

## Autism and the Cognitive Processing Triad: A Case for Revising the Criteria in the *Diagnostic and Statistical Manual*

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**TOPIC:** The next iteration of the *Diagnostic and Statistical Manual of Mental Disorders* is due for release in May 2013. The current diagnostic criteria for autism are based on a behavioral triad of impairment, which has been helpful for diagnosis and identifying the need for intervention, but is not useful with regard to developing interventions. Revised diagnostic criteria are needed to better inform research and therapeutic intervention.

**PURPOSE:** This article examines the research underpinning the behavioral triad of impairment to consider alternative explanations and a more useful framing for diagnosis and intervention.

**SOURCES:** Contemporary research and literature on autism were used in this study.

**CONCLUSIONS:** It is proposed that the cognitive processing triad of impaired abstraction, impaired theory of mind, and impaired linguistic processing become the triad of impairment for autism in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders*. These are investigable at the diagnostic level and can usefully inform intervention. Further, in addressing the debate on whether restrictive and repetitive behavior should remain central to diagnosis or be replaced by a deficit in imagination, the authors argue that both behavioral manifestations are underpinned by impaired abstraction.

### Autism, the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)*, and the Behavioral Triad of Impairment

Autism is diagnosed as a probabilistic statement based on the presence of a triad of impairment at a significant enough level to disturb social and occupational functioning. The identification of the triad of impaired social skills, impaired communication, and restricted and repetitive activities, interests, and behaviors was a revolution in understanding that promoted international recognition of autism. It built on the pioneering work of Leo Kanner on autistic disturbances of affective contact and Hans Asperger on autistic psychopathy. Although Kanner described his sample as largely intelligent (Kanner, 1943), over the years the quest for diagnostic certainty saw a retraction in diagnosis to the point of inclusion, largely only

of those with a significant comorbid intellectual disability. However, it was clear that those with average and higher intelligence also exhibited significant features of the triad of impairment, and terms such as high-functioning autism got traction as people attempted to recognize autism and distinguish between different levels of function.

This problem was solved to a degree with the introduction of Asperger's disorder into the *DSM-IV* (American Psychiatric Association, 1994). The creation of the construct of Asperger's disorder allowed a broadening of clinician recognition and diagnosis of autism, and a shift in the general understanding of what autism is. This coincided with the widely publicized alarm regarding the rising prevalence of autism. Autism prevalence estimates typically range between 0.6% and 1.6% of the world's population (Baron-Cohen et al., 2009; Barry, 1997; Centers for Disease Control and Prevention, 2007a, 2007b; MacDermott, Williams, Ridley,

Glasson, & Wray, 2007). However, a recent study involving a total population sample of South Korean children identified a prevalence rate as high as 2.64% (Kim et al., 2011). Notably, though, prospective studies appear to produce higher rates than those relying on retrospective data.

The inclusion of Asperger's disorder in the *DSM-IV* served the important purpose of focusing attention on the core of autism in terms of the behavioral triad of impairment and its full expression. However, a conundrum arose when it became clear that in adhering to the diagnostic criteria—without being restricted to the internalized assumed criteria regarding intelligence—no one could receive the diagnosis of Asperger's disorder (Cashin, 2006). While many studies that have been published aimed at determining the difference between autistic disorder and Asperger's disorder, they are scientifically flawed in that each needed to change the diagnostic criteria to allow allocation to either the Asperger's disorder group or the autistic disorder group. There were many variations on how this was done. A common finding was that when those with high cognitive ability were assigned to the Asperger's disorder group, relative to those assigned to the autistic disorder group, those in the Asperger's group were unsurprisingly determined to be higher functioning (Cashin, 2006). However, the *DSM* multiaxial system accommodates recording of what we now recognize as the comorbidity of intellectual delay (American Psychiatric Association, 2000).

Language acquisition can be seen, at first glance, as a distinguishing feature between autistic disorder and Asperger's disorder. Kanner first recognized the variability in language of those with autism in his original article (Kanner, 1943). This variability can range from mutism in a small percentage of people (Lord, Risi, & Pickles, 2004) to hyperlexia (Newman et al., 2007). While early language delay is a differentiating diagnostic factor between autistic disorder and Asperger's disorder, the time of language acquisition has not been found to correlate with later capability. For example, a comparison between 34 adults with high-functioning autism and 42 adults with Asperger's disorder, all with nonverbal IQs greater than 70, found both groups to have comparable language abilities even though language ability was below chronological age level (Howlin, 2003). No significant differences in communication outcomes were identified, and language comprehension and expression were comparable despite those in the Asperger's group being reported not to have had an early language delay (Howlin, 2003). Therefore, the time of language acquisition has not shown utility as a diagnostic factor. It appears likely in the next edition of the *DSM*, due for release in 2013, that we will have a unified autism diagnosis (Wing, Gould, & Gillberg, 2011). Terms such as high-functioning autism and Asperger's disorder will become historical entities that mark the progress in our understanding of autism. It would seem likely that in the new diagnostic

approach, the triad will remain central. However, debate as to the relative merit of the current constructs within the triad continues (Wing et al., 2010).

### Causation

No biological cause for autism has been identified, nor any physiological variance that could serve a diagnostic function. It would appear that as a behavioral construct, autism may be heterogeneous in its causes and there may be many paths to the same gene-brain/cognitive-behavior pathways (Viding & Blakemore, 2007). Some authors argue that it may be more sensible to look at the causes of each point of the triad individually to begin to approach an understanding of structural variance present in those with autism (Ferstl & Cramon, 2002). The problem is not autism specific and arises because our understanding of the brain remains gross, with a great deal of overlap in our understanding of the brain areas involved in the processing of information. As an example, there is no obvious distinction in the brain area involved in social information processing, language, and evaluative judgment. It would appear from a study of a small sample of nine adults, using magnetic resonance imaging (MRI) technology, that the frontomedian cortex is particularly activated by social information processing tasks (Ferstl & Cramon, 2002). Such research is potentially hampered, or confounded, by the coexisting presence of anxiety, as anxiety potentially causes activation of the brain and changes in neurotransmitters (Burnette et al., 2005).

The brain remains an area of science under development. The problem of development is not just related to current technology but is exacerbated by our inability to remove the brain, attach electrodes, and successfully put it back or alternatively use invasive investigation techniques. All brain research needs to remain noninvasive. Scanning holds promise. A theory of underconnectivity and variance in cortical features in autism has an emerging evidence base, but there are discrepancies between individuals. Thus, it is far from conclusive and not yet ready to integrate into diagnostic processes (Ecker et al., 2010; Just, Cherkassky, Keller, Kana, & Minshew, 2006). With regard to extrapolating a possible cause from a treatment, no curative treatment has evolved for autism. As summed up by Berney, "as in 19th century exploration well mapped areas are outweighed by the unknown from which emerge traveller's tales of strange practices and exotic cures" (Berney, 2000, p. 24). No drugs have been established in their efficacy beyond providing palliation from anxiety and coexisting depression.

### Toward a Cognitive Triad of Impairment

The notion of the whole being greater than the sum of the parts is true with regard to the impairment of autism, in that it

is the combined arms of the triad that causes global difference in function and disability in a neurotypical society. Nonetheless, the interrelated nature of communication and social skills would appear to be domains worth unpacking. While Wing et al. (2010) contested the utility of restricted and repetitive interests, activities, and behavior; we argue that overregulation is central in autism and perhaps even causal of the other two points of the triad (Cashin & Waters, 2006). What is currently unchallenged is that there is a great degree of variance in individual presentation and that terms such as mild, moderate, or severe autism are meaningless. Behavioral presentation is dependent on the person's environmental context and emotional state. A person with autism who is stressed by novelty will appear much more impaired than when comfortable in familiar surrounds and routine (Cashin, 2005). In other words, when under stress, impairment may appear severe as opposed to perhaps moderate when less stressed. What is often mistakenly labeled as the level of autism is actually the associated or comorbid intellectual disability. Thus, the labeling of the degree of impairment relates not to the autism, but rather to the level of intellectual disability.

While behavior varies relative to context, what remains constant is the underlying information processing and thinking style of people with autism. We argue that the real triad of impairment, and perhaps the basis for revision of the new diagnostic system, is the cognitive processing triad of impairment in autism (Cashin & Barker, 2009). This triad consists of impaired abstraction, impaired theory of mind, and impaired linguistic processing (a relative strength in visual as opposed to linguistic processing). In addition to facilitating diagnosis, this triad offers a basis for consistent measurement in research (Newman, Cashin, & Waters, 2010), and a clear framework for teaching and in therapeutic interventions, such as cognitive behavioral therapy (Wood et al., 2009) and narrative therapy (Cashin, 2008).

## Abstraction

Impaired abstraction is a recognizable trait in people with autism. Unlike their neurotypical counterparts, people with autism are not blessed with the great gift of abstraction written of by Aristotle (Gadamer, 1966/1976). It is widely known that people with autism have a deficit in this thinking domain (Scott, Clark, & Brody, 2000). This explains behaviors that follow literal or black and white thinking, such as why students with autism are want to bend down and comply when told to "pull up your socks," as opposed to taking the demand to refer to general behavior improvement (this is also partly attributable to a theory of mind deficit). In terms of abstraction, the implications run deep. It is abstraction that allows the development of a unified base of knowledge about the world. The formation of thinking schemata and engrams

relies on a thinking ability to generalize (Ogden & Richards, 1952). Without abstraction, a more eidetic or documentary style of memory and thinking formation occurs (Sacks, 1995). Memories and information are not self-referential (Crane & Goddard, 2008). Without reference to a developing and constantly evolving worldview, there is no basis of orientation from which to draw when confronted with novel situations. Unless enough of a cue has been presented to elicit information on how to proceed, the person with autism can be left daunted. Abstraction is testable and situations can easily be constructed within a diagnostic environment to observe the behavioral sequelae. This could form one arm of the next evolution of the triad.

Abstraction is the ability to orientate information within a worldview; with reference to other memories, information, and people. Several frameworks have historically been used to explain abstraction difficulties faced by people with autism, including executive function theory (Ozonoff, 1995), Central Coherence Theory (Shah & Frith, 1993), and complex information processing difficulties (proposed by Minshew, Goldstein, & Siegel, 1997). While this confusion of nomenclature has limited theoretical development, studies have consistently suggested a cognitive deficit underpinning autism (Jarrold, Butler, Cottington, & Jimenez, 2000; Morgan, Maybery, & Durkin, 2003).

The need of people with autism for sameness and their demonstration of stereotypical behaviors were highlighted by Adrien et al. (1995), based on a summary of earlier research. Their study compared children with autism with those with impaired intellectual ability to measure differences in behavior regulation when solving a cognitive problem. While the study had some shortcomings (e.g., it was limited to children with low developmental ages), the findings showed that children with autism had more difficulties than the comparison group in performing tasks and regulating behavior when the degree of abstraction was high.

Other studies have also provided insight into the lack of abstraction experienced by people with autism. Minshew, Meyer, and Goldstein (2002) found evidence that people with autism, without a comorbid learning difficulty, had limited abstraction abilities specifically related to difficulties integrating concept identification and concept formation. McKenzie, Evans, and Handley (2010), in a series of three experiments, found that adolescents with autism could not easily and instinctively contextualize presented material compared with the typical adolescent population. While not resonating with some research on weak central coherence, they were in line with Minshew et al.'s (1997) complex information processing descriptions, significantly assuming that incoming information needs a contextual framework in order to create concepts, and for processing (McKenzie et al., 2010; Minshew et al., 1997; Williams, Goldstein, & Minshew, 2006). Williams et al. (2006) administered clinical memory tests to high-

functioning children with autism and an equivalent control group without autism. Their findings supported Boucher's (1981) proposal that children who have autism are unable to obtain the "whole picture" from presented information. Williams et al. (2006) suggested that the measured differences in memory function could limit the ability of children with autism to subsequently organize all the information presented to them on a daily basis and lead to bewilderment and confusion.

Not only has research established that past memory ability is impaired in people with autism, but Lind and Bowler (2010) also found evidence to suggest that future memory, some might say imagination, is affected. This study provides a basis for examining further episodic future thinking. The authors conclude that episodic memory (past and future) may well be based on a dysfunctional neurocognitive system. A more recent study into memory functioning in children and adolescents with autism by Southwick et al. (2011) echoed these findings, concluding that episodic memory in people with autism is diminished, with the most likely reason being ineffective cognitive processing strategies.

These findings consistently point to a cognitive rather than behavioral triad to diagnose autism and specifically suggest that abstraction could be one arm of the next evolution of the triad. As our society is based on the ability of people to engage socially and have the ability to categorize experiences, the differences or deficits in abstraction (and theory of mind) can cause a person with autism to experience frequent anxiety (Cashin & Waters, 2006; Estes Dawson, Sterling, & Munson, 2007; Leyfer et al., 2006). Without reference to a developing and constantly evolving worldview, there is no basis of orientation from which to draw when confronted with new situations. The person then prefers to rely on routine and familiarity, rejecting new opportunities, to lessen anxiety (Attwood, 2001; Cashin & Waters, 2006; Williams, 1992). As people with autism often present stereotyped recurring behavioral patterns (American Psychiatric Association, 2000), can we assume that new, anxiety-inducing situations cause overregulated behaviors?

The role of restricted and repetitive behaviors (RRBs) in the diagnosis of autism is under question (Bishop & Lord, 2010). However, as RRBs are currently central to a diagnosis of autism, it is imperative that we understand the cause of these, especially as their occurrence and severity vary considerably across the autistic spectrum. Leekham, Prior, and Uljarevic (2011) undertook a review of the last 10 years of research into RRBs. The research is fragmented, spanning several disciplines with a focus on empirical work rather than theoretical justification. The review found that RRBs have a combination of causes and triggers, which include: anxiety and communication problems, lack of stimulation, learned stereotypes, and internal biological triggers. Of these triggers, anxiety is increasingly highlighted; however, further research

is critical to understand how the causes and triggers relate to each other and what their significance is in the diagnosis and treatment of autism (Leekham et al., 2011)

The authors of this article support the proposal that anxiety is a major factor in RRBs and suggest that a lack of abstraction sits below repetitive and restricted interests and activities as well as behaviors such as ticks and obsessions. Mothers of children who have autism identified that new situations increase the level of vigilance required in order to mitigate adverse or obsessive behaviors (Larson, 2010).

Without abstraction, people find it difficult to relate new situations to existing knowledge. This means that new experiences can confound a person and leave them intellectually paralyzed and unable to proceed, or stressed and anxious. In other words, impaired abstraction means that sameness and predictability are needed to manage on a day-to-day basis. This has been described as a lack of imagination (Gould, 1982; Wing, 1981; Wing & Gould, 1979); however, we are proposing that what has traditionally been seen as a lack of imagination is actually a lack of abstraction.

## Theory of Mind

The second arm to the cognitive processing triad of impairment is theory of mind, a concept popularized in autism as related to impaired social skills. Jarrold et al. (2000) carried out three experiments to investigate whether weak central coherence and theory of mind were related. The experiments suggested "that poorer theory-of-mind ability is associated with a weaker drive for central coherence, and vice versa" (Jarrold et al., 2000, p. 126). As weak central coherence, or impaired abstraction, means a person has difficulty in taking the global perspective, it could be suggested that this also means that impaired abstraction is clearly linked to impaired theory of mind. If a lack of abstraction underpins overregulated behaviors, which restrict the ability to function, then this again could relate to difficulties in fully developing theory of mind.

The concept of mind has exercised philosophers in the Eastern and Western traditions for centuries. Gadamer wrote of understanding the world in a self-referential manner that involves guessing the perspective of others based on one's own worldview (Gadamer, 2003). Other people's minds are an intentional category, in that intentionality signifies the ability to attend to and take notice of others (Lauer, 1967). The basic notion is that if I have a mind, so must others and although they are different, guesses can be made about the workings and experiences of others' minds, with communication giving clues. Thus, the theory of mind deficit is strongly enmeshed with communication and social skills (Cashin, 2005). In individuals with autism, the theory of mind characteristic varies, and may fluctuate with a decline

into an anxious state. It is testable with projection tests such as the Thematic Apperception Test.

Clues to an individual's theory of mind and abstraction ability can be identified when looking at vocabulary. Children and young people with autism have a relative strength in naming words. However, these words are more often related to objects as opposed to internal feeling states. While people with autism have been found to score well on standardized vocabulary tests (Kjelgaard & Tager-Flusberg, 2001), their use of words that are not concrete descriptors, such as those that relate to cognitive states (e.g., remember, think), and metaphorical or slang words, are underrepresented in their vocabularies (Dennis, Lazenby, & Lockyer, 2001; Tager-Flusberg, Paul, & Lord, 2005). It is these abstract words, or inferences, that are used to elaborate on, and attribute meaning to, verbal communication and therefore form the basis of successful communication (Dennis et al., 2001).

### Linguistic Processing

The third arm of the proposed cognitive processing triad relates to linguistic processing. The application and knowledge of language can be absorbed by people with autism in an eidetic way and learnt in a linear fashion due to its rule-based domain. However, the application of language in meaningful communication requires gestalt processing where the person makes sense of what is being said in the context of judgments made about the speaker's thoughts and feelings. The relative success of people with autism in the application of language, represented by vocabulary, pronunciation, and syntax use, may account for the less severely impaired *expressive* language abilities in comparison with *receptive* language abilities identified in research findings. A recent U.K. study of 152 children diagnosed with autism, aged between 24 and 59 months, found greater impairment in receptive compared with expressive language skills using direct assessment and parental report measures (Hudry et al., 2010).

Significant impairments in receptive language ability have been identified in both children and adults with autism. Paul (1987, p. 77) described the difference in the development of expressive versus receptive language in those with autism: "The autistic child who eventually masters the verbal system can, to some extent, be seen as developing syntactic and phonological systems that fail to 'hook up' with their semantic/pragmatic counterparts." People with autism have been found to have difficulty with semantics; that is, the domain of language that requires an abstract ability to recognize that there may be several meanings to concepts and to process these in context. In a study examining language used by 40 individuals with autism compared with 40 individuals without autism, increased use of neologisms and idiosyncratic language, and use of words that had no semantic similarity to the intended word, were found in those with autism (Volden & Lord,

1991). Such semantic errors may account for the overliteral language use characteristic of autism.

The seminal works of Temple Grandin allow an insider view of thinking in pictures (Grandin, 1995). MRI studies have since supported the notion of visual as opposed to linguistic processing (Kana, Keller, Cherkassky, Minshew, & Just, 2006). For many years, visual supports have been used to promote learning and adaptation (Scott et al., 2000). Studies have looked at the relative balance of visual and verbal information as supporting semantics. An advantage of pictures over words in accessing semantics for those with autism was found in a Japanese study of 20 adolescents and adults with high-functioning autism compared with 20 matched controls (Kamio & Toichi, 2000). It was found that the group with autism performed significantly better on picture-word completion tasks than on word-word completion tasks, supporting the notion that people with autism process thoughts through a pictorial semantic system. An examination of brain function using functional MRI provides further evidence that people with autism support language comprehension through a reliance on visualization (Kana et al., 2006). Neurologist Oliver Sacks (1986) captured the visual cognitive processing style of those with autism when he wrote about twins with autism who had a savant gift with numbers. He observed, "if you ask them how they can hold so much in their minds- a three-hundred-figure digit, or the trillion event of four decades- they say, very simply, 'we see it.' And 'seeing'—'visualising'—of extraordinary intensity, limitless range, and perfect fidelity, seems to be key to this" (Sacks, 1986, p. 199).

This relative strength in visual processing varies from the neurotypical population where thought is based on mentalese, a type of individual language (Pinker, 1997). When combined with abstraction, linguistic processing lends itself to construction of meaning and a unified base of knowledge in a way not facilitated by visual processing. Like the behavioral triad, the cognitive processing triad is heavily interrelated.

### Therapy

There are numerous behavioral programs for children with autism. Recently, a number of different programs have been proposed. Volker and Lopata (2008) summarize these as behavioral interventions, cognitive-behavioral interventions, and psychopharmacological interventions. Despite disagreement about best practice, it is now commonly agreed that with regard to the first two categories of intervention, early intervention produces the most effective outcomes (Attwood, 2001; Grossberg & Seidman, 2006; Sherer & Schreibman, 2005; Volker & Lopata, 2008). With the fear of neuroplasticity ceasing at school age behind us, the principle is the earlier the better, but never too late. To be effective, it is axiomatic that any form of cognitive intervention needs to

make sense to the person with autism, and therefore take into account the information processing style of those with autism. Therapies originally designed to work with neurotypical individuals need to be modified with an understanding of the cognitive processing triad of impairment to be of the most benefit for people with autism.

## Conclusion

The cognitive processing triad of impairment of impaired abstraction, impaired theory of mind, and impaired linguistic processing facilitates a deep understanding of autism. It gives an account of the origins of the behavioral triad and a clear direction to modify therapy and teaching designed for the neurotypical population to work with people who have autism. The debate about whether restrictive and repetitive behaviors should be replaced by impaired imagination is avoided as both are identified as behavioral manifestations of impaired abstraction. We propose that the cognitive processing triad should replace the current behavioral triad in the next iteration of the DSM. The proposed triad represents established traits across the spectrum. This is entirely consistent with the unification of the concept “autism” as a spectrum disorder.

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