

**Social Intelligence and Autism Spectrum Disorders**

**Prepared for Kerry's Place Autism Services by**

**Jessica Schroeder**

**With the supervision of James M. Bebko**

**York University**

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Social intelligence, which is comprised of social cognition and social competence, are of critical importance in the development and success of children and adolescents. Social skills in childhood and adolescence impact quality of life, school and work success, and interpersonal relationships throughout the lifespan. The purpose of this paper is to review and consolidate research in the field to provide an understanding of what social intelligence is comprised of and the impact that it has on typically developing individuals and those with autism spectrum disorders (ASD). First, the concept of traditional academic intelligence will be briefly reviewed. Next, the development of the construct of social intelligence will be discussed, followed by a review of some of the research on the topic. A very brief overview of some of the relevant neurological research will follow. Then, some points to consider in the assessment of social intelligence will be outlined, followed by a very brief review of the state of the research on interventions used to develop social intelligence.

### *Traditional “Academic” Intelligence Defined*

Traditional intelligence is a multi-dimensional construct that has been re-conceptualized and re-defined over the past two centuries. One of the most hotly debated topics in the understanding of intelligence is the structure of intelligence. On one side, Spearman (1927) identified a single, general “g” intelligence that is common to and underlies a variety of specific intellectual abilities. Conversely, Guilford (1956) proposed a structure of intelligence comprised of 120 distinct abilities (later this was increased to 180; Guilford, 1982). The concept of multiple intelligences will be expanded on in the next section as these theories contributed to the development of the concept of social intelligence. While there is still considerable debate about the composition of intelligence, current models tend towards a compromise between these two

extremes, a hierarchical model. Currently, the two most widely-used measures of intelligence are consistent with a hierarchical conceptualization of intelligence, in that they provide a general, overall score comprised of two primary factors, verbal and non-verbal reasoning. In addition, the content of both measures reflect Horn and Cattell's (1966) distinction between fluid intelligence, the ability to think and problem solve in novel situations, and crystallized intelligence, the accumulation of acquired skills and knowledge. The current edition of the Wechsler Intelligence Scale for Children and the Wechsler Adult Intelligence Scale (WISC-IV; Wechsler, 2003; WAIS-IV, Wechsler, 2008) comprises tests of both verbal and non-verbal reasoning, as well as scales of working memory and processing speed. The Stanford-Binet V (Roid, 2003) includes tests of fluid reasoning, knowledge, quantitative processing, visuo-spatial processing, and working memory abilities. For a more comprehensive review of the history of the conceptualization of and research on traditional intelligence refer to Cianciolo & Sternberg (2004). For the purposes of simplicity, traditional intelligence, as assessed using the conventional IQ measures described above will be referred to in this paper as "academic intelligence" (which should not be confused with academic abilities, such as reading, writing, mathematics, nor achievement within the academic domain).

### *Social Intelligence History*

Thorndike (1920) was the first to introduce the concept of social intelligence, as distinct from other types of intelligence which he referred to as abstract and mechanical. Thorndike defined social intelligence as, "the ability to understand and manage men and women, boys and girls -- to act wisely in human relations" (Thorndike, 1920, p. 228). Thorndike's concept of

social intelligence was well-received by psychologists and became a focus of an abundance of research (Walker & Foley, 1973).

Gardner's theory of multiple intelligences has also contributed to the development of current social intelligence conceptualization. In contrast with proponents of Spearman's general factor model of intelligence, Gardner asserted that current conceptualizations of intelligence were limited and did not account for the wide range of human abilities. Gardner (1983) proposed a model of 7 intelligences, two of which are of relevance to social intelligence: interpersonal and intrapersonal. Interpersonal intelligence is the ability to read others' emotions and intentions, while intrapersonal intelligence refers to self-reflective abilities. These forms of intelligence met Gardner's criteria for inclusion as an intelligence: a) potential for isolation of skill by brain lesion, b) individuals exist who excel or have a deficit in the particular kind of intelligence, c) there exists a core operation or set of operations that are required for performance of a particular kind of intelligence, d) a developmental progression, from novice to mastery, e) feasible evolutionary value, f) evidence from experimental research, g) evidence from psychometric tests, and h) capacity to be encoded using symbolic expression. However, Gardner's Theory of Multiple Intelligences has not been without its critics. The primary criticism is that there is a lack of clarity in defining and differentiating between each type of intelligence and in addressing how to go about measuring these intelligences (Eysenck, 1998). Eysenck also points out that Gardner's theories are based on anecdotal research from individuals in a limited, high range of academic IQ.

Another substantial contribution to the construct of social intelligence was made by Sternberg and colleagues with their work on human abilities and the Triarchic Theory of Intelligence (Sternberg, 1996; Sternberg & Kaufman, 1998; Sternberg & Wagner, 1986;

Sternberg, Wagner, & Okagaki, 1993). Like Gardner, they argue that conventional notions of intelligence are limited and inadequate at accounting for success (Sternberg & Williams, 1997). Rather, traditional intelligence tests predict success in performance on similar types of tasks, like tests at school and grades (Sternberg & Williams, 1997). The Triarchic Theory of Intelligence is based on what Sternberg (1996) refers to as successful intelligence, which he defines as, “the ability to adapt to, shape, and select environments to accomplish one’s goals and those of one’s society and culture” (Sternberg, 1998, p. 494). It is comprised of three broad abilities: analytical, creative, and practical. Analytical intelligence is the ability to successfully respond to well-defined problems that have only one correct answer, similar to what is measured using traditional intelligence tests. Creative intelligence refers to the ability to deal with novel problems and to generate novel solutions. Practical intelligence is the ability to draw on knowledge and skills to respond to problems of everyday life that are of personal relevance. The theory reflects the finding that substantial cross-cultural differences exist in terms of how intelligence is defined. As Sternberg points out, “cultures designate as intelligent the cognitive, social, and behavioral attributes that they value as adaptive to the requirements of living in those cultures” (Sternberg & Kaufman, 1998, p. 497). Each of these theories have influenced current concepts of social intelligence.

### *Social Intelligence Defined*

The introduction of the concept of social intelligence in the psychological literature by Thorndike (1920) preceded Spearman’s (1927) concept of the general ‘g’ intelligence trait. However, while there appears to be some degree of consensus among psychologists about the traits that comprise academic intelligence (Carroll, 1993), social intelligence remains to be

operationally defined and measured (Weis & Süß, 2007). Research in the study of social intelligence generally falls into one of three categories. The first category examines social cognition, such as person perception, social insight, and the ability to read nonverbal cues. The second category is social competence, which is measured by behaviourally-based outcomes that indicate social effectiveness. The third category can be classified as multi-trait, incorporating social cognitive and social competence skills, examining both effective social thinking and social behaviour. The method of defining social intelligence has a direct impact on results, particularly with respect to the differentiation between social and academic intelligence.

Based on the research reviewed below, Marlowe's definition of social intelligence is particularly comprehensive and concise. It is defined as "the ability to understand the feelings, thoughts, and behaviours of persons, and to act appropriately upon that understanding" (Marlowe, 1986, p. 52). This definition incorporates the cognitive and competence components. Romney & Pyryt (1999) point out that this definition incorporates the interpersonal and intrapersonal intelligence components of Gardner's theory (1993) and is consistent with Sternberg & Wagner's practical intelligence (1986), as described in the previous section. It also incorporates the concept of emotional intelligence, defined as "the capacity to perceive emotions, assimilate emotion-related feelings, understand the information of those emotions, and manage them" (Mayer, Caruso, & Salovey, 2000) and theory of mind (ToM), the ability to understand another persons' thoughts, beliefs, and desires. The constructs of emotional intelligence and ToM have received empirical support and are constituent components of social intelligence.

### *Importance of Social Intelligence*

Research and theoretical papers alike have indicated the importance of emotional and social intelligence in general life success (e.g. Goleman, 1995; Jones & Day, 1997; Salovey & Mayer, 1990). Social intelligence is linked to a variety of outcomes, including social adjustment, psychopathology, academic achievement, and work-related success. The development of social intelligence is critical for healthy development (Gresham, 2002; Gresham, Sugai, & Horner, 2001; Katz, McClellan, Fuller, & Walz, 1995; LeCroy, 2002; Masten & Coatsworth, 1998; Obradovic, van Dulmen, Yates, Carlson, & Egeland, 2006; Warnes, Sheridan, Geske, & Warnes, 2005). Early social skills in children are linked with later social adjustment and psychopathology (Campbell, 1995; Carter, Briggs-Gowan, Jones, & Little, 2003; Carton, Kessler, & Pape, 1999; Denham, McKinley, Couchoud, & Holt, 1990; Najaka, Gottfredson, & Wilson, 2001; Nowicki & Duke, 1994; Rose-Krasnor, 1997; Shaw, Keenan, Vondra, Delliquadri, & Giovannelli, 1997). Furthermore, social competence is related to resiliency and can serve as a protective factor in children and adolescents (Brooks, 2006; Masten, 1994; Masten & Coatsworth, 1998). Children who are well-liked tend to adjust well socially, while children who are rejected or ignored by peers in early childhood appear to be at risk for negative outcomes (Denham & Holt, 1993; Ladd, Kochenderfer, & Coleman, 1997; Parker & Asher, 1993; Pettit, 2004; Rutter, 2003). In particular, lower social intelligence is related to increased anxiety, delinquency, substance use, and conduct problems (e.g. Barkin, Smith, & DuRant, 2002; Beelman, Pflingsten, & Lösel, 1994; Carter et al., 2003; Gagnon & Nagle, 2004; Moote, Smyth, & Wodarski, 1999; Webster-Stratton & Hammond, 1998).

Social intelligence in very young children has been found to be a correlate of school-readiness and successful transitioning into formal schooling (Denham, 2006). Social intelligence has also been linked with academic achievement and school grades (Clark, Gresham, & Elliot,

1985; Feshbach & Feshbach, 1987; Green, Forehand, Beck, & Vosk, 1980; Izard, Fine, Schultz, Mostow, Ackerman, & Youngstrom, 2001; Keating, 1978; Márquez, Martin, & Brackett, 2006; Nowicki & Duke, 1994; Safer, 1986; Zsolnai, 2002). There are several possible explanations for the observed relationship between social intelligence and academic success. Children with stronger social skills are more likely to be well-liked by peers and teachers, thus making school an enjoyable experience. These children may elicit positive responses from teachers, leading them to receive more attention and approval from their teachers and enabling them to understand what their teachers expect from them. In fact, Nowicki and Duke (1994) found that emotional intelligence scores of children were more predictive of teacher ratings than academic intelligence scores. In addition, children with strong social skills may benefit by learning through observation of peers.

Social competence is adaptive in adulthood as well. It is valued by employers and leads to greater financial and career success (O'Neil, 1997). Several researchers confirm that social and emotional intelligence have been linked to stronger work performance (e.g. Boyatzis & Ratti, 2009; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979). In particular, social and emotional intelligence have been linked with strong leadership abilities (Barling, Slater & Kelloway, 2000; Dulewicz & Higgs, 2005; Zaccaro, Gilbert, Thor, & Mumford, 1991), stronger sales performance (Wong, Law, & Wong, 2004), and higher supervisor rating of job-performance (Slaski & Cartwright, 2002; Law, Wong, & Song, 2004). The research reviewed indicates that social intelligence is an important construct to examine, given its important role in adjustment, the development of psychopathology, school readiness, and academic and workplace success.



### *Social Intelligence Research*

The popularity of conducting research on social intelligence has fluctuated since the construct was first proposed by Thorndike in 1920. The primary research questions have been whether social intelligence and academic intelligence can be differentiated, how many constructs should be included in the definition of social intelligence, and how it should be measured. Empirical support for the discriminability of social and academic intelligence varies depending on which method of measurement is being used (Weis & Süß, 2007). Considerable variability has also been found in terms of the factor structure of social intelligence, as well as how to measure it. Several key studies in the field are reviewed below, followed by a brief summary of the current state of the research.

Ford and Tisak (1983) were one of the first to use multiple measures of social intelligence, including a behavioural effectiveness component. Unlike most of the research that had preceded them, Ford and Tisak (1983) were the first to identify a social intelligence factor that differed from the academic intelligence factor (Wong, Day, Maxwell, & Meara, 1995). They also found that their social measures converged to indicate an overall social intelligence factor and that the social measures were more predictive of scores of social effectiveness than were measures of academic intelligence. One limitation to their findings is that they used different types of methods to measure academic versus social intelligence, so some of their observed differences may have been related to methodology. Barnes and Sternberg (1989) found that both cognitive aspects of social intelligence (decoding nonverbal cues), and behavioural aspects of social intelligence (self-reported social competence), were positively correlated. Consistent with Ford & Tisak (1983), social and academic intelligence were not found to be significantly

correlated with each other, providing further evidence of the discriminability between the two types of intelligence.

Using a multitrait-multimethod (MTMM) design, Wong and colleagues (1995) found that social knowledge, social perception, and social behaviour were distinct from one another, and from academic intelligence. One limitation noted by the authors was that the sample was limited, as it was a sample of undergraduate students from a very prestigious university in the United States. Lee and colleagues (2000) also used MTMM design and found that they were able to distinguish between social and academic intelligence. Within each form of intelligence, they were able to further discriminate between fluid and crystallized intelligence, suggesting that this distinction may be of relevance to both types of intelligence (Lee, Wong, Day, Maxwell, & Thorpe, 2000).

In summary, research over the past decades has contributed significantly to current understanding of social intelligence. Although the structure of social intelligence and its discriminability from academic intelligence have not been entirely resolved, some tentative conclusions can be made. Consistent with numerous recommendations by researchers in the field (Bray, Campbell & Grant, 1974; Ford & Tisak, 1983; Keating, 1978; Renk & Phares, 2004; Riggio, Messamer, & Throckmorton, 1991; Saltzman-Benaiah, Lalonde, & Christopher, 2007), MTMM research designs have recently become the method of choice and have been applied to studies of social intelligence to investigate its structure and validity as a construct that differs from academic intelligence (Jones & Day, 1997; Lee, Day, Meara, & Maxwell, 2002; Lee, Wong, Day, Maxwell, & Thorpe, 2000; Vaughn et al., 2009; Weis & Süß, 2007; Wong, Day, Maxwell, & Meara, 1995). These studies have provided support for a multi-dimensional view of social intelligence (Weis & Süß, 2007). In particular, many researchers emphasize the

importance of considering both the cognitive and the behavioural aspects of social intelligence (e.g. Barnes & Sternberg, 1976; Ford & Tisak, 1983; Jones & Day, 1997; Vaughn et al., 2009). This multi-dimensionality of the social intelligence construct may help to explain Ford & Tisak's (1983) observation that individuals who are successful in one setting (e.g. a professor at a faculty meeting), might struggle in a different setting (e.g. a dinner party), or that individuals might be popular with some people (e.g. a "teacher's pet"), but not with others (e.g. the student's peers). With respect to discriminating between social and academic intelligence, studies that incorporate a behavioural effectiveness (e.g. social skills ratings, social cognition tasks) component to their methodology have been successful in finding that social intelligence is distinct from academic intelligence (Weis & Süß, 2007). Most studies have found that they are distinct (Ford & Tisak, 1983; Barnes & Sternberg, 1976; Lee et al., 2000; Weis & Süß, 2007; Wong et al., 1995), although some researchers suggest that they are distinct, but overlapping constructs (Brown & Anthony, 1990).

### *Neurological Research*

Relative to other primates, the human brain has evolved specialized social intelligence skills to be able to effectively navigate human social culture (e.g. Jensen, Hare, Call, & Tomasello, 2006; Herrmann, Call, Hernández-Lloreda, Hare, Tomasello, 2007; Silk et al., 2005). In fact, Herrmann and colleagues (2007) found that primates and human toddlers performed similarly on traditional cognitive tasks, but that humans demonstrated significantly stronger performance on social-cognitive tasks. This indicates that social intelligence must be of particular importance in the adaptive functioning of humans. The results of some of the reviews

and meta-analyses that have been conducted on the neural correlates of social intelligence are reviewed below.

A review by Beer and Ochsner (2006) outlined several regions involved in social cognition, including the orbitofrontal cortex (OFC), the medial prefrontal cortex (mPFC), the superior temporal sulcus (STS), the amygdala, and the fusiform face (FFA). The OFC appears to be the connection between the limbic system, which mediates emotions, and the PFC, which is involved in cognition (Savage, 2002). The amygdala is part of the limbic system and is implicated in the processing and memory of emotion. The FFA and the STS are involved in face processing, particularly face recognition in the FFA and tracking gaze direction (used in inferential processing of emotion and intentionality in others) in the STS. With regard to ToM, a review by Mitchell (2008) noted that one of the most consistent findings in cognitive neuroscience is that there are a limited range of neural regions that are involved in understanding the mental states of others, including the medial prefrontal cortex (mPFC), temporo-parietal junction (TPJ), the cingulate, amygdala, and the superior temporal sulcus (STS). A meta-analysis of over 200 fMRI studies confirms that the TPJ and mPFC are engaged during ToM tasks (Van Overwalle, 2009). The cingulate is also a part of the limbic system and mediates the formation, processing and memory of emotions. The TPJ is involved in the understanding of others' goals and intentions and is a component of the mirror neuron system (MNS). The MNS theory suggests that ToM is developed through the ability to interpret others through simulation. It postulates that there are specific systems and neurons that are activated when observing the actions of others, and when imitating others. These neurons help to essentially recreate the observed action within the observer, allowing the observer to understand what the action feels like. This work stems from Rizzolatti and colleagues' (1996) work with macaque monkeys,

which pinpointed a neural region that was activated both when observing and executing actions (Rizzolatti, Fadiga, & Gallese, 1996). The human correlate is proposed to be the IFG (pars opercularis). It is interesting to note that all of the anatomical regions and systems discussed above have been found to be implicated in autism spectrum disorders (for example, see for a review Penn, 2006; Schroeder, Desrocher, Bebko & Cappadocia, 2009). This provides neurological support for the inclusion of social deficits as one of the primary diagnostic criteria for an ASD.

### *Social Intelligence and ASD*

Impairments in social functioning are core features of ASD (APA, 1994). Difficulties are noted on both the social-cognitive and the social-behavioural level (Turner-Brown, Perry, Dichter, Bodfish, & Penn, 2008). Social-behaviour impairments include problems interacting with others, difficulty making friends (Turner-Brown et al., 2008), and differences in behavioural reactions to the emotional responses of others (Bacon, Fein, Morris, Waterhouse, & Allen, 1998; Blair, 1999; Corona, Dissanayake, Arbelle, Wellington, & Sigman, 1998; Dissanayake, Sigman, & Kasari, 1996; Sigman, Kasari, Kwon, & Yirmiya, 1992). Examples of social-cognitive impairments include difficulties in understanding and recognizing complex emotional expressions in others requiring inference about another's mental state, such as pride and embarrassment (Bormann-Kischkel, Vilsmeier, & Baude, 1995; Capps, Yirmiya, & Sigman, 1992; Hobson, 1986; Howard et al., 2000) and the integration of verbal and non-verbal aspects emotional reactions (Hobson, Ouston, & Lee, 1989; Loveland et al., 1995). In higher-functioning individuals with autism, social skills are significantly impaired relative to academic intelligence (Klin et al., 2006). These deficits impact individuals with ASD's ability to secure employment

and independent living, even in those with intact academic intelligence (Klin et al., 2006; Tantam, 1991). In fact, individuals with ASD have difficulty obtaining meaningful work and very few become independent enough to get married or own their own property. As adults, between 5–15% of individuals with ASD achieve a fairly normal social life and adequate school and work success (Howlin, 2000; Howlin & Goode, 1998; Nordin & Gillberg, 1998). Individuals with ASD with intact academic intelligence (high-functioning autism and Asperger syndrome) often want social interaction with peers, but have difficulty in making friends due to limited understanding of others (Turner-Brown et al., 2008). This discrepancy can lead to social isolation and loneliness (Bauminger & Kasari, 1999; Orsmond, Krauss, & Seltzer, 2004).

The neurological research reviewed in the previous section indicated several neurological regions that mediate social intelligence and ToM, all of which are impacted in individuals with ASD. This suggests that social deficits start at the neurological level in the ASD population. Several researchers have demonstrated that in many social cognition tasks, individuals with ASD recruit brain regions that are used for non-social cognition tasks in typically developing individuals (see review by O'Connor & Kirk, 2008).

Additionally, other symptoms of ASD may have an indirect impact on the development of social difficulties. Difficulties with language are likely to make communication with peers, teachers, and parents difficult, leading to reduced social acceptance and opportunities for social interaction. Sensory issues may also be related to social difficulties in individuals with ASD. Hilton and colleagues (2007) demonstrated that sensory processing issues were negatively correlated with social competence in individuals with ASD (Hilton, Graver, & LaVesser, 2007). Individuals with ASD who are under-sensitive may not notice what is happening in their environment and may miss social cues. Sensory behaviours (e.g. toe-walking, hand flapping)

may distract them from social pursuits and discourage others from interacting them (Dunn, Saiter, & Rinner, 2002).

Some researchers propose that ToM deficits are at the core of the manifestation of social deficits in individuals with ASD (Baron-Cohen, Leslie, & Frith, 1985). Researchers consistently find ToM difficulties in individuals with ASD, such that it is now conclusively accepted (Garfield, Peterson, & Perry, 2001). ToM abilities have been found to be correlated with a number of skills that are impacted in some individuals with ASD, including: conversational skills, complexity of pretend and joint play, school adjustment, social competence, interpersonal sensitivity, peer acceptance, and size of social network (Cutting & Dunn, 1999; Dunn, 1995; Jenkins & Astington, 2000; Liddle & Nettle, 2006; Slaughter, Dennis, & Pritchard, 2002; Stiller & Dunbar, 2007; Sutton, Smith, & Swettenham, 1999; Taylor & Carlson, 1997). ToM deficits lead to difficulty in understanding of the mental states the self and of others, impacting the ability to make sense of the social world and to interact with others appropriately (Baron-Cohen et al., 1999). While some higher functioning individuals are able to successfully complete simple ToM problems, they often fail complex tasks (Happé, 1994). Happé (1995) also found that the verbal mental age of the limited number of individuals with ASD who do pass ToM tasks is significantly higher than in the typically developing population. She found that 25% of the typically developing sample passed the ToM task at a verbal mental age of 3.5 years, and that 80% of the sample had passed at 4.5 years. Conversely, none of the ASD sample passed the task below a verbal mental age of 5.5 and only 50% of ASD participants passed the task at the verbal mental age of 9 years. These results indicate that ToM development may be present in some individuals with ASD, but it is significantly delayed relative to typically developing peers.

### *Assessment of Social Intelligence*

Relative to academic intelligence, the assessment of social intelligence is still in its early stages (Semrud-Clikeman, 2007). Dozens of assessment tools of varying levels of utility and quality have been developed for measuring social intelligence (for a comprehensive review see Semrud-Clikeman, 2007). There is currently no “gold standard” measure of social intelligence. As such, within a clinical setting, information about social skills and social thinking can be derived from number of sources, many of which would already be included in an assessment of ASD, including: general psychopathology screeners, ASD diagnostic screeners, school and clinical observations, and interviews regarding development, adaptive level, and ASD symptoms. Well-established rating scales of general social, emotional, and behavioural problems and competencies, such as the Childhood Behaviour Checklist (Achenbach, 1991) and the Behavior Assessment Scale for Children (Reynolds, & Kamphaus, 2004), include scales of social problems and social competence and can be completed by teachers, parents, and the child. ASD symptom screeners, such as the Social Communication Questionnaire (Rutter, Bailey, & Lord, 2003) and the Social Responsiveness Scale (Costantino & Gruber, 2005) will provide information about social deficits. Observational measures used in making an ASD diagnosis, such as the Childhood Autism Rating Scale (Schopler, Reichler, & Renner, 1992) and the Autism Diagnostic Observation Schedule (Lord, Rutter, DiLavore, & Risi, 2002) provide information about current social behaviour. Measures of adaptive functioning, such as the Adaptive Behavior Assessment System (Harrison, & Oakland, 2003) and the Vineland-II (Sparrow, Cicchetti, & Balla, 2005), provide information about social adaptive functioning skills, and the Autism Diagnostic Interview-Revised (Lord, Rutter, & LeCouteur, 2003), an interview measure used to assess ASD symptomatology, also has sections to inquire about social deficits.



Several rating scales and tasks, have been developed to specifically assess social cognition and skills. According to Semrud-Clikeman (2007), overall reliability and validity coefficients of these measures ranges from .50 -.80, which is lower than the generally accepted .80. The review states that the psychometric properties of these assessment tools, overall, is comparable to those used to assess personality, but are not at the level that would suggest that they have “good” psychometric properties. Some of these measures are reviewed below; they were selected based on popularity in the field, psychometric properties, and clinical utility.

### *Rating Scales*

The Social Skills Rating System (SSRS; Gresham & Elliott, 1990) is a widely-used standardized questionnaire used to evaluate social skills (empathy, self-control, assertiveness, responsibility, and cooperation), problem behaviours (internalizing, externalizing, hyperactivity), and academic competence. There are parent, teacher and child rating versions and it can be used with children and adolescents age 3-18 years. The authors report strong internal consistency and test-retest reliability scores are acceptable (correlations for total scores ranging from .67-.87). The SSRS has been used with individuals with ASD by several researchers and differences been shown between individuals with ASD and typically developing comparison groups (e.g. Macintosh & Dissanayake, 2006), however, the measure has not been norm-referenced on an ASD population.

### *Direct Task-based Measures*

The NEPSY II (Korkman, Kirk, & Kemp, Sally, 2007) a commonly-used standardized test of neuropsychological functioning in children and adolescents (ages 3-16). It contains a Social Perception subscale, which consists of a Theory of Mind task, which requires the child to make inferences about characters' thoughts and feelings based on descriptions or pictures of experiences,

and an Affect Recognition task, which requires the child to identify affect in pictures. The NEPSY II has a strong theoretical and empirical foundation, a large and representative standardization group, and strong psychometric properties (D'Amato & Titley, 2010; Napolitano, 2010). Furthermore, the manual presents data on individuals with ASD. While this measure is useful for assessing social perception abilities in individuals with average or above average levels of cognitive functioning, it requires an elaborated verbal response, thus it would not be useful for non-verbal or lower cognitive functioning individuals with ASD.

The Diagnostic Analysis of Nonverbal Accuracy (DANVA 2; Nowicki, 2000) assesses the individual's ability to interpret a range of emotions of varying intensities based on facial expression and paralinguistic cues. Subtests include: Child Facial Expression, Adult Facial Expression, Child Paralanguage, and Adult Paralanguage. The authors report achieving construct validity from a series of studies (Nowicki, 1997). They also report internal consistency, with an average coefficient alpha across 10 studies at .78 (Nowicki, 1997). Higher scores have been found to be significantly correlated with higher teacher-rated social competence (Collins, 1996; Maxim & Nowicki, 1996; Nowicki & Mitchell, 1998).

### *Summary*

From the research reviewed, several recommendations can be made regarding the assessment of social intelligence. It is important to assess both cognitive and behavioural components of social intelligence. In addition, Semrud-Clikeman (2007) recommends obtaining observations of the person in structured and unstructured situations. Probably the most important recommendation is that multiple informants should be used when using interviews or rating scales to get an accurate estimate of a person's social intelligence. In particular, Semrud-Clikeman (2007) recommends including teacher and peer assessments when possible because behaviour is likely to vary depending on the environment. She notes that some researchers

indicates good agreement between parent and teacher assessment of social competence, while others have found that they do not. Galloway and Porath (1997) note a similarity between parents' and teachers' ratings of social skills overall and that differences appear at the level of specific types of social skills. A meta-analysis revealed that the greatest agreement between social skills ratings across informants was between teachers and peers (Renk & Phares, 2004). Peers may be the best source for information regarding social competence because they observe children in the school context continuously, beyond the scope of what the teacher observes (Greener & Crick, 1999; Semrud-Clikeman, 2007). In addition, peers may have the opportunity to observe each other on the playground and in social situations outside of school. Finally, peers are the most likely to understand the culturally determined expectations for social acceptance and popularity within their own cohort. However, there may be ethical and logistical constraints on using peer reports in the clinical setting, leading to a research conundrum. On the one hand, reliance solely on self-report is not advisable, as social desirability is likely to impact self-ratings (Semrud-Clikeman, 2007). Individuals have a tendency to overestimate positive and underestimate negative social behaviour (Eisenberg & Mussen, 1989). Furthermore, low correlations have been found between self and peer ratings of social intelligence (Brown & Anthony, 1990; Greener, 2000). As a result, clear theoretical or clinical rationale should determine who rates an individual's social skills, and the limitations of each approach should be acknowledged in making the decision.

### *Interventions*

Several evidence-based therapy and educational programs have emerged to aid in the development of social skills in children and adolescents (Brooks, 2006; Gresham, 2002; Griffin, Botvin, Nichols, & Doyle, 2003; Katz, McClellan, Fuller, & Walz, 1995; Masten, 1994; for a

review of techniques see Semrud-Clikeman, 2007). Variations in research methodology, target skills, treatment settings and assessment tools make the evaluation of effectiveness findings difficult (Cotugno, 2009). In general, improvements have been observed (Hwang & Hughes, 2000; McConnell, 2002; Rogers, 2000; Turner-Brown et al., 2008), but generalization of acquired skills in the real-world tends to be problematic (Turner-Brown, et al., 2008).

Interventions that aim to improve these skills in individuals with ASD show a similar pattern of results (Bauminger, 2002, 2007; Gevers, Clifford, Mager, & Boer, 2006; Hadwin, Baron-Cohen, Howlin, & Hill, 1997; Ozonoff & Miller 1995). Techniques used within this population include cognitive behavior therapy, behavioural therapy, parent training, video modeling, and peer modeling to teach a range of social cognitive and social interaction skills. Volkmar and colleagues (2004) encourage the combination of techniques to support the development of social skills in individuals with ASD, although the effectiveness of most still needs to be demonstrated.

### *Conclusion*

The research reviewed in this paper documents the development of the construct of social intelligence. An operational definition of social intelligence must include cognitive and behavioural effectiveness components. It must also incorporate understanding of self and other's feelings, thoughts, and behaviours. When defined this way, social intelligence is distinct from, but related to academic intelligence. The impact of social intelligence on life outcomes provides evidence that the development of social intelligence is of critical importance in human development. Social intelligence has been linked to a variety of outcomes, including social adjustment, the development of psychopathology, school readiness, academic and workplace

success, and interpersonal relationships. Numerous components of social intelligence are impacted in individuals with ASD, with significant impact on their lives. It is imperative that a variety of elements of social intelligence be assessed in individuals with ASD, and that these elements are used in monitoring and evaluating treatment efficacy. Task-based measures of social cognition and behaviour need to be developed for use with individuals with ASD with limited language abilities, as the current measures require verbal responses and fairly high levels of cognitive ability. Several intervention techniques have been developed and show promising results, however, continued research efforts are needed for the development, improvement and evaluation of these intervention techniques. Intervention is needed to support the development of social intelligence in individuals with ASD. It is essential that social skills be considered an essential target in treatment planning of all individuals with ASD as these skills are critical for their success.

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