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## The Autistic Mind

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This chapter focuses on two main issues: the processing and encoding of incoming information, and emotion and thought in autism. Although I refer to research findings, much of what I say comes from personal accounts (published and not) and from my clinical experience with adolescents and adults with autism. My thesis is that attention, when focused, is overly narrow; that this has major implications for how information is perceived, processed, and encoded in memory; and that emotion is connected to thought but with limited self-awareness. Throughout, I use the term *autism* to refer to the disorder of all those who, in varying degrees, fall on the autistic spectrum. However, the extent to which my arguments might apply to particular individuals will vary with both their cognitive status and the severity of autism.

### Processing and Encoding of Information in Autism

The mind has been likened to a “filing system” consisting of multiple filing cabinets in which incoming information is organized. Waleski (personal communication, October 1997) extended this metaphor to people with autism, arguing that in them, minds are distinguished by two unique features. First, an obstruction exists between the senses and the mind, or, put somewhat differently, the door to the outside (sensory) world is blocked. Implied here is that incoming information may be incomplete or otherwise distorted. Second, information is stored in separate rather than conceptually or semantically related folders, thus resulting in precision at the expense of categorization and generalization. From the first, namely, that in autism, the senses obstruct the mind, I argue that hypersensitivity to sensory input results in states of overarousal and the adoption of an overly narrow beam of attention. Further, this narrowly focused attention is associated with acute perception, an analytical-computational and sequential

approach to processing information, and a precise but context-dependent memory system. Below I elaborate on each in turn.

Evidence suggests that in autism, the physical or perceptual world has an unusually strong pull. It is as if sensory information is too salient. Speech, for example, may be perceived as overly distinct phonemes rather than segmented into words, which (unlike phonemes) denote meaning. Anecdotal reports of people with autism implicate a lower threshold for perceiving sounds (e.g., a train in the far distance; Cesaroni and Garber, 1991) or visual phenomenon (e.g., particles in the air; Williams, 1992), and underscore that various forms of sensory stimulation may be experienced as unusually intense or even painful (Grandin, 1986). Hypersensitivity to sensory stimulation, whether novel, unpredictable, or otherwise experienced as intense or disturbing, may induce a state of overarousal (cf. Dawson and Lewy, 1989), such that the mind is obstructed by the senses, and information uptake is incomplete or even distorted. In an attempt to offset states of overarousal, information uptake may be further restricted by the adoption of an overly narrow focus of attention (cf. Zentall and Zentall, 1983).

Consistent with such claims, empirical findings have been taken as evidence of “tunnel vision” (Rincover and Ducharme, 1987) or of a narrow beam or “spotlight” of attention in autism (Bryson et al., 2004; Landry and Bryson, 2004). Even under relatively benign viewing conditions, people with autism have marked difficulty disengaging attention from one stimulus or event and moving it elsewhere: they remain “stuck” on one of two competing stimuli (Bryson et al., 2004; Landry and Bryson, 2004). Indeed, failure to respond to their names, once absorbed or focused on a particular activity, is one of the best early indicators of autism (Robins et al., 2001). Evidence of overly focused attention also comes from studies of visual discrimination learning, in which people with autism tend to respond to only one of multiple stimulus dimensions (e.g., color versus form; Rincover and Ducharme, 1987). Such effects have been found to distinguish autism when the (spatial) distance between stimulus dimensions is increased, thus underscoring that the beam of attention is unusually narrow.

One implication of a narrow beam of attention is that incoming information will be perceived as brighter or louder, or as otherwise more salient. Such heightened perception would contribute even further to the pull of the physical world, and is consistent with anecdotal reports of acute attention to and memory for perceptual detail. As might be expected, evidence indicates that people with autism are actually superior to the norm at detecting a figure embedded in a complex visual display (Shah and Frith, 1983). The same is the case on complex visual search tasks requiring the detection of an anomalous feature (O’Riordan et al., 2001; also see Bonnel et al., 2003, for evidence of superior auditory dis-

crimination). This enhanced perception in autism suggests that the mental representations or memory codes for patterns or objects are more readily activated than is normally the case (Brian et al., 2003). In the case of action, this is well exemplified in tasks requiring that objects be used for purposes other than the familiar (e.g., hammering with a toothbrush). People with autism have difficulty inhibiting the well-practiced actions associated with particular familiar objects (Smith and Bryson, 1998).

Overly focused attention in autism appears to be associated with a reliance on an analytical and computational approach to processing incoming information. An analytical (versus holistic, gestalt, or synthetic) processing style is thought to underlie performance on tasks requiring the reconstruction of block designs, on which superior performance has been documented in people with autism (Shah and Frith, 1993). Their approach in these and related tasks (e.g., drawing) appears to be one of building up piece-by-piece to the whole (Sacks, 1995). By contrast, their ability to see or apprehend the whole in the parts from the outset, as required in skillfully assembling puzzle pieces of familiar objects, is less well developed (see Frith, 1989, who argues for the lack of “central coherence” to explain this and related phenomena). People with autism also fail to show the McGurk effect (McGurk and MacDonald, 1976); that is, the tendency for speech perception to be influenced by visual information (for a “d” sound to be perceived as “p” when the mouth makes a “p” movement; Jessel, 1995). Their attention is overly focused on the auditory (versus visual) information, and/or they have difficulty integrating or synthesizing the two sources of information. Several individuals with autism have reported to me that it is easier to follow what others are saying by focusing on their speech rather than looking at them, as if looking actually interferes with an analysis of what is heard.

Interest and talent in such domains as music, languages, mathematics, and computers would also argue for an analytical processing style in autism. Indeed, some individuals are unusually skilled at penetrating the underlying structure or logic of formal or physical systems. One relatively capable person who attended university was described by a professor as having an “uncanny” sense of the syntax (versus semantics) of multiple languages. Similarly, computational skills, as required not only in mathematics or computing dates, but also in drafting or drawing to size (e.g., Wiltshire, 1991), can be truly remarkable, even in less capable people with autism. One such person whom I know well cannot cope with the spatial aspects of a basketball court or multiple moving players but is exceptionally skilled at computing the operations necessary to accurately place basketballs in a net (and therefore he remains stationed near the net and others simply pass to him!).

This approach to the world also appears to be associated with a **tendency toward processing information sequentially rather than simultaneously or in parallel.** Assuming, as the evidence indicates, that attention is overly focused in autism, information would, by necessity, be processed sequentially. A reliance on analysis or logic would suggest the same. In those capable of at least some understanding of the minds of others, a more analytical and presumably sequential processing style is adopted. **One person with Asperger syndrome, hurt by the accusation that he lacks sensitivity to others, described the process as lengthy, involving a series of “if this, then that” computations.** I would add, however, that in people with autism, this processing style is not specific to the social realm, but rather, characterizes their approach to most forms of information. It may simply be that the complex, ever-changing, and multidimensional nature of social information places particular limitations on the effectiveness of a more analytical and sequential processing style (cf. Dawson and Lewy, 1989).

Consistent with an overly focused and analytical or restricted processing style, people with autism tend to file information in separate rather than conceptually or semantically related folders (Waleski, personal communication, October 1997; also see Luria, 1968, for a rich description of a mnemonist, and Hermelin and O'Connor, 1967, 1970, for relevant discussions). This results in **precision at the expense of categorization and generalization:** memory for specific events (versus their relationship to previous experience) is relatively strong, although retrieval of information tends to be context-dependent (i.e., dependent on the presence of particular stimulus cues). Similarly, actions would appear to be coded in overly specific but precise ways (Smith and Bryson, 1994). Such a system might explain why people with autism are able to access information in response to specific rather than general questions, or why they produce topographically similar responses in the presence of the same but not similar stimulus conditions.

Overly specific and more readily activated memories might also underlie a preference for facts rather than fiction. Apprehension of the directly accessible physical or perceptual (versus mental) world is well documented in people with autism (e.g., Baron-Cohen et al., 1986). They have **a relatively good sense of physical causality and of how things fit together.** Some individuals report that they think in pictures, with difficulty conceiving of categories such as “dog,” as there is no categorical referent, only specific (different-looking) referents for each type of dog (e.g., Grandin, 1995). Similarly, relational terms, such as pronouns, prepositions, and some adjectives (e.g., large), pose a problem, as there are no constant or context-independent referents (Park, 1967; Menyuk and Quill, 1985). Memory appears to be true to the facts rather than reconstructed by thought and experience. However, many individuals with autism develop at least some imaginary

thought, however repetitive or routinized. Indeed, as **in typical young children, they may become absorbed in such activities, have difficulty distinguishing between reality and fantasy, and be quite insistent that their fantasies are true, at least in part because their images are so compelling.** My experience suggests further that their capacity for absorption may be associated with the presence of imaginary friends, the co-occurrence of which has been documented in a subset of typical young children who appear prone to hypnotic states (Hilgard, 1979). It may be, as implied by Park (1967, 2001), that the “siege” involves a journey from a relatively safe, inner-centered, and trancelike state of “nirvana” to the outside world of people, as well as of things.

### Emotion and Thought in Autism

Emotion, like thought, is a complex issue in autism. There are at least **three defining features of emotion. These include its expression, the physical sensations associated with feeling states, and the cognitive meaning we attribute to emotional experiences** (Plutchik, 1984). People with autism tend to be **emotionally nonexpressive**, whether indexed by facial emotion or the use of eye movements, gestures, or vocal intonation (e.g., Yirmiya et al., 1989; also see Czapinski and Bryson, 2003). It bears emphasizing, however, that a lack of expressed emotion **does not necessarily imply a lack of felt emotion.** Indeed, contrary to what conventional wisdom might suggest (e.g., Kanner, 1943), I would argue that people with autism experience a range of emotions, particularly the primary emotions (happiness, sadness, surprise, fear, and frustration/anger), although the expression of these may not be readily recognized. Rather, **in autism, emotion tends to be expressed atypically** (e.g., through hand flapping), or in ways more typical of very young children (e.g., excessive mouthing, gaze aversion, or physically moving away; Landry, 1998).

In my experience, the most striking exceptions occur under conditions of great personal significance, in which the emotion experienced is extreme. In one instance, a relatively capable 18-year-old with classic autism was confronted with the death of his girlfriend, with whom he had spent considerable time and had reported feelings of “love.” On hearing the news, he broke down, appropriately sobbing and embracing his father in a way that had never been observed in him by either of his parents. Parents of a younger child provide a similar description of typical, coordinated affect expression when their son was saved from drowning by his father. In another youngster (aged 16), also with classic autism but less capable linguistically, I directly observed an incident in which he was clearly very angry, ostensibly about being “bossed around.” With the exception of his language, which was surprisingly fluent but odd (yelling, “You are nothing but a

noun, and you a verb”), all aspects of his behavior, including facial expression, the look in his eyes, stance, and use of gestures and intonation, expressed anger in a normal, integrated fashion.

However, extreme emotion in individuals with autism can also result in catatonic-like freezing (cf. Wing, 2000), underscoring that the window of normal affect expression (like attention) may be unusually narrow. Examples I have observed include a woman who, hearing of my father’s death, stood frozen for several minutes with her arm in the air and a look of absolute terror. Later in the day, on her own accord, she bought and hand-delivered the most emotion-laden sympathy card that I received. I have observed similar reactions (i.e., **initial “freezing” followed by expressions of concern**) in adolescent boys who had just learned that one of their housemates was missing and could not be located. My sense is that in autism, the internal physical sensations associated with emotion can be experienced as intense and even overwhelming, and, as with other forms of sensory stimulation, may result in a state of overarousal. Overarousal will presumably only exacerbate existing problems, both in differentiating feeling states and in regulating emotion. Indeed, even at the best of times, many people with autism seem capable of distinguishing only between “good” and “bad” feelings. In the extreme, good feelings may readily become aversive, complicating matters further.

My main point is that, regardless of difficulties in expressing emotion and in distinguishing subtle differences in their own feeling states, people with autism do experience a range of emotions. Despite their well-documented difficulties reading emotion in others (e.g., Hobson, 1986), many have at least some sensitivity, although typically, this is based on distinct physical cues, such as tone of voice rather than the more subtle facial and gestural cues so communicative for most of us. One child with Asperger syndrome whom I know well becomes noticeably distressed and actually asks his mother “to use her loving voice” when she is angry or otherwise upset. **Adolescents and adults can be particularly sensitive to criticism and rejection, although they may protest indifference or respond with anger, which, in my experience, may provide an escape from their pain of hurt. Indeed, I know individuals with autism who actively defend against the softer emotions, specifically those that elicit crying, which they report “feels terrible and uncontrollable.” When unavoidable, one woman takes a shower, and lets the water cry for her.**

Finally, and again contrary to conventional wisdom (Hermelin and O’Connor, 1985), I would argue that in autism, emotion is connected with, although poorly modulated by, thought. The co-existence of the two is well exemplified by the tendency to avoid particular situations or people because of incidents associated with negative emotion. The intensity of the emotion, as

revealed in the person's retelling of the incident, can be truly remarkable, particularly given that the event may have occurred many years in the past. I know a 42-year-old woman with classic autism who was distressed by the intensely negative emotion she routinely experienced when visiting her parents. Together, we came to understand this as an association formed while staying with them following hospitalization for a psychotic break, which she experienced as devastating. She is now able to enjoy her parents by visiting with them in places other than their home.

The presence of the more cognitively complex emotion of guilt in at least some people with autism also serves to underscore that emotion is connected to thought. However, emotion is poorly modulated by thought. This most likely reflects the intensity of the emotion, as well as the lack of self-awareness typical of most people with autism (see Frith and Happe, 1999, for a detailed discussion). **The ability to reflect on the self depends on what may be common to most if not all high-order executive functions; namely, the capacity to suspend immediate experience, whether direct perception or a thought arising from perception, in order to think about that which is being experienced** (Dennis, 1991; also see Russell, 1997). Evidence indicates that executive tasks pose a problem for people with autism (Ozonoff, 1995). Rather, it appears that they have **difficulty disengaging from emotionally significant events or thoughts, and that these can become the focus of prolonged and obsessive or anxiety-driven attention**. In my experience, reasoning with them is difficult, as their attention is overly focused on the event in question, and once fixated, it is extremely difficult for them to disengage and think about anything else. The potential significance of this is underscored by claims that the disengagement operation plays an important role in the regulation of emotion (Rothbart et al., 1992). Perhaps the most basic way we deal with emotional upset is by disengaging or distracting ourselves from the source of distress. In people with autism, difficulties disengaging attention may place them at increased risk for intense and prolonged emotional upset.

## Summary and Conclusion

My intent here has been to develop some ideas about the mind in people with autism. Two issues have been addressed: the processing and encoding of information in memory, and the relationship between thought and emotion. I have argued that in autism, the mind is vulnerable to sensory overload, that it is hypersensitive to sensory stimulation, and that it adapts to the resulting state of overarousal by assuming a narrow beam or focus of attention. Although this limits the boundaries of perception, information within the narrow focus is perceived as unusually intense and thus imprinted strongly in memory. Overly

focused attention in autism appears to be associated with an analytical-computational and sequential style of processing information. Information is approached in a piecemeal fashion, in which the “whole” is systematically built up or constructed from the parts in sequence. In contrast, the ability to process multiple sources of information simultaneously or in parallel, as required, for example, in seeing the “whole” from the outset, appears to be a relative weakness. In my view, such difficulties are particularly obvious in but not specific to the social domain (e.g., in reading the emotions of others). I have argued, further, that the more focused and analytical or restricted processing style in autism results in an overly precise and context-dependent memory system. Incoming sensory information appears to be filed in separate rather than conceptually related folders. Memory for the details of events is relatively strong, but the costs include a lack of categorization and generalization, and a reliance on specific contextual cues to access information from memory.

I have also argued that people with autism experience a range of emotions, particularly the primary emotions, and that, like other sources of sensory stimulation, emotion can be experienced as intense and overwhelming. My main point is that it is important to distinguish between the experience of emotion and other aspects of our emotional lives. Clearly, the expression of emotion poses a problem for people with autism, as does their difficulty detecting and understanding emotion in others. However, none of this implies that they themselves do not feel, or that they have no sensitivity to emotion in others, or that thought is necessarily disconnected from their emotional states. Rather, I have argued that in autism, emotion is connected to but poorly modulated by thought, and that such difficulties most likely reflect both the intensity of experienced emotion and a lack of self-awareness (i.e., the ability to reflect on one’s thoughts or experiences). When people with autism are aroused by emotionally significant events, their attention becomes narrowly focused, the tendency to engage in repetitive behavior is enhanced, and it is extremely difficult for them to disengage and move their attention elsewhere. Not surprisingly, under such circumstances, positive emotion can readily be experienced as aversive.

Two former students and I have previously suggested that the phenomenon of hemispatial neglect might provide a useful framework for thinking about the emotional and cognitive lives of people with autism (Bryson et al., 1990; also see Ornitz, 1989). Briefly, their pervasive inattention to and lack of awareness of both external stimulation and their own internal states serve to underscore the parallels between the two (cf. Heilman et al., 1979). However, what we know about spatial neglect comes from studies of adults who have suffered an injury to the brain, whereas autism is, of course, a disorder of development. We can there-



fore only speculate about the implications of spatial neglect for a developing child. It would appear, for example, that in autism, information outside the narrow focus is processed preattentively or automatically. A failure to actively process figure and ground, such that the two are decoupled and related to previous experience, might underlie their context-dependent learning. Similarly, inattention to and lack of awareness of internal states, together with states of overarousal and extreme anxiety, would presumably have major implications for the development of a sense of self, as well as that of others. Future research on autism might profitably explore these and related issues, using spatial neglect as a model for conceptualizing important outstanding questions.

In the meantime, there are both empirical and logical grounds for assuming that in autism, there is a narrow focus of attention, an analytical-computational and sequential approach to processing information, and a precise but context-dependent memory system. And, to the questions, “Do people with autism have an emotional life?” “Are they sensitive to some emotion in others?” and “Is their emotion connected to thought?” my answer is “Yes.” I do not mean to minimize their expressive difficulties or their difficulties in detecting, making sense of, or regulating emotions, whether their own or those of others. However, my experience suggests that there is much for us to understand about the experience of emotion in autism: that many individuals are highly emotionally sensitive, that anxiety poses a significant problem, and that a better understanding of emotion, as well as of thought, will allow us to more effectively intervene and support the needs of the many individuals affected.

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