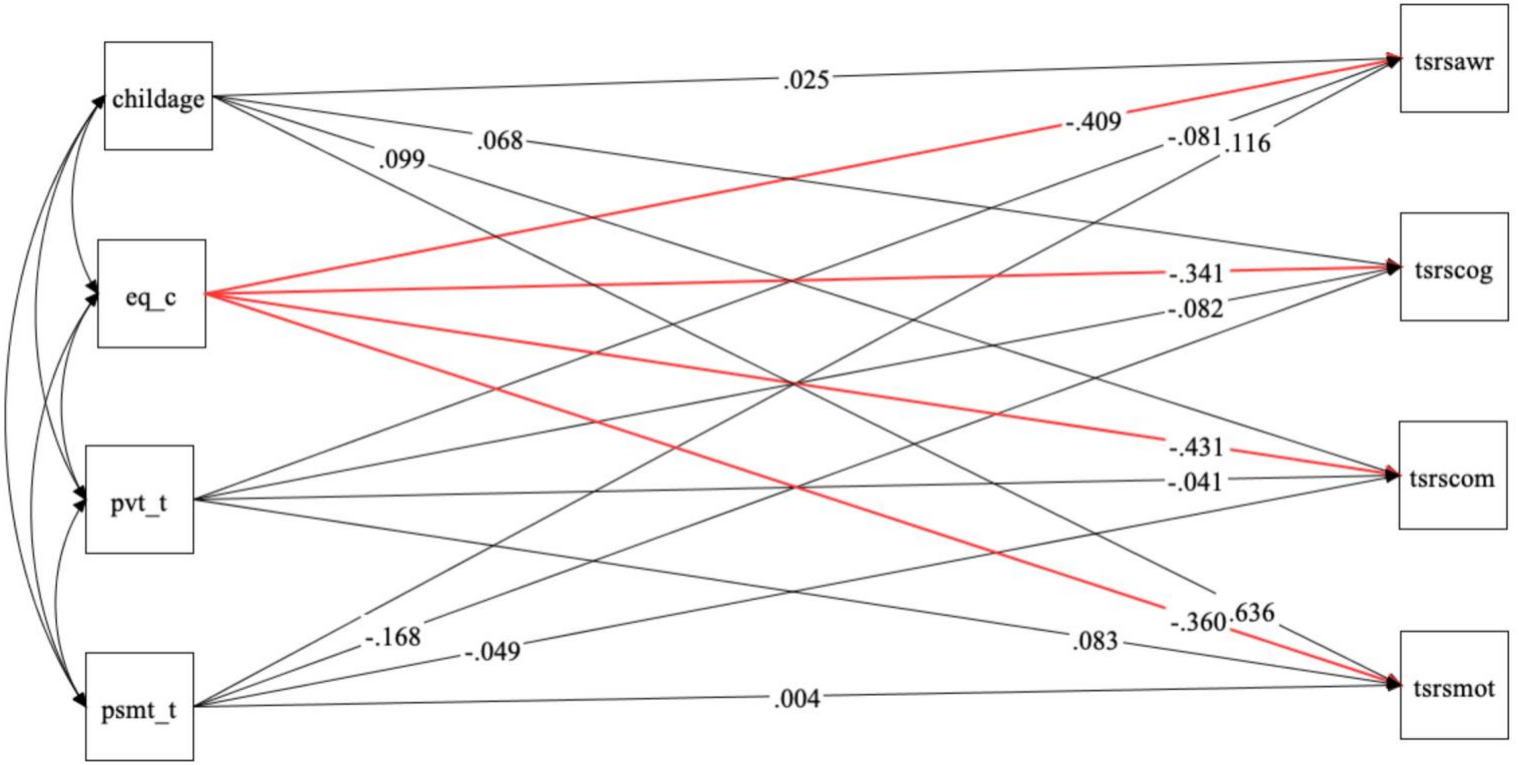
Results from the multiple group path analysis for WS group



Note: Red arrows indicate statistically significant relationships ($p < .001$). WS = Williams syndrome; EQ-C = Children's version of Empathy Quotient; PVT_T = T-scores of Picture Vocabulary Test; PSMT_T = T-scores of Picture Sequence Memory Test; TSRSAWR = T-scores of social awareness subscale of Social Responsiveness Scale-Second Edition (SRS-2); TSRSCOG = T-scores of social cognition subscale of SRS-2; TSRSCOM = T-scores of social communication subscale of SRS-2; TSRSMOT = T-scores of social motivation subscale of SRS-2.

Figure 4

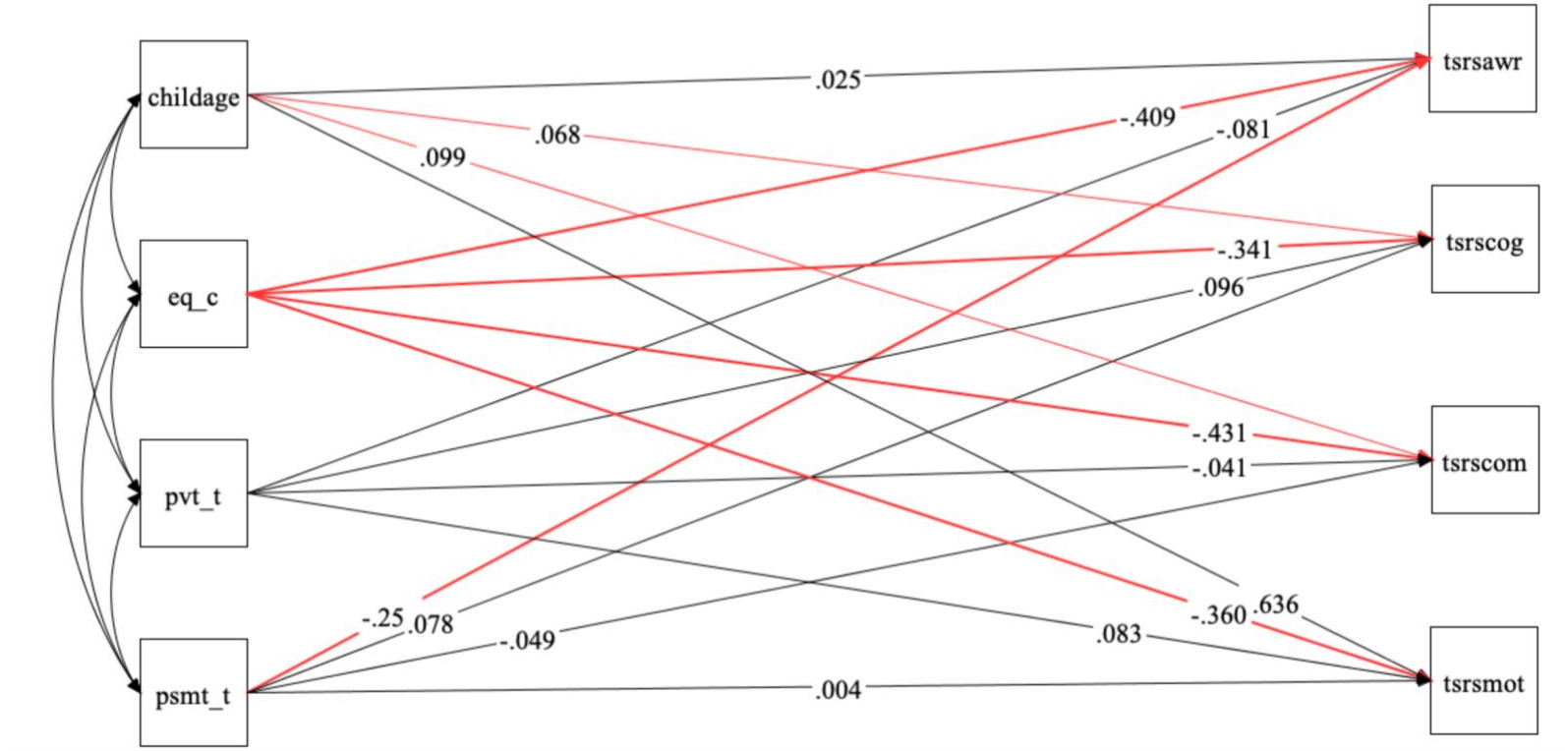
Results from the multiple group path analysis for DS group



Note: Red arrows indicate statistically significant relationships ($p < .001$). DS = Down syndrome; EQ-C = Children's version of Empathy Quotient; PVT_T = T-scores of Picture Vocabulary Test; PSMT_T = T-scores of Picture Sequence Memory Test; TSRSAWR = T-scores of social awareness subscale of Social Responsiveness Scale-Second Edition (SRS-2); TSRSCOG = T-scores of social cognition subscale of SRS-2; TSRSCOM = T-scores of social communication subscale of SRS-2; TSRSMOT = T-scores of social motivation subscale of SRS-2.

Figure 5

Results from the multiple group path analysis for TD group



Note: Red arrows indicate statistically significant relationships ($p < .001$). TD = Typically developing; EQ-C = Children's version of Empathy Quotient; PVT_T = T-scores of Picture Vocabulary Test; PSMT_T = T-scores of Picture Sequence Memory Test; TSRSAWR = T-scores of social awareness subscale of Social Responsiveness Scale-Second Edition (SRS-2); TSRSCOG = T-scores of social cognition subscale of SRS-2; TSRSCOM = T-scores of social communication subscale of SRS-2; TSRSMOT = T-scores of social motivation subscale of SRS-2.

Table 5

Estimates and Confidence Intervals of Pathway Models Across Groups

Pathways constrained separately	Modification Indexes (X^2)	Path coefficients for Unconstrained Model							
		ASD		WS		DS		TD	
		Estimate	95% CI	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Child age → SRS-2 Social Motivation	3.801	0.719[a]	(-0.008, 1.445)	-0.636	(-1.306, 0.035)	-0.636	(-1.306, 0.035)	-0.636	(-1.306, 0.035)
Empathy Quotient → SRS-2 Social Awareness	5.929	-0.409	(-0.569, -0.248)	-0.741[a]	(-0.907, -0.575)	-0.409	(-0.569, -0.248)	-0.409	(-0.569, -0.248)
Child age → SRS-2 Social Communication	4.202	0.099	(-0.315, 0.513)	-0.768[a]	(-1.612, -0.076)	0.099	(-0.315, 0.513)	0.099	(-0.315, 0.513)
Empathy Quotient → SRS-2 Social Motivation	2.279	-0.360	(-0.519, -0.200)	-0.153[a]	(-0.376, 0.069)	-0.360	(-0.519, -0.200)	-0.360	(-0.519, -0.200)
Picture Sequence Memory Test → SRS-2 Social Awareness	8.365	0.116	(-0.028, 0.261)	0.116	(-0.028, 0.261)	0.116	(-0.028, 0.261)	-0.250	(-0.411, 0.460)
Picture Vocabulary Test →SRS-2 Social Cognition	5.302	-0.082	(-0.197, 0.032)	-0.082	(-0.197, 0.032)	-0.082	(-0.197, 0.032)	0.096	(-0.025, 0.217)
Picture Sequence Memory Test → SRS-2 Social Cognition	6.066	-0.168	(-0.351, 0.015)	-0.168	(-0.351, 0.015)	-0.168	(-0.351, 0.015)	0.078	(-0.063, 0.219)

Table 5 (cont'd)

Note. SRS-2 = Second Edition of Social Responsiveness Scale; ASD = Autism spectrum disorder; WS = Williams syndrome; DS = Down syndrome; TD = Typically developing.
[a] Covariates allowed to be freed or to vary for a group.

The multi-group path analyses indicated significant correlations between empathy skills and some social skills across groups (see Table 6). For the ASD group, the EQ-C was moderately and negatively correlated with all of the subscales of the SRS-2, indicating that poorer empathy skills related to poorer social skills. For the WS group, the EQ-C was moderately to strongly correlated in a statistically significant negative direction for all the SRS-2 subscales except for social motivation (r = -0.15, p = 0.18), indicating that social motivation may have no substantial relationship with empathy skills for individuals with WS. For the DS group, the EQ-C was moderately correlated in the negative direction with all the subscales of the SRS-2, indicating lower ratings of empathy related to poorer ratings on social skills. Finally, for the TD group, the EQ-C was moderately and negatively correlated with all the subscales of the SRS-2, demonstrating that poorer empathy skills also relate to lower ratings on social skills for individuals without IDD.

Table 6

Descriptive Statistics and Correlations for Empathy and Social Skills

Group	Variable	*M*	*SD*	1	2	3	4	5
ASD	1. Children's EQ	18.62	8.50	--	-0.41**	-0.431**	-0.36**	-0.34**
	2. SRS-2 Social Awareness	67.07	9.53	-0.41**	--	44.59**	25.39**	37.96**
	3. SRS-2 Social Communication	68.93	11.67	-0.43**	44.59**	--	34.64**	62.20**
	4. SRS-2 Social Motivation	62.03	8.33	-0.36**	25.39**	34.64**	--	18.45
	5. SRS-2 Social Cognition	69.03	10.73	-0.34**	37.96**	62.20**	18.45	--
WS	1. Children's EQ	25.20	8.31	--	-0.74**	-0.43**	-0.15	-0.34**
	2. SRS-2 Social Awareness	61.17	8.23	-0.74**	--	17.54**	4.15	19.50**
	3. SRS-2 Social Communication	58.97	7.85	-0.43**	17.54**	--	16.71**	28.93**
	4. SRS-2 Social Motivation	47.70	5.72	-0.15	4.15	16.71**	--	7.80
	5. SRS-2 Social Cognition	66.50	8.31	-0.34**	19.50**	28.93**	7.80	--
DS	1. Children's EQ	27.41	7.00	--	-0.41**	-0.43**	-0.36**	-0.34**
	2. SRS-2 Social Awareness	55.52	5.40	-0.41**	--	2.38	4.68	3.98
	3. SRS-2 Social Communication	55.56	5.32	-0.43**	2.38	--	8.89	7.14**
	4. SRS-2 Social Motivation	48.63	6.40	-0.36**	4.68	8.89	--	2.66
	5. SRS-2 Social Cognition	57.89	5.14	-0.34**	3.98	7.14**	2.66	--
TD	1. Children's EQ	36.11	8.32	--	-0.41**	-0.43**	-0.36**	-0.34**
	2. SRS-2 Social Awareness	46.07	6.40	-0.41**	--	1.86	1.57	3.56
	3. SRS-2 Social Communication	43.26	4.50	-0.43**	1.86	--	9.53**	7.64**
	4. SRS-2 Social Motivation	46.15	7.56	-0.36**	1.57	9.53**	--	15.49**
	5. SRS-2 Social Cognition	43.42	4.49	-0.34**	3.56	7.64**	15.49**	--

Note. ASD = Autism spectrum disorder; WS = Williams syndrome; DS = Down syndrome; TD = Typically developing; EQ = Empathy Quotient; SRS-2 = Social Responsiveness Scale-2nd edition.
** $p < .01$

Results of the multi-group path analysis also indicated significant differences in the relationship between empathy skills and social skills across groups. Most notably, the WS group differed significantly from the other groups on performance on the EQ-C in relation to the social awareness subscale (M = -0.33, p < .001) but did not differ with the social motivation subscale (M = 0.21, p = 0.13) of the SRS-2. Correlations between the different subscales of the SRS-2 also differed across groups. More specifically, the TD group differed significantly with the IDD groups regarding correlations between social awareness and social motivation (M = -0.37, p < .001) and social motivation and social cognition (M = 0.25, p = 0.047) of the SRS-2.

Discussion

Given the relation of empathy and social skills to positive social outcomes and differences in behavioral phenotypes across different IDD conditions, the current study examined the relationship between empathy skills and social skills for individuals with ASD, WS, DS, and individuals without disabilities. The results of this study indicate that empathy and social skills differ between individuals with ASD, WS, and DS. These findings have important implications for future research and practice.

Differences in Empathy Skills

First, compared to those with WS and DS, as well as to those without disabilities, individuals with ASD exhibit poor empathy skills. This finding supports the general consensus among ASD researchers that challenges in empathy are a key aspect of the ASD behavioral phenotype (Baron-Cohen and Wheelwright, 2004), as often measured with the Empathy Quotient (Fletcher-Watson & Bird, 2020; Josol, [Chapter 2]). This finding also highlights that empathy might be a critical intervention target for individuals with ASD but might not be as important for individuals with WS or DS.

Additionally, cognitive ability was not related to empathy in the path models for each group, despite statistically significant differences in intellectual disability between groups. This finding suggests that cognitive ability may not play a significant role in the empathy skills of individuals with IDD and mirrors past research that have demonstrated that IQ may not add significantly to differences in empathic responsiveness for individuals with IDD such as children and adolescents with ASD (e.g., Scheeren et al., 2018). Still, because individuals with WS and DS were reported to have lower empathy skills than the TD controls, future research should continue to explore whether empathy deficits exist among these populations and whether specific empathy-focused interventions are warranted.

Relationship between Empathy and Social Skills

Exploring the relationship between empathy and social skills across the different groups, the primary findings were among those in the WS group. Specifically, individuals with WS differed from other groups regarding the relationship between their empathy skills and social skills. Unlike for the ASD, DS, and TD groups, lower ratings on empathy skills were not significantly correlated with social motivation for individuals with WS. In other words, empathic abilities are not related to the motivation to interact with others. This finding supports past research indicating that individuals with WS are highly motivated in social situations (Jawaid et al., 2012; Jones et al., 2000) and do not experience deficits in the social motivation domain of social skills (Fisher et al., 2020; Fisher & Morin, 2017). The lack of empathy's relation to social motivation for individuals with WS is different from the general research literature, which suggests that social motivation and empathy skills are interdependent (Ickes, 2011; Smith et al., 2011; Zaki, 2014). This difference will be important to further examine.

Furthermore, the results of this study also demonstrate that individuals with WS differed significantly in their relationship between empathy skills and social awareness (i.e., one's ability to recognize social cues) compared to other groups. More specifically, the relationship between empathy skills and social awareness was significantly poorer for those with WS compared to ASD, DS, and those without disabilities, indicating that individuals with WS with poor social awareness also had poorer empathy skills. This finding highlights a potential area for intervention for individuals with WS.

The social-emotional learning literature defines social awareness as "the ability to take the perspective of and empathize with others from diverse backgrounds and cultures [and] to understand social and ethical norms for behavior" (Collaborative for Academic, Social and Emotional Learning, 2012, p. 11). Much of this definition aligns with affective empathy (i.e., how one responds to the emotional state of others; Björkqvist et al., 2000). Thus, to address the relation between poor empathy skills and social awareness skills for individuals with WS, interventions that address affective empathy may be important for this population. Many school-based social-emotional learning programs currently include some form of empathy intervention (Malti et al., 2016) and may provide a helpful framework to specifically address the unique empathy and social awareness challenges of individuals with WS.

Limitations

The primary aim of this study was to examine the role of empathy skills in relation to social skills for different IDD groups and compared to those without disabilities. While the results of this study demonstrate key differences and significant relationships regarding empathy and social skills among individuals with various IDD conditions, there are limitations. First, given the small sample size used for the multiple group path analysis, the results should be

interpreted with caution. While simple models can be meaningfully tested in small sample sizes (Hoyle & Kenny, 1999; Marsh & Hau, 1999), a typical sample size in studies for path analysis is around 200 participants (Kline, 2011). Given that the current study included individuals with relatively rare genetic conditions (e.g., WS), recruitment of 30 individuals within each group was considered sufficient. Second, only caregiver reports were used to measure and compare the empathy and social skills of participants in this study. While caregivers are uniquely positioned to report on their child's empathy and social skills, the inclusion of other proxy reports, such as teachers, can provide more insight into the presentation of certain skills and abilities in different social contexts and settings (Yoder & McDuffie, 2006). Third, this study was conducted during the COVID-19 pandemic. As a result of social distancing requirements, all data collection was conducted online, and most data were collected when participants were attending school virtually. Thus, ratings of empathy and social skills may have been impacted by the change in social circumstances during the pandemic. Fourth, the reliability of many scales and subscales within the sample was poor or unacceptable, particularly for the DS group on the social awareness and social cognition subscales of the SRS-2. Further research is warranted to examine and ensure the reliability of social measures for different IDD groups.

Future Directions

The findings of this study indicate that empathy in relation to social skills can differ between individuals with different IDD conditions and highlights the importance of considering etiology and its role in the strengths and challenges observed within and across IDD conditions. While differences in empathy and social skills were observed between children and adolescents with ASD, WS, and DS, future research should examine whether such differences would be present in adults with these same IDD conditions. Given that developing empathy skills is a

gradual process beginning with reflexive crying in newborns to more stability of empathy as a trait in adulthood (McDonald and Messinger, 2012), further examination across age groups between and within different diagnostic groups may strengthen current and future interventions by accounting for developmental level as well.

Finally, regarding future intervention research, use of the social-emotional learning framework may provide a useful means of targeting specific empathy and social skills for individuals with IDD as many social-emotional learning programs are already school-based. In a meta-analysis of 213 school-based social-emotional learning programs on behavior problems, academic performance, and positive social behavior, Durlak et al. (2011) reported that the largest effect sizes were found in programs targeting empathy development and emotion recognition, suggesting that empathy-related constructs were crucial to the success of the program. Future research should examine whether the social-emotional learning framework could be adapted for individuals with ASD, WS, and DS. For example, given that empathy and social awareness skills were related among individuals with WS in the present study, a social-emotional learning program could be developed to explicitly target affective empathy skills while capitalizing on their strengths in social motivational skills. Alternatively, the overall empathy and social skills deficits displayed by individuals with ASD may warrant a broader social-emotional learning approach to teaching empathy skills for that population.

As demonstrated in the current study, different IDD conditions can elicit differences in empathy and social skills. Therefore, consideration of etiology and its impact on observed social phenotypes is critical for research and clinical application. Clearly, different IDD groups present with different strengths and weaknesses in certain social domains. Carefully addressing weaknesses while also acknowledging and using their strengths, as determined by IDD

condition, may assist in ensuring that current and future interventions are effective for specific IDD groups. The development of more adapted interventions for different IDD groups will not only help improve the relationship between empathy and social skills but ultimately improve the social outcomes of individuals with IDD.

REFERENCES

REFERENCES

Allemand, M., Steiger, A. E., & Fend, H. A. (2015). Empathy development in adolescence predicts social competencies in adulthood. *Journal of Personality, 83*(2), 229-241. https://doi.org/10.1111/jopy.12098

Auyeung, B., Wheelwright, S., Allison, C., Atkinson, M., Samarawickrema, N., & Baron-Cohen, S. (2009). The children's empathy quotient and systemizing quotient: Sex differences in typical development and in autism spectrum conditions. *Journal of Autism and Developmental Disorders, 39*(11), 1509-1521. doi:10.1007/s10803-009-0772-x

Baron-Cohen, S., & Wheelwright, S. (2004). The empathy quotient: An investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. *Journal of Autism and Developmental Disorders, 34*, 163-175. https://doi.org/10.1023/B:JADD.0000022607.19833.00

Behrends, A., Müller, S., & Dziobek, I. (2012). Moving in and out of synchrony: A concept for a new intervention fostering empathy through interactional movement and dance. *The Arts in Psychotherapy, 39*(2), 107-116. https://doi.org/10.1016/j.aip.2012.02.003

Björkqvist, K., Österman, K., & Kaukiainen, A. (2000). Social intelligence - empathy = aggression? *Aggression and Violent Behavior, 5*(2), 191-200. https://doi.org/10.1016/S1359-1789(98)00029-9

Blair, R. J. R. (2008). Fine cuts of empathy on the amygdala. Dissociable deficits in psychopathy and autism. *The Quarterly Journal of Experimental Psychology, 61*, 157– 170. https://doi.org/10.1080/17470210701508855.

Bölte, S., Poutska, F., & Constantino, J. N. (2008). Assessing autistic traits: Cross-cultural validation of the social responsiveness scale (SRS). *Autism Research, 1*(6), 354-364. https://doi.org/10.1002/aur.49

Byrne, B. M. (2016). *Structural equation modeling with AMOS. Basic concepts, applications, and programming* (3rd ed.). Routledge. https://doi.org/10.4324/9781315757421

Domitrovich, C. E., Moore, J. E., & Thompson, R. (2012). Collaborative for Academic, Social, and Emotional Learning. Interventions that promote social-emotional learning in young children. *Handbook of Early Education*, 393-415.

Constantino, J., & Gruber, C. (2005). *The social responsiveness scale.* Western Psychological Services.

Constantino, J., Gruber, C. P., Davis, S., Hayes, S., Passanante, N., & Przybeck, T. (2004). The factor structure of autistic traits. *The Journal of Child and Psychology and Psychiatry, 45*(4), 719-726. https://doi.org/10.1111/j.1469-7610.2004.00266.x

de Wied, M., Branje, S. J. T., & Meeus, W. H. J. (2007). Empathy and conflict resolution in friendship relations among adolescents. *Aggressive Behavior, 33*(1), 48-55. https://doi.org/10.1002/ab.20166

Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). Enhancing students' social and emotional development promotes success in school: Results of a meta-analysis. *Child Development, 82*, 474–450. doi:10.1111/j.1467-8624.2010.01564.x

Dykens, E. M. (1995). Measuring behavioral phenotypes: Provocations from the "new genetics." *American Journal on Mental Retardation, 99*, 522-532.

Dykens, E. M., Hodapp, R. M., & Finucane, B. (2000). *Genetics and mental retardation syndromes: A new look at behavior and treatments.* Paul H. Brookes Publishing Company.

Eisenberg, N., Fabes, R. A., & Spinrad, T. L. (2006). Prosocial development. In N. Eisenberg, W. Damon, & R. M. Lerner (Eds.), *Handbook of Child Psychology: Social, emotional, and personality development* (6th ed., pp. 646-718). John Wiley & Sons.

Fisher, M. H., Josol, C. K., & Shivers, C. M. (2020). An examination of social skills, friendship quality, and loneliness for adults with Williams syndrome. *Journal of Autism and Developmental Disorders, 50,* 3649-3660. https://doi.org/10.1007/s10803-020-04416-4

Fisher, M. H., & Morin, L. (2017). Addressing social skills deficits in adults with Williams syndrome. *Research in Developmental Disabilities, 71*, 77-87. doi:10.1016/j.ridd.2017.10.008

Fletcher-Watson, S., & Bird, G. (2020). Autism and empathy: What are the real links?. *Autism, 24*(1), 3-6. doi: 10.1177/1362361319883506

Frith, U. (2012). The 38th Sir Frederick Bartlett Lecture. Why we need cognitive explanations for autism? *The Quarterly Journal of Experimental Psychology, 75*, 2073–2092. https://doi.org/10.1080/17470218. 2012.697178.

Gershon, R. C., Wagster, M. V., Hendrie, H. C., Fox, N. A., Cook, K. F., & Nowinski, C. J. (2013). *Neurology, 80*(11 Supplement 3), S2-26. https://doi.org/10.1212/WNL.0b013e3182872e5f

Harris, P. A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. G. Research electronic data capture (REDCap)—A metadata-driven methodology and workflow process for providing transitional research informatics support. (2009). *Journal of Biomedical Information, 42*(2), 377-381. https://doi.org/10.1016/j.jbi.2008.08.010

Hessl, D., Sansone, S. M., Berry-Kravis, E., Riley, K., Widaman, K. F., Abbeduto, L., Schneider, A., Coleman, J., Oaklander, D., Rhodes, K. C., & Gershon, R. C. (2016). The NIH

Toolbox Cognitive Battery for intellectual disabilities: Three preliminary studies and future directions. *Journal of Neurodevelopmental Disorders, 8*, 1-18. https://doi.org/10.1186/s11689-016-9167-4

Hill, C. E. (2009). *Helping skills: Facilitating, exploration, insight, and action* (3rd ed.). American Psychological Association.

Hillier, A., Cloppert, P., & Beversdorf, D. Q. (2007). Outcomes of a social and vocational skills support group for adolescents and young adults on the autism spectrum. *Focus on Autism and Other Developmental Disabilities, 22*(2), 107-115. https://doi.org/10.1177/10883576070220020201

Hockley, O. J., & Langdon, P. E. (2015). Men with intellectual disabilities with a history of sexual offending: Empathy for victims of sexual and non-sexual crimes. *Journal of Intellectual Disability Research, 59*(4), 332-341. https://doi.org/10.1111/jir.12137

Hodes, R. J., Insel, T. R., & Landis, S. C. (2013). The NIH Toolbox. *Neurology, 80*(11 Supplement 3), S1. https://doi.org/ 10.1212/WNL.0b013e3182872e90

Hoffman, M. L. (2000). *Empathy and moral development: Implications for caring and justice.* Cambridge University Press.

Hoffman, M. L. (2001). Toward a comprehensive empathy-based theory of prosocial moral development. In A. C. Bohart & D. J. Stipek (Eds.), *Constructive & destructive behavior: Implications for family, school, & society* (pp. 61–86). American Psychological Association. https://doi.org/10.1037/10433-003

Hoyle, R. H., & Kenny, D. A. (1999). Sample size, reliability, and tests of statistical mediation. *Statistical strategies for small sample research, 1*, 195-222.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal, 6*(1), 1-55. doi:10.1080/10705519909540118

Ickes, W. (2011). Everyday mind reading is driven by motives and goals. *Psychological Inquiry, 22*(3), 200-206. doi:10.1080/1047840X.2011.561133

Jawaid, A., Riby, D. M., Owens, J., White, S. W., Tarar, T., & Schulz, P. E. (2012). 'Too withdrawn' or 'too friendly': Considering social vulnerability in two neuro-developmental disorders. *Journal of Intellectual Disability Research, 56*(4), 335-350. https://doi.org/10.1111/j.1365-2788.2011.01452.x

Jones, W., Bellugi, U., Lai, Z., Chiles, M., Reilly, J., Lincoln, A., & Adolphs, R. (2000). II. Hypersociability in Williams syndrome. *Journal of Cognitive Neuroscience, 12*(Supplement 1), 30–46. https://doi.org/10.1162/089892900561968

Kasari, C., Freeman, S. F. N., & Bass, W. (2003). Empathy and response to distress in children with Down syndrome. *Journal of Child Psychology and Psychiatry, 44*, 424–431. https://doi.org/10.1111/1469–7610.00132.

Koegel, L. K., Ashbaugh, K., Navab, A., & Koegel, R. L. (2016). Improving empathic communication skills in adults with autism spectrum disorder. *Journal of Autism and Developmental Disorder, 46*, 921-933. https://doi.org/10.1007/s10803-015-2633-0

Malti, T., Chaparro, M. P., Zuffianò, A., & Colasante, T. (2016). School-based interventions to promote empathy-related responding in children and adolescents: A developmental analysis. *Journal of Clinical Child & Adolescent Psychology, 45*(6), 718-731. doi:10.1080/15374416.2015.1121822

Marsh, H. W., & Hau, K. (1999). Confirmatory factor analysis: Strategies for small sample sizes. In R. Hoyle (Ed.), *Statistical issues for small sample research*. Sage.

McDonald, N. M., & Messinger, D. S. (2012). Empathic responding in toddlers at risk for an autism spectrum disorder. *Journal of Autism and Developmental Disorders, 42*(8), 1566–1573. doi:10.1007/s10803-011-1390-y.

Muthén, L. K., & Muthén, B. O. (2012). *Mplus User's Guide* (7th ed.). Muthén & Muthén.

Nugent, W., & Halvorson, H. (1995). Testing the effects of active listening. *Research on Social Work Practice, 5*(2), 152–175. https://doi.org/10.1177/104973159500500202

Nummenmaa, L., Hirvonen, J., Parkkola, R., & Hietanen, J. K. (2008). Is emotional contagion special? An fMRI study on neural systems for affective and cognitive empathy. *NeuroImage, 43*(3), 571-580. https://doi.org/10.1016/j.neuroimage.2008.08.014

Riggio, R. E. (1986). Assessment of basic social skills. *Journal of Personality and Social Psychology, 51*(3), 649-660. https://doi.org/10.1037/0022-3514.51.3.649

Riggio, R. E., Tucker, J., & Coffaro, D. (1989). Social skills and empathy. *Personality and Individual Differences, 10*(1), 93-99. https://doi.org/10.1016/0191-8869(89)90184-0

Rueda, P., Fernández-Berrocal, P., & Schonert-Reichl, K. A. (2014). Perspective-taking and empathic concern as mediators for happiness and positive affect in adolescents with and without asperger syndrome. *Journal of Developmental and Physical Disabilities, 26*(6), 717-735. doi:10.1007/s10882-014-9391-3

Scheeren, A. M., Koot, H. M., Mundy, P. C., Mous, L., & Begeer, S. (2013). Empathic responsiveness of children and adolescents with high-functioning autism spectrum disorder. Autism Research, 6(5), 362–371. doi:10.1002/aur.1299

Senland, A. K., & Higgins-D'Alessandro, A. (2016). Sociomoral reasoning, empathy, and meeting developmental tasks during the transition to adulthood in autism spectrum

disorder. *Journal of Autism and Developmental Disorders, 46*(9), 3090-3105. doi:10.1007/s10803-016-2849-7

Shamay-Tsoory, S. G., Aharon-Peretz, J., & Perry, D. (2009). Two systems for empathy: A double dissociation between emotional and cognitive empathy in inferior frontal gyrus versus ventromedial prefrontal lesions. *Brain, 132*(3), 617-627. https://doi.org/10.1093/brain/awn279

Shields, R. H., Kaat, A. J., McKenzie, F. J., Drayton, A., Sansone, S. M., Coleman, J., Michalak, C., Riley, K., Berry-Kravis, E., Gershon, R. C., Widaman, K. F., & Hessl, D. (2020). Validation of the NIH Toolbox Cognitive Battery in intellectual disability. *Neurology, 94*(12), 1229-1240. https://doi.org/10.1212/WNL.0000000000009131

Smith, A. (2009). Emotional empathy in autism spectrum conditions: Weak, intact, or heightened? *Journal of Autism and Developmental Disorders, 39*, 1747–1748. https://doi.org/10.1007/s10803-009-0799-z.

Smith, J., Ickes, W., Hall, J., & Hodges, S. (2011). *Managing interpersonal sensitivity: Knowing when and when not to understand others.* NOVA Science Publishers.

Sturm, A., Kuhfeld, M., Kasari, C., & McCracken, J. T. (2017). Development and validation of an item response theory-based Social Responsiveness Scale short form. *The Journal of Child Psychology and Psychiatry, 58*(9), 1053-1061. https://doi.org/10.1111/jcpp.12731

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Allyn & Bacon.

Waite, J., Heald, M., Wilde, L., Woodcock, K., Welham, A., Adams, D., & Oliver, C. (2014). The importance of understanding the behavioural phenotypes of genetic syndromes associated with intellectual disability. *Paediatrics and Child Health, 24*(10), 468-472. https://doi.org/10.1016/j.paed.2014.05.002

Weintraub, S. W., Bauer, P. J., Zelazo, P. D., Wallner-Allen, K., Dikmen, S. S., Heaton, R. K., Tulsky, D. S., Slotkin, J., Blitz, D. L., Carlozzi, N. E., Havlik, R. J., Beaumont, J. L., Mungas, D., Manly, J. J., Borosh, B. G., Nowinski, C. J., & Gershon, R. C. (2013). I. NIH Toolbox Cognition Battery (CB): Introduction and pediatric data. *Monographs of the Society for Research in Child Development, 78*(4), 1-15. https://doi.org/10.1111/mono.12031

Woodard, C. (2009). Psychometric properties of the ASPeCT-DD: Measuring positive traits in persons with developmental disabilities. *Journal of Applied Research in Intellectual Disabilities, 22*(5), 434-444. https://doi.org/10.1111/j.1468-3148.2009.00494.x

Yoder, P. J., & McDuffie, A. (2006). Treatment of joint attention in children with disabilities. In T. Charman, & W. Stone (Eds.), *Social & communication in autism spectrum disorders: Early identification, diagnosis, & intervention* (pp. 117–142). Guilford.

Zaki, J. (2014). Empathy: a motivated account. *Psychological Bulletin, 140*(6), 1608-1647. doi:10.1037/a0037679

Zoom Video Communications Inc. (2016). *Security guide*. Zoom Video Communications Inc. Retrieved from https://d24cgw3uvb9a9h.cloudfront.net/static/81625/doc/Zoom-Security-WhitePaper.pdf

CHAPTER 4

Improving the Empathy of Students with Autism Spectrum Disorder: Suggestions & Guidelines

"Be kind to one another." "Put yourself in someone else's shoes." "Treat someone how you would want to be treated." These are all sayings students hear time and time again in order to promote empathy– the ability to appropriately understand and respond to another person's emotions. Yet empathy remains elusive in many school settings, as students continue to experience bullying victimization and to struggle with developing positive peer relationships. These negative experiences are particularly true for students with autism spectrum disorder (ASD). Thus, this conceptual piece reviews the relation of empathy to positive social outcomes, outlines important considerations for empathy assessment and intervention, and provides guidelines for improving the empathy skills of students with ASD.

The Importance of Empathy

Empathy is a multicomponent phenomenon encompassing a wide range of processes which can generally be divided into a cognitive component and an affective component. Cognitive empathy is the ability to understand another person's feelings, while affective empathy refers to the ability to share in or respond to the other person's emotional state (de Weid et al., 2007). Empathy skills are consistently linked to promoting prosocial behaviors (e.g., helping others) and inhibiting aggressive behaviors (Eisenberg et al., 2010), resulting in better quality friendships and relationships (Chow et al., 2013; Cramer & Jowett, 2010). Empathy is more than just being kind to one another, placing yourself in another person's shoes, or treating others how you want to be treated; empathy is crucial for social functioning and well-being (Damon et al., 2006; De Waal, 2008).

Empathy Skills of Students with ASD

Individuals with ASD exhibit challenges in various social domains including struggles with social interactions, unconventional communication skills, and restricted and repetitive behaviors (American Psychiatric Association, 2013). A lack of empathy has also been observed across the autism spectrum for individuals of all ages. In fact, according to teacher reports, compared to their typically developing peers, students with ASD between the ages of 3 and 12 are significantly less empathic (Peterson, 2014). Adolescent self-reports also indicate that individuals with ASD perceive themselves as struggling to display empathy toward others (Senland & Higgins-D'Alesandro, 2013).

The behavioral characteristics of any disability condition can impact individuals to a certain and oftentimes significant degree (Waite et al., 2014). Further complicating the situation is the multi-dimensional nature of empathy, which can make it difficult to identify specific factors that may need to be uniquely addressed. Individuals with ASD seemingly demonstrate more challenges with cognitive empathy (i.e., understanding and identifying the emotions of others) compared to affective empathy (i.e., the expression of empathy; Firth 2012; Smith, 2009). Thus, it is important for professionals such as special and general education teachers, applied behavioral analysts, and school psychologists to account for the specific skill deficits of students with ASD when assessing and developing empathy interventions for this population.

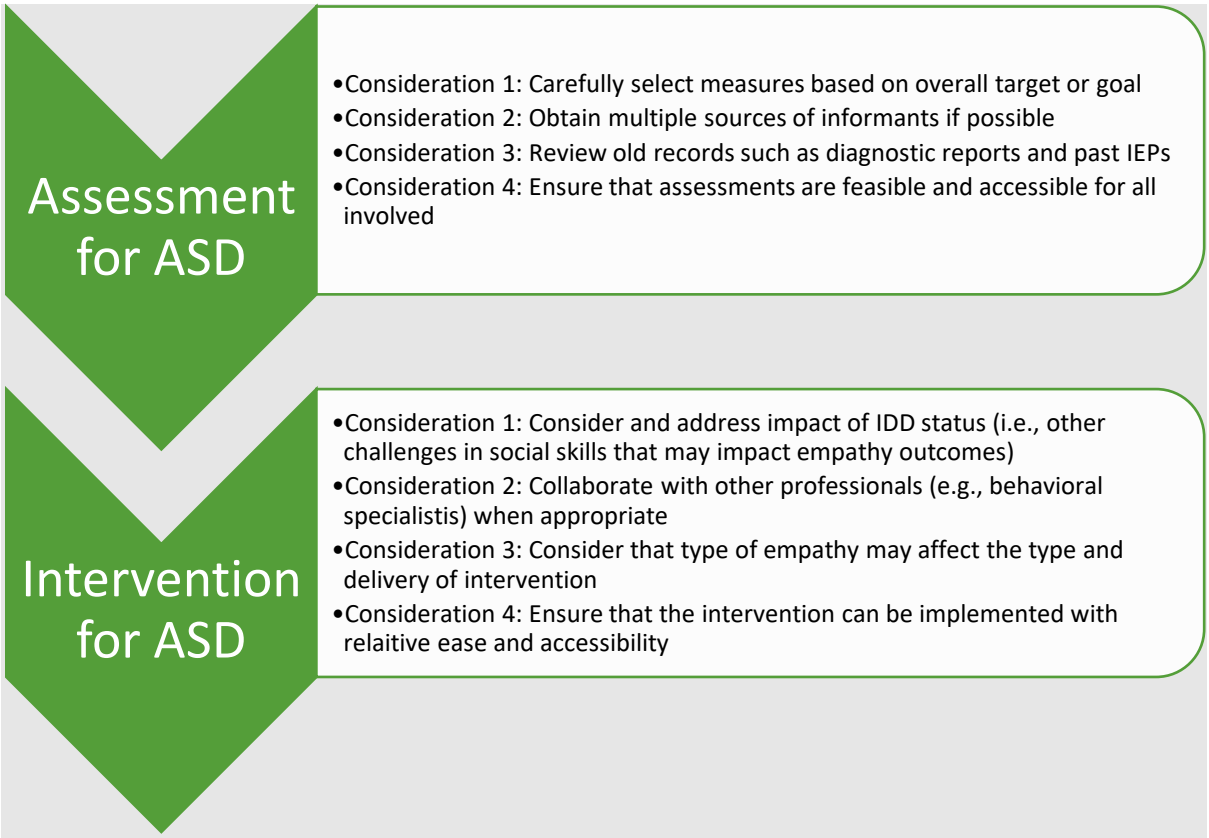
Researchers have developed several theories to explain the observed empathy challenges in individuals with ASD. One prominent theory suggests that ASD should be defined as a single-minded attentional system (i.e., monotropism) that prefers to take in one information source at a time (Murry et al., 2005). This preference may lead some individuals with ASD to miss certain social cues which then impacts their cognitive and affective empathy skills. In fact, according to

some research, this theory of monotropism may explain why young children with ASD are less likely to identify the emotional cues of another person (i.e., cognitive empathy) as it requires orienting toward other people (Mundy, 2018).

Overall, it is critical for educators to understand that empathy might be an important social skill to address for students with ASD and that specific aspects of empathy should be assessed when developing an intervention plan. In the next section, we describe two different cases of students with ASD who are struggling with their empathy skills. Guidelines and suggestions for how to develop and address the unique needs of students with ASD for intervention are provided for each scenario (see Figure 6 for overview).

Figure 6

Empathy Assessment and Intervention Considerations for Students with ASD



The final section then discusses general recommendations that should be considered when defining and targeting empathy for interventions.

Specific Guidelines and Suggestions

We now present our first case. At the beginning of the school year, Ms. Shultz, a special education teacher, began working with Kara, an eleven-year-old student diagnosed with ASD. Kara's IEP states that for the new school year she will transition from less than 40% of the day in general education to 80% of the day or more in general education. Kara's parents expressed concern about how their child would get along with her classmates, fearing that their daughter may be left alone or even bullied in a general education setting due to her ASD symptomatology. Her parents state that Kara struggles with "connecting with others" and has difficulty recognizing the emotions of other people. They worry that because of this Kara may struggle to make friends in the general education classroom.

Fortunately, Ms. Shultz also helps run a social skills training program for students with disabilities at Kara's school. Ms. Shultz suggests that Kara enroll in the program in order to address some of her parent's concerns. Once enrolled in the social skills training program, Ms. Shultz reviews Kara's diagnostic reports and past IEPs and determines that Kara may benefit further from empathy training to better connect with fellow students and gain the skills to correctly identify the emotional state of others. Ms. Shultz realizes she will need to develop an empathy intervention that is not only appropriate but incorporates any special considerations for students with ASD such as Kara.

To capture a general picture of Kara's empathic skills, it is critical to obtain reports from multiple informants including self-report, parent-report, and teacher-report. In particular, teacher- and parent-reports are useful for the identification of certain skills and abilities of

younger individuals across different contexts, such as school and home settings (Renk & Phares, 2004; Yoder & McDuffie, 2006). There are several empathy measures available to identify areas for intervention (see summary of different empathy measures in Table 7).

Table 7

Summary of Different Measures Used to Assess Empathy

	Measure	Type of Empathy	Number of Items	Scale/Score	Target Age Group(s)
Self Report	Empathy Quotient (Baron-Cohen & Wheelwright, 2004)	Cognitive Empathy Affective Empathy	60	Likert scale providing overall empathy score	Young-Late Adulthood
	Interpersonal Reactivity Index (Davis, 1980)	Empathic Concern	28	Four subscales providing sub-scores for each scale and an overall empathy score	Young-Late Adulthood
Parent Proxy Report	Children's version of Empathy Quotient (Auyeung et al., 2009)	Empathizing	27	Likert scale providing overall empathy score	Ages 4-11
	Griffith Empathy Measure (Dadds et al., 2008)	Cognitive Empathy Affective Empathy	23	Likert scale providing a cognitive and affective empathy sub-score and overall total score	Children/ Adolescents
Teacher Proxy Report	Teacher-adapted Griffith Empathy Measure (e.g., Deschamps et al., 2014)	Cognitive Empathy Affective Empathy	23	Likert scale providing a cognitive and affective empathy sub-score and overall total score	Children

First, to confirm general empathy deficits, Ms. Schultz asks Kara's parents to complete the parent-report version of the Empathy Quotient (EQ-C; Auyeung et al., 2009) which is widely

used to assess the empathy skills of individuals with ASD. The EQ-C provides one overall empathy score (max score = 54) with lower scores indicative of poorer empathy performance. More information regarding the scoring and items are detailed by Auyeung and colleagues (2009). Kara's mother completed the EQ-C and reported an overall score of 22 indicating that Kara demonstrates poor empathy skills in general. To confirm which specific areas of empathy Kara seems to struggle with the most, Ms. Schultz then asks her teacher from the previous year to complete the 23-item Griffith Empathy Measure (GEM; Dadds et al., 2008), which can be adapted for teachers and has been used in the research literature to assess the empathy skills of students with ASD (e.g., Deschamps et al., 2014). The GEM provides separate scores for cognitive empathy (6 items; max score = 24) and affective empathy (9 items; max score = 36) as well as a total overall score (max score = 92) with lower scores indicative of poorer empathy skills. More information about the items and scoring can be found by Dadds et al. (2008). Kara's previous teacher reported scores of 12 for cognitive empathy, 20 for affective empathy, and 66 for the total overall score indicating that Kara exhibits poor performance in both cognitive and affective empathy. Ms. Schultz determines that Kara should first focus on improving her cognitive empathy skills given that in order to respond appropriately to another person's emotional state she will need to first identify their emotions or feelings accurately (Behrends et al., 2012).

Given that Kara is enrolled in the social skills training program, Ms. Schultz recommends they develop an intervention program focused on improving her ability to accurately label the emotions or feelings of others. There are two types of social skills training programs depending on whether implicit or explicit learning is required. *Explicit* social skills groups are often quite structured, may follow a manual with different modules, and consist of practice with repeated

exercises to practice social norms in group or at home (Cotugno, 2009). While explicit social skills training has its benefits, some children with ASD who participate in such training demonstrate challenges with generalizing learned skills in different situations (Baker & Myles, 2003; Cotugno, 2009). Instead, Ms. Schutz opts for an *implicit* social skills training approach in which individuals learn social skills on their own first and then they are exposed to different social situations often in the form of games in a group setting meant to elicit those social skills (Jonsson et al., 2016). Past research indicates that implicit social skills training can improve the cognitive empathy skills of adolescents with ASD. For instance, to improve cognitive empathy skills, Goldingay and colleagues (2013) conducted a pilot of an implicit social skills training program for seven adolescents with ASD incorporating a number of group activities such as creating a movie together that considered understanding the emotional state of each character (i.e., understanding what it would feel like to be that character). This way, Kara's peers can be involved in the intervention so Kara may practice accurately identifying the emotional state of others.

Here is our second case. Mr. Sanchez is a special education teacher who is working with Max, a fourteen-year-old student diagnosed with ASD. While discussing behavioral goals with Max and his parents, Mr. Sanchez learns that Max struggles with appropriately responding to the emotional states of other people, particularly regarding tense social situations and will often elope in most cases. His parents report that parents of other peers tell them that their children think Max "doesn't seem to care" about their problems; however, Max reports that he simply feels overwhelmed and does not know how to respond in tense social situations. This is of great concern to his parents who worry this may make it more difficult for Max to make friends with his peers, especially as he gets older.

Given the parents' concerns, Mr. Sanchez determines that he will need to collaborate with a behavior specialist and develop a targeted behavior intervention plan for Max to learn a few ways to appropriately respond to a peer during tense social interactions. Max will need to be taught how to state an empathic listening statement and an empathic follow-up question as a way to appropriately respond to a peer. There are several approaches and methods that Mr. Sanchez may use to achieve this aim, but the approach will depend on the results of the assessments he first chooses to conduct.

Given that the main area of concern for Max is related to affective empathy (i.e., how one responds to the emotional state of others), Mr. Sanchez, in collaboration with a behavior specialist, determines that multiple reports of Max's current empathy skills should be obtained. First, Mr. Sanchez asks that one of Max's parents complete the EQ-C to determine general challenges in empathy. Max's father completed the EQ-C resulting in a total score of 26 indicating that Max exhibits poor empathy skills in general. Next, being Max's current teacher, Mr. Sanchez completes the teacher-adapted version of the GEM. Mr. Sanchez reported scores of 20 for cognitive empathy, 16 for affective empathy, and 68 for the total overall score indicating that Max demonstrates more weakness in affective empathy compared to cognitive empathy. Mr. Sanchez and the behavior specialist determine that Max can accurately understand the feelings of others but may struggle to respond in an appropriate manner.

The behavior specialist suggests using a video feedback intervention package to specifically teach Max how to respond to a peer using an empathic listening statement and a follow-up question to improve his affective empathy skills. Video feedback is a relatively accessible and affordable intervention (Schreibman et al., 2000) that involves recording an individual performing specific behaviors and then reviewing the recording for self-evaluation

(Maione & Mirenda, 2006). Past research indicates that video feedback interventions can be effective at improving the affective empathy of individuals with ASD (Josol et al., 2022; Koegel et al., 2016). For example, Josol and colleagues (2022) used a video feedback intervention package to teach four adolescents with ASD to respond to peers with an empathic listening statement (e.g., "That seems like a lot of pressure!") and an empathic follow-up question (e.g., "Have you talked to anyone else on the team?") in response to a statement of emotion (e.g., "I'm worried about the basketball try-outs"). Mr. Sanchez and the behavior specialist agree that if the video feedback intervention proves effective for Max, the next step should be to assess if Max can generalize his learned affective empathy skills to different peers across different settings (e.g., classroom, lunchroom, library).

General Considerations

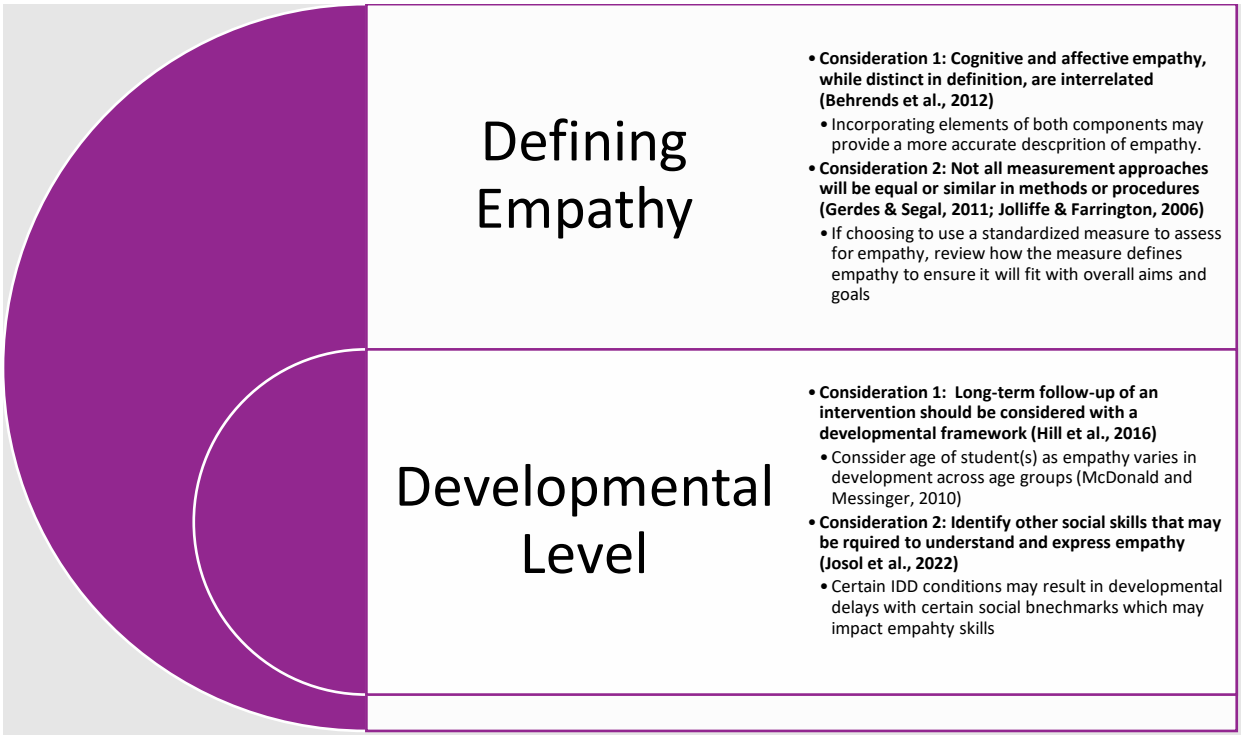
While differences should be accounted for when developing empathy interventions for individuals with ASD, there are general guidelines that working professionals should also consider for intervention. First, how empathy is defined will be of critical importance for assessment or intervention. There is no general consensus on an exact definition or measurement of empathy (Innamorati et al., 2019). This lack of consensus can make defining and measuring empathy particularly challenging for those who assess empathy and develop interventions for individuals with ASD. Figure 7 provides general suggestions for elements that should be considered to define empathy.

Second, the developmental age or level of the individual with ASD should be a general consideration when designing and implementing an intervention. Throughout the developmental lifespan, empathic responses grow in complexity, particularly during childhood and adolescence (Dadds et al., 2008). In the first 12 months of life, infants display empathic responses that are

involuntary and automatic by appearing stressed and seeking comfort for themselves (Dondi et al., 1999). As humans grow older, so does the cognitive capacity to understand and respond to a variety of subtle and diverse emotions (Hart, 1999; Hoffman, 1990; Schulte-Rüther et al., 2014). Figure 7 provides general suggestions to assist professionals in considering developmental age or level when designing and implementing empathy interventions.

Figure 7

General Considerations for Empathy Assessment and Intervention



Third, other social skills may need to be addressed before specifically focusing on cognitive and affective empathy for intervention. That is, other social skills may be required in order to appropriately communicate empathy towards others (Hills, 2009; Josol et al., 2022; Koegel et al., 2016). In fact, lower performance in empathic responses may be due to challenges in communication during a conversation (Baron-Cohen & Wheelwright, 2004) rather than any actual deficits in empathy skills. Other social skills that may impact empathic performance

include conversation skills such as the speaker and listener adopting each other's point of view, turn-taking during conversation, and conversing on topics relevant to all parties (Chin & Bernard-Opitz, 2000). Given that individuals with ASD may struggle with such social skills, assessment of social strengths and weaknesses may be needed prior to implementation of interventions targeting empathy skills.

Final Thoughts

The ability to connect with and build meaningful social relationships with each other is rooted in empathy. That is, the ability to understand and respond to the emotional state of others is prevalent in all aspects of our day-to-day social lives. Given that deficits in empathy skills are associated with poorer social outcomes and that individuals with ASD already face barriers to developing and maintaining meaningful relationships, there is an urgent need to develop and implement effective and appropriate interventions for this population. These suggestions and guidelines can be used to design interventions that address the unique considerations and needs of individuals with ASD. There are also general considerations that should be accounted for, such as being mindful of how empathy is defined and measured as well as ensuring that any empathy measure or intervention is developmentally appropriate for the individual with ASD. By considering such factors in assessment and intervention development, we can more effectively address and improve the empathy skills of individuals with ASD. For many students with ASD, this will have an immeasurable impact on their ability to develop and maintain meaningful relationships throughout their lifetime.

REFERENCES

REFERENCES

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Auyeung, B., Wheelwright, S., Allison, C., Atkinson, M., Samarawickrema, N., & Baron-Cohen, S. (2009). The children's empathy quotient and systemizing quotient: Sex differences in typical development and in autism spectrum conditions. *Journal of Autism and Developmental Disorders, 39*(11), 1509-1521. doi:10.1007/s10803-009-0772-x

Baker J., & Myles B. (2003). *Social skills training for children and adolescents with Asperger syndrome and social-communication problems*. Autism Asperger Pub.

Baron-Cohen, S., & Wheelwright, S. (2004). The empathy quotient: an investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. *Journal of Autism and Developmental Disorders, 34*(2), 163-175. doi:10.1023/B:JADD.0000022607.19833.00

Behrends, A., Müller, S., & Dziobek, I. (2012). Moving in and out of synchrony: A concept for a new intervention fostering empathy through interactional movement and dance. *The Arts in Psychotherapy, 39*(2), 107-116. https://doi.org/10.1016/j.aip.2012.02.003

Chow, C. M., Ruhl, H., & Buhrmester, D. (2013). The mediating role of interpersonal competence between adolescents' empathy and friendship quality: A dyadic approach. *Journal of Adolescence, 36*(1), 191-200. https://doi.org/10.1016/j.adolescence.2012.10.004

Chin, H. Y., & Bernard-Opitz, V. (2000). Teaching conversational skills to children with autism: Effect on the development of a theory of mind. *Journal of Autism and Developmental Disorders, 30*(6), 569-583. doi:10.1023/A:1005639427185

Cotugno, A. J. (2009). Social competence and social skills training and intervention for children with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 39*(9), 1268-1277. doi:10.1007/s10803-009-0741-4

Cramer, D., & Jowett, S. (2010). Perceived empathy, accurate empathy, and relationship satisfaction in heterosexual couples. *Journal of Social and Personal Relationships, 27*(3), 327-349. https://doi.org/10.1177/0265407509348384

Dadds, M. R., Hunter, K., Hawes, D. J., Frost, A. D. J., Vassallo, S., Bunn, P., Merz, S., & Masry, Y. E. (2008). A measure of cognitive and affective empathy in children using parent ratings. *Child Psychiatry and Human Development, 39*(2), 111-122. https://doi.org/10.1007/s10578-007-0075-4

Damon, W., Lerner, R. M., & Eisenberg, N. (Eds.). (2006). *Handbook of Child Psychology, Social, Emotional, and Personality Development.* John Wiley & Sons.

Davis, M. H. (1980). *Interpersonal reactivity index*. American Psychological Association.

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

de Waal, F. B. M. (2008). Putting the altruism back into altruism: The evolution of empathy. *Annual Review of Psychology, 59*, 279-300. https://doi.org/10.1146/annurev.psych.59.103006.093625

de Wied, M., Branje, S. J. T., & Meeus, W. H. J. (2007). Empathy and conflict resolution in friendship relations among adolescents. *Aggressive Behavior, 33*(1), 48-55. https://doi.org/10.1002/ab.20166

Dondi, M., Simion, F., & Caltran, G. (1999). Can newborns discriminate between their own cry and the cry of another newborn infant? *Developmental Psychology, 35*(2), 418–426. https://doi.org/10.1037/0012-1649.35.2.418

Eisenberg, N., Eggum, N. D., & Giunta, L. D. (2010). Empathy-related responding: Associations with prosocial behavior, aggression, and intergroup relations. *Social Issues and Policy Review, 4*(1), 143-180. https://doi.org/10.1111/j.1751-2409.2010.01020.x

Goldingay, S., Stagnitti, K., Sheppard, L., McGillivray, J., McLean, B., & Pepin, G. (2015). An intervention to improve social participation for adolescents with autism spectrum disorder: Pilot study. *Developmental neurorehabilitation*, *18*(2), 122-130. doi:10.3109/17518423.2013.855275

Hart, T. (1999). The refinement of empathy. *Journal of Humanistic Psychology, 39*(4), 111-125. https://doi.org/10.1177/0022167899394007

Hill, C. E. (2009). *Helping skills: Facilitating, exploration, insight, and action* (3rd ed.). American Psychological Association.

Hoffman, M. L., (1990). Empathy and justice motivation. *Motivation and Emotion, 14*, 151-172. https://doi.org/10.1007/BF00991641

Innamorati, M., Ebisch, S. J. H., Gallese, V., Saggino, A., & Urgesi, C. (2019). A bidimensional measure of empathy: Empathic Experience Scale. *PLoS ONE, 14*(4), 1-19. https://doi.org/10.1371/journal.pone.0216164

Jolliffe, D., & Farrington, D. P. (2006). Development and validation of the Basic Empathy Scale. *Journal of Adolescence, 29*(4), 589-611. https://doi.org/10.1016/j.adolescence.2005.08.010

Jonsson, U., Choque Olsson, N., & Bölte, S. (2016). Can findings from randomized controlled trials of social skills training in autism spectrum disorder be generalized? The neglected dimension of external validity. *Autism, 20*(3), 295-305. doi:10.1177/1362361315583817

Josol, C. K., Fisher, M. H., Brodhead, M. T., & Dueñas, A. (2022). Using a Video Feedback Intervention Package to Improve Affective Empathy Skills for Adolescents with Autism Spectrum Disorder. *Journal of Developmental and Physical Disabilities, 34*(1), 127-145. doi:10.1007/s10882-021-09793-x

Koegel, L. K., Ashbaugh, K., Navab, A., & Koegel, R. L. (2016). Improving empathic communication skills in adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, *46*(3), 921-933. doi:10.1007/s10803-015-2633-0

Maione, L., & Mirenda, P. (2006). Effects of video modeling and video feedback on peer-directed social language skills of a child with autism. *Journal of Positive Behavior Interventions, 8*, 106–118. https://doi.org/10.1177/10983007060080020201.

Mundy, P. (2018). A review of joint attention and social-cognitive brain systems in typical development and autism spectrum disorder. *European Journal of Neuroscience, 47*(6), 497-514. https://doi.org/10.1111/ejn.13720

Murray, D., Lesser, M., & Lawson, W. (2005). Attention, monotropism and the diagnostic criteria for autism. *Autism, 9*(2), 139-156. https://doi.org/10.1177/1362361305051398

Peterson, C. (2014). Theory of mind understanding and empathic behavior in children with autism spectrum disorders. *International Journal of Developmental Sciences, 39*, 16-21. https://doi.org/10.1016/j.ijdevneu.2014.05.002

Renk, K. & Phares, V. (2004). Cross-informant ratings of social competence in children and adolescents. *Clinical Psychology Review, 24*(2), 239-254. doi:10.1016/j.cpr.2004.01.004

Schreibman, L., Whalen, C., & Stahmer, A. C. (2000). The use of video priming to reduce disruptive transition behavior in children with autism. *Journal of Positive Behavior Interventions, 2*, 3–11. https://doi.org/10.1177/109830070020040030501.

Schulte-Rüther, M., Greimel, E., Piefke, M., Kamp-Becker, I., Remschmidt, H., Fink, G. R., Herpertz-Dahlmann, B., & Konrad, K. (2014). *Social Cognitive and Affective Neuroscience, 9*(8), 1118-1126. https://doi.org/10.1093/scan/nst088

Senland, A. K., & Higgins-D'Alessandro, A. (2013). Moral reasoning and empathy in adolescents with autism spectrum disorder: Implications for moral education. *Journal of Moral Education, 42*(2), 209-223. doi:10.1080/03057240.2012.752721

Waite, J., Heald, M., Wilde, L., Woodcock, K., Welham, A., Adams, D., & Oliver, C. (2014). The importance of understanding the behavioural phenotypes of genetic syndromes

associated with intellectual disability. *Paediatrics and Child Health, 24*(10), 468-472. https://doi.org/10.1016/j.paed.2014.05.002

Yoder, P. J., & McDuffie, A. (2006). Treatment of joint attention in children with disabilities. In T. Charman, & W. Stone (Eds.), *Social & communication in autism spectrum disorders: Early identification, diagnosis, & intervention* (pp. 117–142). Guilford.

CHAPTER 5

The Importance of Empathy for Individuals with Intellectual and Developmental Disabilities

The understanding between empathy, social skills, and their impact on individuals with intellectual and developmental disabilities (IDD) continues to improve. Described as a multidimensional construct, empathy consists of a cognitive component and affective component. Cognitive empathy refers to an individual's ability to recognize the emotional state of others, while affective empathy refers to an individual's ability to share in another person's emotional state (van Noorden et al., 2015). Both components of empathy are interdependent in nature (Behrends et al., 2012).

Generally, individuals with IDD exhibit challenges with the understanding and expression of empathy compared to individuals without IDD (e.g., Cebula & Wishart, 2008; Johnson et al., 2017). However, different etiologies can elucidate different strengths as well as weaknesses in relation to empathy skills (Waite et al., 2014). For example, challenges in empathy skills can be observed for individuals with autism spectrum disorder (ASD) across age groups (e.g., Peterson, 2014; Senland & Higgins-D'Alesandro, 2013; Trimmer et al., 2017). On the other hand, individuals with Williams syndrome (WS) and Down syndrome (DS) appear to display stronger empathy skills, especially cognitive empathy, compared to their ASD counterparts (e.g., Jones et al., 2000; Kasari et al., 1995).

Empathy is closely linked to other social domains including various social skills and social outcomes. More specifically, empathy itself can be considered a specific social and communication skill (Riggio et al., 1989) and has been linked to other social skills such as social motivation (Smith et al., 2011; Zaki, 2014) and social awareness (Collaborative for Academic,

Social, and Emotional Learning, 2012). Researchers also demonstrate that better empathy skills are associated with more positive social interactions and higher quality meaningful relationships and friendships (Chow et al., 2013; Cramer & Jowett, 2010). Additionally, higher empathy skills are related to the inhibition of aggressive or anti-social behaviors (Roberts et al., 2014). Given the importance of empathy to social skills and outcomes as well as potential differences across IDD conditions, the current dissertation was conducted to examine the empathy and social skills as well as social outcomes of individuals with ASD, WS, and DS.

Chapter 2 of this dissertation was a systematic literature review of 169 studies conducted to identify the current research on empathy skills and social outcomes for individuals with ASD, WS, and DS. Although the majority of studies focused on the empathy skills of individuals with ASD, the findings of this literature review highlight several key patterns across articles that focused on empathy and social outcomes within the past 15 years. Regarding general study characteristics, a majority of the studies focused on individuals with ASD, had more male than female participants for their samples, and used a group quasi-experimental or experimental design.

The top empathy measures used across studies were the Empathy Quotient (EQ; Baron-Cohen et al., 2004) and the Interpersonal Reactivity Index (IRI; Davis, 1980). On the EQ, individuals with ASD generally reported lower scores compared to typically developing control groups. Lower empathy scores also often correlated with higher scores on measures for autism symptomatology such as the Autism Quotient (e.g., Paulus et al., 2013). On the IRI, individuals with ASD rated significantly lower than control groups on various sub-scales including perspective-taking and empathic concern (e.g., Bos & Stokes, 2019; Rogers et al., 2007). Of the

few studies to include individuals with WS and DS, findings indicate that these groups perform well on empathy-related tasks (e.g., Plesa Skwerer et al., 2016).

Only a few studies examined empathy in relation to social outcomes; however, these studies generally reported that empathy played a significant role in social outcomes across different age groups for individuals with ASD (e.g., Rueda et al., 2014; Senland & Higgins-D'Alessandro, 2016). Overall, the results of the systematic literature review indicate that individuals with ASD experience poorer empathy skills and these deficits relate to poor social skills. Further, there is a lack of research on empathy for other IDD conditions (e.g., WS and DS) and in relation to other social domains (e.g., social skills).

As such, Chapter 3 of this dissertation examined the specific relationship of empathy and social skills for individuals with ASD, WS, and DS and examined differences across groups and compared to a typically developing (TD) control group. The final sample (N = 120) included 30 students diagnosed with ASD (mean age = 10.73 years) and their caregivers, 30 students diagnosed with WS (mean age = 12.07 years) and their caregivers, 30 students with DS (mean age = 11.53 years) and their caregivers, and 30 TD students (mean age = 10.90 years) and their caregivers. Caregivers were asked to complete the children's version of the Empathy Quotient (EQ-C; Auyeung et al., 2009) and the Social Responsiveness Scale-Second Edition (SRS-2; Constantino & Gruber, 2005).

Results demonstrate that, according to parent reports, students with ASD present with lower empathy skills compared to students with WS and DS and to students without disabilities. Students with WS and DS also were reported to have poorer empathy skills compared to students without disabilities. Differences between groups were also demonstrated regarding the relationship between empathy skills and social skills. More specifically, for students with WS,

lower empathy skills were not significantly correlated with social motivation. Rather, compared to other groups, students with WS differed significantly in their relationship between empathy skills and social awareness (i.e., the ability to recognize social cues). The results of Chapter 3 highlight that differences in empathy and social skills should be accounted for in empathy-related interventions and underscore the importance of developing etiology-specific interventions.

In response to the importance of developing interventions that account for the student's disability, Chapter 4 was written to the development of intervention to address empathy skills deficits for students with ASD. When assessing empathy skills, it is crucial to obtain the perspective of multiple informants including parent- and teacher-reports. The use of multiple sources will provide both a general picture of a student's empathy skills along with information for specific areas of concern. Other general considerations for empathy assessment and intervention include incorporating elements of cognitive and affective empathy during assessment, adopting a developmental framework to guide both short term and long-term goals, and identifying additional social skills deficits to target prior to or during the empathy intervention, if applicable.

This dissertation highlights key differences in empathy and social skills among individuals with ASD, WS, and DS. First, some of the current research, as demonstrated in Chapter 2, suggests that rather than lacking empathy, individuals with ASD may experience greater distress or overstimulation in social situations which may impact the ability to empathize with others (e.g., Bos & Stokes, 2019; Elcheson et al., 2018). Additionally, other research demonstrates that individuals *without* ASD may have difficulties with identifying the emotional states of individuals with ASD (Edey et al., 2016; Sheppard et al., 2016). Such findings align

with more current research focused on the 'double empathy problem', the notion that challenges in empathy may be due to individuals without ASD misunderstanding the empathy skills of individuals with ASD and vice versa (Mitchell et al., 2021). Future research is warranted to explore the 'double empathy problem' including a closer examination of current empathy measures as some of these (e.g., the EQ and IRI) have been used to assess for deficits rather than differences in empathy skills between individuals with and without ASD. Clearly, the results of this dissertation and other research indicate that the mechanisms underlying empathy challenges for individuals with ASD are complex, requiring further research and examination into factors that may be impeding or facilitating better empathy skills for individuals with ASD.

Second, the findings of this dissertation demonstrate that the relationship between empathy skills and different social domains is complex and can vary across IDD groups. While the results of Chapter 2 demonstrate a lack of research examining the relationship between empathy skills and various social domains for specific IDD groups such as WS and DS, the findings of Chapter 3 indicate that diagnosis can elicit differences in empathy skills and social skills. For example, students with WS differed significantly in their relationship between empathy skills and social awareness (i.e., an individual's ability to recognize and understand social cues) compared to students with ASD, DS, and without disabilities. More specifically, the relationship between empathy and social awareness was significantly poorer for students with WS compared to the other groups. Additionally, compared to other IDD groups, the relationship between empathy and social motivation was not significant for students with WS, suggesting that other factors may be impacting their empathy skills. These differences in empathy and social skills highlight the importance of the relationship between etiology and behavior (often referred to as "behavioral phenotypes"; Dykens et al., 2000). The different behavioral phenotypes of

various IDD conditions may be a contributing factor to any observed differences in outcomes and may have important implications for intervention.

Consequently, the lack of research on empathy skills and different social domains for different IDD groups may impact the effects of current and future interventions. That is, while interventions may be effective at achieving specific short-term behavioral goals (e.g., more turn-taking in a conversation, prolonged eye contact), it remains unclear whether such results relate to long-term social outcomes (e.g., improved friendships, better relationships) for individuals with different forms of IDD. Examination of long-term intervention effects is generally quite rare in the research literature (Farrington, 2006) given some of its limitations including selection bias and differential attrition (Hill et al., 2017). However, a focus on long-term intervention outcomes would improve the current understanding of whether short-term behavioral goals in socially related interventions correlate with long-term social outcomes such as more meaningful friendships and relationships. Doing so will ensure that interventions for individuals with IDD will produce both positive and lasting improvements in their social outcomes.

There is no question that the concept of empathy is complex, particularly in relation to social domains. Empathy is so connected to other social domains that researchers from different fields have pursued its origins, processes, and outcomes (Hall & Schwartz, 2019). The overall aim of this dissertation was to examine the relationship between empathy and social outcomes for individuals with different IDD conditions. Clearly, empathy and social outcomes have an important relationship for individuals with IDD; however, this relationship can vary across and within different IDD conditions. Future research is warranted to further explore such differences to ensure that interventions are appropriately designed for individuals with various IDD conditions, including those with ASD, WS, and DS.

REFERENCES

REFERENCES

Auyeung, B., Wheelwright, S., Allison, C., Atkinson, M., Samarawickrema, N., & Baron-Cohen, S. (2009). The children's empathy quotient and systemizing quotient: Sex differences in typical development and in autism spectrum conditions. *Journal of Autism and Developmental Disorders, 39*(11), 1509-1521. doi:10.1007/s10803-009-0772-x

Baron-Cohen, S., & Wheelwright, S. (2004). The empathy quotient: an investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. *Journal of Autism and Developmental Disorders*, *34*(2), 163-175. doi:10.1023/B:JADD.0000022607.19833.00

Behrends, A., Müller, S., & Dziobek, I. (2012). Moving in and out of synchrony: A concept for a new intervention fostering empathy through interactional movement and dance. *The Arts in Psychotherapy, 39*(2), 107-116. https://doi.org/10.1016/j.aip.2012.02.003

Bos, J., & Stokes, M. A. (2019). Cognitive empathy moderates the relationship between affective empathy and wellbeing in adolescents with autism spectrum disorder. *European Journal of Developmental Psychology*, *16*(4), 433-446. doi:10.1080/17405629.2018.1444987

Cebula, K. R., & Wishart, J. G. (2008). Social cognition in children with Down syndrome. *International Review of Research in Mental Retardation, 35*, 43–86. https://doi.org/10.1016/S0074-7750(07)35002-7

Chow, C. M., Ruhl, H., & Buhrmester, D. (2013). The mediating role of interpersonal competence between adolescents' empathy and friendship quality: A dyadic approach. *Journal of Adolescence*, *36*(1), 191-200. https://doi.org/10.1016/j.adolescence.2012.10.004

Constantino, J., & Gruber, C. (2005). *The social responsiveness scale.* Western Psychological Services.

Cramer, D., & Jowett, S. (2010). Perceived empathy, accurate empathy, and relationship satisfaction in heterosexual couples. *Journal of Social and Personal Relationships, 27*(3), 327-349. https://doi.org/10.1177/0265407509348384

Davis, M. H. (1980). *Interpersonal reactivity index*. American Psychological Association.

Domitrovich, C. E., Moore, J. E., & Thompson, R. (2012). Collaborative for Academic, Social, and Emotional Learning. Interventions that promote social-emotional learning in young children. *Handbook of Early Education*, 393-415.

Dykens, E. M. (2000). Annotation: Psychopathology in children with intellectual disability. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 41*(4), 407–417. https://doi.org/10.1111/1469-7610.00626

Edey, R., Cook, J., Brewer, R., Johnson, M. H., Bird, G., & Press, C. (2016). Interaction takes two: Typical adults exhibit mind-blindness towards those with autism spectrum disorder. *Journal of Abnormal Psychology, 125*(2), 879–885. doi:10.1037/abn0000199

Elcheson, J., Stewart, C., Lesko, A., Willey, L. H., Craft, S., Purkis, Y., & Campbell, M. (2018). *Spectrum women: Walking to the beat of autism.* Jessica Kingsley.

Farrington, D. P. (2006). Key longitudinal-experimental studies in criminology. *Journal of Experimental Criminology, 2*(2), 121-141. doi:10.1007/s11292-006-9000-2

Hall, J. A., & Schwartz, R. (2019). Empathy present and future. *Journal of Social Psychology, 159*(3), 225-243. https://doi.org/10.1080/00224545.2018.1477442

Hill, K. G., Woodward, D., Woelfel, T., Hawkins, J. D., & Green, S. (2016). Planning for long-term follow-up: Strategies learned from longitudinal studies. *Prevention Science, 17*(7), 806-818. doi:10.1007/s11121-015-0610-7

Johnson, E., Hervás, R., Gutiérrez-López-Franca, C., Mondéjar, T., & Bravo, J. (2017). Analyzing and predicting empathy in neurotypical and non-neurotypical users with an affective avatar. *Mobile Information Systems*, 1-11. https://doi.org/10.1155/2017/7932529

Jones, W., Bellugi, U., Lai, Z., Chiles, M., Reilly, J., Lincoln, A., & Adolphs, R. (2000). II. Hypersociability in Williams syndrome. *Journal of Cognitive Neuroscience, 12*(Supplement 1), 30–46. https://doi.org/10.1162/089892900561968

Kasari, C., Freeman, S., Mundy, P., & Sigman, M. (1995). Attention regulation by children with Down syndrome: Coordinated joint attention and social referencing looks. *American Journal on Mental Retardation, 100*, 128-136.

Mitchell, P., Sheppard, E., & Cassidy, S. (2021). Autism and the double empathy problem: Implications for development and mental health. *British Journal of Developmental Psychology, 39*(1), 1-18.

Paulus, F. M., Kamp-Becker, I., & Krach, S. (2013). Demands in reflecting about another's motives and intentions modulate vicarious embarrassment in autism spectrum disorders. *Research in developmental disabilities*, *34*(4), 1312-1321. doi:10.1016/j.ridd.2013.01.009

Peterson, C. (2014). Theory of mind understanding and empathic behavior in children with autism spectrum disorders. *International Journal of Developmental Neuroscience, 39*, 16-21. doi:10.1016/j.ijdevneu.2014.05.002

Plesa Skwerer, D., & Tager-Flusberg, H. (2016). Empathic responsiveness and helping behaviours in young children with Williams syndrome. *Journal of Intellectual Disability Research, 60*(10), 1010-1019. doi:10.1111/jir.12302

Riggio, R. E., Tucker, J., & Coffaro, D. (1989). Social skills and empathy. *Personality and Individual Differences, 10*(1), 93-99. https://doi.org/10.1016/0191-8869(89)90184-0

Roberts, W., Strayer, J., & Denham, S. (2014). Empathy, anger, guilt: Emotions and prosocial behaviour. *Canadian Journal of Behavioural Science / Revue canadienne des sciences du comportement, 46*(4), 465–474. https://doi.org/10.1037/a0035057

Rogers, K., Dziobek, I., Hassenstab, J., Wolf, O. T., & Convit, A. (2007). Who cares? Revisiting empathy in Asperger syndrome. *Journal of autism and developmental disorders, 37*(4), 709-715. doi:10.1007/s10803-006-0197-8

Rueda, P., Fernández-Berrocal, P., & Baron-Cohen, S. (2015). Dissociation between cognitive and affective empathy in youth with Asperger Syndrome. *European Journal of Developmental Psychology, 12*(1), 85-98. doi:10.1080/17405629.2014.950221

Senland, A. K., & Higgins-D'Alessandro, A. (2016). Sociomoral reasoning, empathy, and meeting developmental tasks during the transition to adulthood in autism spectrum disorder. *Journal of Autism and Developmental Disorders, 46*(9), 3090-3105. doi:10.1007/s10803-016-2849-7

Senland, A. K., & Higgins-D'Alessandro, A. (2013). Moral reasoning and empathy in adolescents with autism spectrum disorder: Implications for moral education. *Journal of Moral Education, 42*(2), 209-223. doi:10.1080/03057240.2012.752721

Sheppard, E., Pillai, D., Wong, G. T. L., Ropar, D., & Mitchell, P. (2016). How easy is it to read the minds of people with autism spectrum disorder? *Journal of Autism and Developmental Disorders, 46*(4), 1247–1254. doi:10.1007/s10803-015-2662-8

Smith, J., Ickes, W., Hall, J., & Hodges, S. (2011). *Managing interpersonal sensitivity: Knowing when and when not to understand others.* NOVA Science Publishers.

Trimmer, E., McDonald, S., & Rushby, J. A. (2017). Not knowing what I feel: Emotional empathy in autism spectrum disorders. *Autism, 21*(4), 450-457. doi:10.1177/1362361316648520

van Noorden, T. H. J., Haselager, G. J. T., Cillessen, A. H. N., & Bukowski, W. M. (2015). Empathy and involvement in bullying in children and adolescents: A systematic review. *Journal of Youth and Adolescence, 44*(3), 637-657. https://doi.org/10.1007/s10964-014-0135-6

Waite, J., Heald, M., Wilde, L., Woodcock, K., Wellham, A., Adams, D., & Oliver, C. (2014). The importance of understanding the behavioural phenotypes of genetic syndromes associated with intellectual disability. *Pediatrics and Child Health, 24*(10), 468-472. https://doi.org/10.1016/j.paed.2014.05.002

Zaki, J. (2014). Empathy: a motivated account. *Psychological Bulletin, 140*(6), 1608-1647. doi:10.1037/a0037679