



Papers By Yellowbrick Leadership

## **NLD and Asperger's Disorder**

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**Nonverbal Learning Disabilities, Chapter 11, pages 205-218**

Controversy exists as to the relationship between NLD and Asperger's disorder. Some believe that at a minimum, children with Asperger's disorder have NLD but that few children with NLD have Asperger's disorder. An additional confound to diagnostic clarity is introduced by the concept of autistic spectrum disorder (ASDs). This disorder, along with diagnoses of pervasive developmental disorder (PDD) and PDD-NOS (not otherwise specified), blur the distinction between individuals with autism and those with higher-functioning autism, Asperger's Disorder, or NLD. Furthermore, in a critical review of the construct of Asperger's disorder Klin and Volkmar (2003) found that, in their research, investigators have either modified the DSM-IV (American Psychiatric Association, 1994) criteria by treating Asperger's disorder and high functioning autism interchangeably or used altogether different criteria for their definition of the condition. They conclude the nosologic status of AS [Asperger's disorder] is, therefore, extremely problematic, given that studies cannot be necessarily compared because of the adoption of different diagnostic definitions, and there has been no comparison across different diagnostic schemes with regard to the relative usefulness of each of the schemes (p. 8). Finally, confusion exists because the term Asperger's disorder rather than Asperger's disorder is used in many publications (e.g., Klin, 1994; 2004; Volkmar & Klin, 1998, 2000), the terms appear to be interchangeable. In this work, I use the term Asperger's disorder in conformity with the DSM-IV designation (American Psychiatric Association, 1994) except when I refer to investigators who use the term Asperger's syndrome instead.

If differentiations are to be drawn between NLD and Asperger's disorder, they must be made at the level of the three perspectives that we have discussed: the neurobehavioral, the social, and the intrapersonal. Although we may find an overlap among the neuropsychological deficits of both conditions, major demarcations exist between the social features and the intra personal dynamics of each.

We face several obstacles in our effort to differentiate NLD from Asperger's disorder. The first problem relates to the fact that different disciplines use different criteria in making a diagnosis. NLD is a diagnosis made by neuropsychologists but not by psychiatrists. On the other hand, both psychiatrists and neuropsychologists make the diagnosis of Asperger's disorder, which is included in DSM-IV (American Psychiatric Association, 1994). Neuropsychologists and psychiatrists use different theoretical frameworks to arrive at their decisions. Each discipline considers different aspects of children's functioning to be diagnostically significant. Psychiatrists and psychotherapists are often unfamiliar with the diagnosis of NLD. Similarly, neuropsychologists often take little notice of motivational or psychodynamic issues in their assessment of a child's difficulties. Consequently, comparing diagnoses made by different disciplines is fraught with difficulties.

A second problem is fueled by the absence of agreement among researchers as to the core deficits that define each disorder. The issue centers on whether the neuropsychological deficits or the social impairments define the disorder. This viewpoint has led to the suggestion that we create a distinct label, such as SELD (social-emotional learning disability), to distinguish the problems of those children from children who have specific neurocognitive impairments. Current research on the neurobiology of social cognition may provide answers to these diagnostic problems. Borrowing from social and cognitive psychology, neuropsychologists and neurologists rely on constructs such as social cognition to identify domains of psychological function. The issue remains unresolved.

A third problem is that the use of a dimensional approach encourages the blurring of boundaries in an effort to underscore the fact that the children present with heterogeneous symptoms that vary in number, type, age of onset, and severity: The limits of this approach are reached when the dissimilarity between specific phenotypes raises questions as to whether two disorders belong within the same continuum. The choices as to which set of features is necessary for inclusion within the disorder, the level of severity of the symptoms, the level of cognitive impairment, and the age which the diagnosis is made-all contribute to the inaccuracy of the diagnostic process.

The final obstacle is that of overcoming the limits of the perspective that each discipline brings to the diagnostic process. In this work I have advocated the use of multiple perspectives that are integrated to provide a

developmental viewpoint that specifies the way in which each child's mental processes organize and integrate his or her experiences into a coherent whole.

The question we confront is whether NLD is a disorder that is distinct from Asperger's disorder, with its own social features, or whether it belongs within the autistic spectrum along with Asperger's disorder? I argue that NLD is distinct from Asperger's disorder and does not belong in the autistic spectrum. A further question relates to the construct of SELD, which encompasses many of the developmental deficits currently included under the diagnosis of PDD, and would include NLD. It does not appear wise to dismiss that construct at this time because researchers have not pursued it sufficiently. Eventually, it may have some value in making important differentiations.

### **Asperger's Disorder**

In 1944 Hans Asperger published a paper describing a group of children whom he identified as suffering from "autistic psychopathy." These children closely resembled the children that Kanner (1943) had described earlier in his paper on autism, but with some significant differences. Asperger's work was not introduced to English speakers until Wing wrote about his work in 1981 and suggested the label "Asperger's disorder." Utah Frith eventually translated his original paper in 1991 (Asperger, 1991).

The children that Asperger described did not have the severe language impairments that characterized Kanner's children. The features of the syndrome, which was later given Asperger's name, included peculiarities in gaze, use of gesture, facial expressions, and vocal intonation. He described the children as original or creative in their ideas, and he found them to be accurate observers of other people, although they were also inattentive. Socially, they were capable of purposely hurting others and of generally negativistic and stereotypic behaviors. Their feelings did not match their intellectual level. They could not display affection toward others, and they maintained a distance that seemed to denote an inability to be intimate with others. Among their peculiar behaviors were their obsessions with objects, which they persisted in collecting. Finally, they lacked a sense of humor, having no understanding of jokes (Frith, 1991).

In her landmark contribution to the literature on autistic spectrum disorder, Wing (1988) suggested that "a necessary and sufficient condition for a diagnosis of a disorder in this continuum [autistic spectrum disorder] is an impairment in the development of the ability to engage in reciprocal social interactions" (p. 92). She added that children within the spectrum have social interaction impairments in (1) social recognition (2) social communication, and (3) social imagination and understanding. An additional symptom is that of repetitive patterns of activity. Other psychological functions that are impaired include language (particularly, pragmatic language), motor coordination, responses to sensory stimuli, and cognitive skills. Wing considered the triad of impairments in social recognition, social communication, and imagination to constitute the core deficits in autism and in Asperger's disorder. She concluded that Kanner's and Asperger's syndromes fell within a continuum of children having social impairments, although the profiles of Asperger's children differed from those of Kanner's (Wing, 1991).

### **Neuropsychological Features of NLD and Asperger's Disorder**

Using Rourke's (1989a) profile of assets and deficits in NLD, Volkmar and Klin (1998; Klin, 1994; Klin, Volkmar, Sharrow, Ciechette, & Rourke -1995; Klin & Volkmar, 1997; Klin, Volkmar, 1994; Volkmar, Seibalt Rubin & Bronen, 2000) set out to differentiate Asperger's Syndrome from high-functioning autism (HFA). They found an overlap among some of the neurocognitive features of NLD and Asperger's disorder, but not with HFA. They concluded that Asperger Syndrome and HFA are different disorders. This conclusion left open the nature of the relationship between NLD and Asperger Syndrome, although they had found earlier that children with NLD do not exhibit the full clinical syndrome of Asperger Syndrome (Klin et al., 1995; Klin & Volkmar, 1997).

As we saw, Rourke's (1989a) theory proposed that the children's social behaviors are the product of their primary neuropsychological deficits. He interprets the results of the Klin (Klin-et. al.; 1995) study as indicating that an "overwhelming concordance between AS (Asperger Syndrome) and NLD was obtained" (Rourke & Tsatsanis, 2000, p. 245; see also Gunter, Ghaziuddin, & Ellis, 2002). Rourke and Tsatsanis (2000) state that "a strikingly similar pattern of behavior and adaptive functioning" exists between NLD and Asperger Syndrome (p. 244). They conclude: "[I]t is of note that there is convincing preliminary evidence to indicate a correspondence in the neuropsychological

profiles of the two groups. The pattern of neuropsychological assets and deficits that is manifest in NLD seems also characteristic of AS [Asperger syndrome]" (p. 246).

In several publications Volkmar and Klin, who report on their extensive studies of autism and Asperger's disorder, concur that although the diagnoses of NLD and Asperger's disorder are derived from different disciplines—the former from neuropsychology and the latter from psychiatry—some features of the disorders overlap. In the discussion of a case, Klin states that "Although AS and NLD are not mutually exclusive diagnoses (because they belong to different nosologies or classification systems) they often co-occur" (2004, p. 192). Children with Asperger's disorder have NLD, but many children with NLD do not have Asperger's disorder. Finally, their Klin and Volkmar's (2003) review of current research leads them to conclude that "the state of discussions of the nosologic status of AS is . . . problematic, given that studies cannot be necessarily compared because of the adoption of different diagnostic definitions, and there has been no comparison across different diagnostic schemes with regard to the relative usefulness of each of the schemes" pp. 7-8). Given the absence of clarity in the features that might characterize Asperger's disorder, the issue of its relationships to NLD presents difficult challenges.

It appears to me that the greatest overlap in symptomatology between NLD and Asperger's disorder lies in the neuropsychological deficits. Both groups of children have deficits in nonlinguistic perception and tend to have executive function difficulties. Were we to limit ourselves to this perspective in making a differentiation, we would find it difficult to demarcate the two disorders. This is not the case for the other two perspectives, the social and intra personal.

### **Social Features of NLD and Asperger's Disorder**

Some researchers who focused their attention on the differentiation between Asperger's disorder and autism investigated the domain of social functioning. Ozonoff (Ozonoff, Rogers, & Pennington, 1991) and her associates found a basis for making a distinction between Asperger's disorder and high-functioning autism in the responses each group gave to theory-of-mind and executive function tasks. The latter group consistently performed more poorly than the former on those tasks. A defining feature of ASDs and Asperger's disorder for Pennington (1991) is the children's problems in social cognition. Children with social cognition problems present with difficulties in making social contact and understanding social contexts. Secondary problems for these children include pragmatic language problems, echolalia, stereotypies, and deficits in symbolic play. He suggests that children with autism have specific problems in the area of intersubjectivity, which he seems to equate with theory-of-mind functioning. Similar deficits may also be present in children with Asperger's disorder. The latter children have executive function difficulties, which suggest to him that the frontal lobes may be uniquely important in social and cognitive behaviors.

Although Pennington (1991) make a strong case for autism as associated with a deficit in social functioning and for the dissociability of social deficits and cognitive impairments, it is not clear that children with NLD belong within the autistic spectrum—although they too have similar, but not as severe, social impairments. An approach to resolving this issue is to contrast the social impairments of the two groups of children. Testing whether they are successful in passing the false-belief task would provide one source of data for making a differentiation. Two studies (Siegal et al, 1996; Siegal & Varley, 2002) conducted on young people and adults with Asperger's disorder to determine whether they could pass the false-belief test found that most of them could pass it. However, when asked to explain how they arrived at their answer, they did not use mental-state terms. The absence of these terms indicates that although they may have the capacity for first-order mental representation, they do not have second-order capacities. My clinical data suggest that children with NLDs are capable of forming second-order mental representations. Furthermore, my clinical data suggests that the level of severity of their problems with relevance theory appears to be far greater in children with Asperger's disorder than in children with NLDs. Although children with NLDs fail to contextualize fully their remarks, children with Asperger's disorder appear oblivious to their listeners' interest in the topics of their conversations. The pragmatic language difficulties of children with Asperger's disorder are also of a different order of severity from those of children with NLD.

At the level of reciprocal social interaction, as we have seen, children with NLDs are capable of responding to, and interacting with, others at both the cognitive and affective levels. They are capable of sustaining a meaningful dialogue with others; they can appreciate another person's perspective; and they can engage in conversations that indicate an awareness of others as separate and independent beings. It is my clinical impression that most children with Asperger's disorder do not function at this level of complexity (see also Klin, 2004).

Finally, in the domain of the reception, expression, and processing of emotions, some sharp differences exist with regard to how the children feel about themselves and how they feel about others. In this domain the impairments of children with NLD are far less severe than those of children with Asperger's disorder. In contrast to children with NLDs, the capacity to understand the meanings of some emotional communications seems much more limited in children with Asperger's disorder, as is their ability to communicate about their feeling states.

### **Intrapersonal Features of NLD and Asperger's Disorder**

The differences between the two disorders are most marked in the intrapersonal domain. I alluded earlier to the differences in mindsharing capacities. It is sufficient here to reiterate that children with Asperger's disorder have serious limitations in those capacities. Although they are capable of using language to communicate, their capacities for imaginative play are limited, as is their appreciation of the feelings of others. They may be able to form secure attachments, but those appear based on their desire to have their needs satisfied. These constraints contrast with the capabilities of children with NLDs for language communication and imaginative play, which are limited at times but remain functional.

The sense of self in children with Asperger's disorder lacks cohesion and central coherence, in contrast to children with NLDs who are capable of varying degrees of self-cohesion. The evidence that children with Asperger's disorder can act as independent centers of initiative (see Atwood 1998; Cassidy, 2004; Happe, 1991; Nestic-Vuckovik, 2004) is lacking. These children lack the ability to formulate life goals, to achieve those goals, and to participate in the transactions of their community. Most of all, they lack the ability to develop a coherent self-narrative. They have little sense of their history or of their place in their community. The tragedy of these children is that although they are not as seriously impaired as children with autism, they cannot fit comfortably into a society that demands competence, efficiency, and sophisticated social skills to survive psychologically.

### **NLD Contrasted with DSM-IV Criteria for Asperger's Disorder**

In spite of the doubts cast on the validity of DSM-IV's criteria of Asperger's disorder (Klin & Volkmar, 2003), a comparison of the features of the four subtypes of NLD with the DSM-IV criteria for Asperger's disorder (see Table 11.1) would reveal clear-cut differences. There is little question as to the difference between NLD subtypes I and II, and Asperger Disorder. It is only when we consider children with the types of impairments in social cognition that are found in NLD subtypes III and IV that questions may be raised as to whether they are distinct disorders or lie along a continuum. Perhaps making a differential diagnosis between a severe case of NLD subtype IV and Asperger Disorder would present the greatest challenge. I believe that we would then have to fall back on the clinical impression derived from the assessment of the child's intrapersonal status. The questions would center on whether the capacity for mindsharing confounds the diagnostic picture, whether the desire for isolation is defensive or essential to the child, whether the child's sense of self-cohesion is relatively stable, and finally, whether the child is capable of constructing a coherent self-narrative, with help.

#### **Table 11.1. DSM-IV Criteria for Asperger's Disorder**

A. Qualitative impairment in social interaction, as manifested by at least two of the following:

1. marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
2. failure to develop peer relationships appropriate to development level
3. a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest to other people)
4. lack of social or emotional reciprocity

B. Restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:

1. encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
2. apparently inflexible adherence to specific, nonfunctional routines or rituals

3. stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole body movements)
4. persistent preoccupation with parts of objects.

C. The disturbance causes clinically significant impairment in social, occupation, or other important areas of functioning.

D. There is no clinically significant general delay in language (e.g., single words used by age 2 years, communicative phrases used by age 3 years).

E. There is no clinically significant delay in cognitive development or in the development of age-appropriate self-help skills, adaptive behavior (other than in social interaction), and curiosity about the environment in childhood.

F. Criteria are not met for another specific Pervasive Developmental Disorder or Schizophrenia.

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If we were to contrast the features of severe NLD subtype IV with those of Asperger's Disorder on DSM-IV criteria, we would find that the features listed in item A ("Qualitative impairment in social interaction") of the criteria for Asperger Syndrome are identical to those for autistic disorder and are similar to many of the social impairments that are common in children; with NLD subtype IV. What DSM-IV criteria leave unstated is the level of severity of those features. Taken alone, the criteria in item A would apply to many children with a variety of emotional disturbances who do not belong in the autistic spectrum (e.g., shy children, some children with social phobias or severe anxiety disorders).

The descriptions listed in item B ("restricted repetitive and stereotyped patterns of behavior, interest, and activities") are identical to those listed for autistic disorder in item C ("the disturbance causes clinically significant impairment in social, occupational, or other important areas of functioning"), with the possible exception of item B-1 ("encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus"). These features are uncommon in children with NLDs. However, because the criteria state that one feature would be sufficient to diagnose a child with the disorder, we must ask whether the characterization of "encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus" is applicable to children with NLD subtype IV. I would argue that, in my clinical experience, some of the children have demonstrated unusual rote memory, but their interests were not all encompassing, nor were they of such intensity as to interfere with their relationships to others. Neither item B-2 ("apparently inflexible adherence to specific, nonfunctional routines or rituals") nor B-3 ("stereotyped and repetitive motor mannerisms [e.g., hand or finger flapping or twisting, or complex whole-body movements]") applies to children with NLDs.

Regarding item C ("the disturbance causes clinically significant impairment in social, occupational, or other important areas of functioning"), although the children's relationships with others are problematic and at times unsatisfactory, only in the severe cases of subtype IV do these cause "significant impairments ... of functioning." Items D, E, and F would apply to children with NLD subtypes I or II. If applied to NLD Subtypes III or IV, then making a valid differentiation would require more than a simple comparison among the children's symptoms. For each subtype we would need a developmental perspective that traces the path a child takes from birth on. It would also be essential to compare the mental processes that a child uses to organize his or her experience. Finally, the response of the child to clinical interventions is another important diagnostic determinant in that they may confirm or falsify a diagnosis.

We may now draw a sharp contrast between the profiles of children with Asperger's disorder and those with NLDs. From a neurobehavioral perspective, most of the children with NLDs have milder symptoms than those of children with Asperger's disorder. Their nonlinguistic perceptual deficits are not as severe and they may have attentional or executive function problems, but those do not necessarily interfere with their vocational adjustment. From the perspective of social cognition the capacity of children with NLDs for reciprocal social relationships may be impaired but it does not preclude their ability to sustain a relationship with another person. They are capable of a degree of mindsharing functions and have theory of mind abilities, which is not true of children with Asperger's

disorder. The pragmatic language problems of children with NLDs are moderately severe and, at times, can interfere with their ability to communicate, but their strengths in verbal expression can help them compensate for that deficit. In contrast, children with Asperger's disorder have severe pragmatic language problems that often interfere with the possibility of sustaining a meaningful conversation with them. Their communications are centered on topics they wish to discuss, they disregard signals of disinterest from their listeners. Furthermore, their capacity to process affective states is similarly more impaired than that of children with NLDs. For the latter group of children, processing affective states is problematic but for the former group it appears to constitute a foreign language.

Finally, from an intra personal perspective the contrast between the two groups is greatest. Children with Asperger's disorder have critical deficits in theory of mind abilities and in mindsharing capacities. Their sense of self lacks cohesion and they are incapable of providing a coherent self-narrative. Children with NLDs have an unstable sense of self-cohesion but can sustain that sense of cohesion when not under stress and can use the complementary functions that others provide to maintain that cohesion. Their self-narrative have lacunae caused by their deficits and their inability to understand the nature of their disorder. However, they are able to provide a reasonable account of their life stories even though these might be based on the personal meanings they have drawn from their experiences and might not make complete sense to others.

The contrast between the two disorders appears smallest in the severest cases of NLDs (ie., NLD Subtype IV). In those cases, I believe that DSM-IV criteria come to the rescue in making a differentiation. As I described above, many of item B's criteria and those of item C do not apply to children with NLD. Children with NLDs can function independently; they formulate plans and goals to achieve vocationally. With assistance they are able to understand the nature of their deficits and arrive at coherent narratives of the effects those deficits have had on their development. My clinical experience with adults diagnosed with NLDs confirms that impression. Some of these adults have achieved considerably in their chosen careers. They remain in successful relationships, have raised children, and given every indication of being good caretakers and providers. In contrast, adults with Asperger's disorder whom we have treated demonstrate impairments that limit severely both their careers and their relationships with others.

I conclude that NLD and Asperger's disorder are distinct diagnostic disorders.

### **NLD and SELD**

As we have seen, Denckla (1983; 1991) advocated for a separate category called "social-emotional learning disability" (SELD) that is distinct from NLD. I could find no statement in her published work regarding her position on the issue of the relationship between NLD and Asperger's disorder or autistic spectrum disorders.

In an early paper, Voeller (1991) stated that "the core deficit linking AD [autistic disorder], AS [Asperger syndrome], and SELD is impaired social competence. The distinction is based on severity and associated features" (p. 739). A few years later Voeller (1997) noted that "the social deficits seen in SELD can be dissociated from the neuropsychological and academic deficits seen in nonverbal learning disability. A child can have nonverbal learning disability without the array of social deficits and the child with SELD can be quite competent in math and lack the visuoperceptual deficits that characterize nonverbal learning disability" (p. 796). Voeller is proposing two distinct disorders, one of which involves deficits in visual-spatial processing and the other in the ability to process social-emotional information and to make correct inferences about the meaning of social cues. She too suggests that the difficulties in the latter disorder may be related to primary deficits in theory-of-mind functioning. In addition, those children have pragmatic language problems and difficulties judging what is relevant or irrelevant in a given social situation. Finally, at the emotional level, children with SELD can have difficulty with the identification and processing of affects in some instances. Although she suggests that the symptoms of children with SELD can be "mapped onto" the symptoms of children with Asperger's disorder, she stops short of saying that the two are identical. I believe that this is due, in part, to her belief that Asperger's disorder is a psychiatric disorder, found in DSM-IV whereas SELD is a neurobehavioral entity suggested by neurologists and neuropsychologists. The labels are the creations of different disciplines.

In the absence of data from children diagnosed as having SELD, with no Visual-perceptual, visual-spatial, or visual memory problems, we may only speculate as to their social-emotional profile. The hazard of introducing a new label for a disorder is that unless it is followed by research that justifies its introduction, it remains a pure academic exercise. With some justification, Denckla (2000) states:

Little progress has been made since 1993 in the clinical field of socio-emotional learning disabilities .... The clinician, therefore, is limited to recognition of the existence of a type of learning disability, an NVLD [nonverbal learning disability, that is characterized better by what is spared-well-developed linguistic elements, rote verbal memory, basic reading (i.e., decoding) and spelling skills-than by what is deficient. (p. 314)

In a personal communication with Lipton, (February 14, 2005), she suggested that a useful alternative is the creation of a category called social-emotional learning disorders (with the same acronym, SELD). She substitutes the term disorders for disabilities because of the problems associated with considering these disorders as "learning disabilities" rather than neurobehavioral disorders. Such a category focuses on the child's social-emotional functioning. According to Lipton, the criteria used in an evaluation of a child's functioning would include (1) the extent of the child's social interests (desire for age-appropriate, reciprocal peer relationships), (2) the capacity for the comprehension of social-emotional communications, and (3) the ability to give expression to social-emotional behaviors required for effective peer relationships. The children who would be assessed through this algorithm would include all the children (with normal intellectual capacity) who are thought to have developmental brain-based difficulties with sociability and as well as those who fall within the autistic spectrum and children currently diagnosed with NLDs. The rationale for the category is that the symptoms of these children reflect core brain-based deficits in social-emotional cognition.

An advantage of this strategy would be the elimination of the variety of labels currently in use, which only confuses the diagnostic picture. The disadvantage is that, as a dimensional approach to disorders, it would not permit lines of demarcation to be drawn between different disorders. It would assume that the brain mechanisms of such diverse entities as autism and NLD are similar, unless we could specify the brain region in which the impairment that gives rise to the symptoms exists.

In the absence of supporting data, except that of children and adults with right-hemisphere dysfunctions, the differentiation between NLD and SELD leaves open the question as to the differences between the two disorders. If we were to exclude the group of children with visual and visual-spatial deficits from the group diagnosed with NLDs, would the residual group of children be diagnosed with Asperger's disorder or with an autistic spectrum disorder? In their 1997 paper Klin and Volkmar lump together SELD and other right-hemisphere disorders, indicating that eventually the right-hemisphere dysfunction may serve to differentiate among these disorders.

### **Neurobiology of Social Cognition**

Current research on the neurobiology of social behavior and social cognition throws only indirect light on the social impairments of children with NLDs. Most of the research is directed at establishing the linkages between specific brain processes and the representations we have of ourselves, of others, of the interrelationships among others and ourselves and others have among themselves. Major areas of research include the role of the amygdala in social behaviors, the mechanisms that sub serve social and emotional information processing, and the regions involved in the selection of responses to social situations (Adolphs, 2001, 2003a, 2003b; Brothers, 1989, 1996, 1997).<sup>1</sup> A different line of investigation is pursued by researchers who are trying to establish linkages between neurobiology, personality development, and personality disorders (Gabbard, 2005; Grigsby & Stevens, 2000).

Furthermore, current research on the neurobiology of sociality may provide answers to some of the questions raised earlier. The lesson we learned from past research in neurobiology is that there are serious limitations to studies of patients with brain lesions (Amaral, Bauman, Cafetanio, Havenex, Mason, et. al., 2003; Anderson, Bechara, Damasio, Tranel, Denburg, Demasio, 1999; Bar-On, Tranel, Denburg, & Bechara, 2003; Mah, Arnold, & Grafman, 2004). One limitation is that examining something that is broken gives only a rough indication of the function that the broken component plays in the overall system. The strategy may be useful in narrowing the possibilities of the function of that component, because it does tell"

us what functions remain intact, but it fails to alert us to the interconnections between what fails to function and the other components of the system. A second limitation, which is even more relevant to this work, is the limitation imposed by the large gap that exists between the study of a developmental disorder and the study of intact systems that have been subsequently damaged. Developmental disorders follow their own path ontogenetically; they seldom affect discrete sectors of the brain. Often they are diffuse, affecting a broadband of systems. Significantly, during

development such disorders affect how other systems also function, with the result that the symptoms the patients manifest are not simply those of the dysfunction in that region.

The promise of new technologies, such as computed tomography (CT) and functional magnetic resonance imaging (fMRI), is that these less intrusive methodologies can provide a more comprehensive understanding of what occurs in the brains of our children. This more comprehensive understanding will inevitably expose the greater complexity of the disorders—a complexity perhaps of a higher order than we currently imagine.

### **Conclusion**

A close comparison of the features of NLD and Asperger's Disorder along three different perspectives demonstrates that they are different disorders with different developmental trajectories driven by different constraints. Asperger's Disorder appears to include some of the social features of NLD, although NLD does not share many of its features with Asperger's Disorder. Even if we consider the shared features, there appears to be little basis for considering the two entities as part of a continuum of disorders. There are clear demarcations between the two. The fact that questions exist as to the viability of Asperger's Disorder as a separate diagnostic entity is a complicating factor in making the differentiation.

The proposal of a separate label, SELD, for the entire class of disorders is an interesting one. By assuming that a set of brain functions undergirds all social--cognitive functions, it promises to provide a basis for establishing a continuum of disorders. We must await further research to substantiate this proposal. Even then, the SELD conceptualization may not answer the question regarding the distinctiveness of the disorders.

<sup>1</sup>Cozolino (2002) believes that there does not appear to be a unitary module for social cognition within the brain; rather, there are a number of domains of sensory, cognitive, and emotional information processing that come together during normal development that result in social intelligence.