THE FULLER PICTURE: SHARED CHARACTERISTICS

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AIMS

The main aim of this chapter is to provide a more detailed account than has been given so far of what people on the autism spectrum have in common with each other, even when the actual manifestations of these characteristics vary across individuals and over time. Subsidiary aims are: (1) to ensure an appreciation of the complexity of the behavioural, physical and medical characteristics that may occur in individuals with a diagnosis of ASD; (2) to stress strengths as well as ‘impairments’ or ‘anomalies.’

INTRODUCTION

Chapter 2 presented and discussed the latest attempt to identify the distinctive behaviours that people with ASD have in common with each other, behaviours that can be said to be pathognomic of ASD. Although accepting that there are differences in the severity with which these pathognomic behaviours occur, and differences relating to whether or not additional conditions are present, DSM-5 presents a ‘bare bones’ answer to the question ‘What is autism?’ A fuller picture than has been presented so far is important for establishing ‘What has to be explained’ in Part II of the book, concerning causes of autism. It is also important for identifying and responding accurately and appropriately to the practical needs of individuals within the ASD population, to be discussed in Part III. In this chapter, therefore, the bare bones account of the diagnostic impairments will be fleshed out. Some other behavioural characteristics that people with ASD almost certainly share, but which are not mentioned in DSM-5, will also be described.

EXPANDING THE DIAGNOSTIC DESCRIPTIONS

Social, Emotional and Communicative Impairments

Impaired social interaction

Atypicalities of social interaction commonly associated with ASD are outlined below under the subheadings: dyadic interaction, triadic interaction, and interaction involving theory of mind.

1Words or phrases in bold type on first occurrence can be found in the Glossary.
2Another term used to refer to one-to-one social interactions in infancy is primary intersubjectivity. However, ‘dyadic interaction’ will be used here. Similarly, the term ‘triadic interaction’ will be preferred to the alternative term, secondary intersubjectivity.
Dyadic interaction  Interaction involving two people attending solely to each other can be described as dyadic. Typically developing (TD) babies’ earliest social interactions are all of this one-to-one kind. So, for example, within the first two months of life TD infants smile in response to another’s smile and hold another’s face-to-face gaze as if entranced. They also involuntarily imitate other people’s facial movements, such as opening the mouth or protruding the tongue. Within the first six months they engage in face-to-face lap play, initiating and turn-taking in protoconversations or games such as peek-a-boo, unconsciously synchronising their own sounds and movements with those of the other person (Trevarthen & Aitken, 2001; Sigman, Dijamco et al., 2004). Dyadic social interaction continues throughout life, typically occurring in the context of intimate relationships.

Prospective and retrospective studies show that babies who will later be diagnosed with ASD have relatively normal one-to-one interactions with primary caregivers in their earliest months, but lose these some time between the second half of their first year and the end of their second year (Zwaigenbaum, Bryson & Garon, 2013; Jones, Gliga et al., 2014). This age range corresponds to the range of ages-of-onset of ASD identified by parental report (see Chapter 5). Dyadic interaction never regains complete normality in people with ASD, although targeted intervention may ameliorate the impairments.

Triadic interaction  Triadic interaction involves two people attending to the same thing: ‘you, me and X’. Within the first six months of life, TD infants will turn their heads to look where someone else is looking, a response known as gaze following.

Figure 3.1  Protodeclarative pointing and joint attention
By the end of their first year, they will turn back to check where the other person is looking, demonstrating implicit (subconscious) awareness that something in the environment can be the object of shared or joint attention – ‘What I see, you see’, or ‘What I find interesting/funny/scary, you may also find interesting/funny/scary’. In the first half of their second year, they start to use protodeclarative pointing to draw someone else’s attention to something of interest, as illustrated in Figure 3.1. Children with ASD have long been known to lack these early mind-sharing behaviours (Curcio, 1978; Loveland & Landry, 1986), and an absence of joint attention behaviours, in particular a lack of protodeclarative pointing, is one of the most reliable early indications that a toddler is autistic (see Chapter 11).

Interaction involving theory of mind  ‘Theory of mind’ (ToM) refers to the ability to reason consciously about another person’s beliefs, knowledge, feelings, wants, etc., and to predict their behaviour accordingly. The widely accepted test of whether or not an individual has ‘theory of mind’ is the false belief test (see Box 3.1). As indexed by the ability to pass false belief tests, theory of mind comes on stream in TD children towards the end of their fourth year.

Box 3.1  Example of a test format commonly used to assess explicit theory of mind

A doll-sized box and a basket, both with lids/covers, are placed side by side, a small distance apart.
A doll, ‘Sally’, enters, holding a marble.
Sally puts the marble into the basket, replaces the lid, and exits.
A second doll, ‘Ann’, enters, goes to the basket, takes out the marble and places it in the box, replaces both lids, then exits.
Sally returns.
The Tester asks the person being tested: ‘Where will Sally look for her marble?’
To give a correct answer, the individual being tested must consciously, i.e. ‘explicitly’, know that Sally holds the false belief that the marble is in the basket where she placed it, and that she will therefore look for the marble in the basket. The individual being tested must also have sufficient language to understand and to respond to the test question.

Prior to this age, typically developing (TD) children have been shown to have what is sometimes referred to as ‘implicit’ or unconscious ToM. Whereas in tests of ‘explicit’ conscious ToM a verbal or pointing response is requested in response to the test question (as in Box 3.1), in tests of ‘implicit ToM’, anticipatory looking
The Fuller Picture: Shared Characteristics

constitutes the critical measure (see Kulke, Reiß et al., 2018, for discussion of this measure). Specifically, does the person being tested look towards the basket, appreciating that Sally falsely believes that her marble will still be there? Or do they look towards the box, where they themselves know the marble to be, but Sally does not know?

As has long been known, school-age children and adults with ASD struggle to succeed on tests of explicit (conscious, reasoned) ToM (Baron-Cohen, Leslie & Frith, 1985; Yirmiya, Erel et al., 1998). More recently, anticipatory-looking studies have shown that all individuals with an ASD diagnosis also lack implicit (automatic, unconscious) ToM: even highly intelligent adults with ASD who can succeed on explicit false belief tasks by effortful reasoning (Happé, 1994) fail to look involuntarily towards where another person will mistakenly seek a hidden object (Senju, Southgate et al., 2009; Schneider, Slaughter et al., 2013).

Impaired emotion processing

To understand the pattern of emotion-processing abilities and disabilities in people with ASD it is necessary to establish some key terms and concepts. These are presented in Box 3.2.

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Box 3.2 Terms used in the psychological study of emotion

Affect is a term used by psychologists to mean emotion.

Basic emotions are those that are universal in humans: happiness, sadness, anger, fear and disgust (surprise is sometimes included).

Complex emotions are those that are dependent on understanding how others see us, for example, pride, guilt, embarrassment.

Emotion contagion aka contagious/affective empathy* refers to the most primitive form of emotion processing, or affect processing, and consists of the involuntary sharing of others' basic emotions. Emotion contagion produces physiological changes such as increased heart rate, or sweating, which may be accompanied by involuntary behaviours such as laughing or crying along with the laughter or tears of another person. This 'infectious behaviour' can occur in the absence of knowing what the other person is laughing or crying about.

Cognitive empathy* is the term used to describe intuitive knowledge of the cause or 'content' of an experienced emotion: knowing what the emotion is about. The fact that experiencing an emotion can be differentiated from knowing what the emotion is about is evident from the common experience of waking in the morning with a sinking feeling but momentarily not knowing the cause of the feeling (e.g. the exam to be taken, the bad news received the previous day).

(Continued)
PART I What is Autism?

**Alexithymia** is a clinical condition characterised by lack of intuitive knowledge of the content of one's own emotions, and inability to identify or describe one's own emotions.

**Sympathy** is sometimes used to refer to the desire to take action in response to the emotions of other people, for example, to alleviate their pain or to soothe their anger.

**The empathising system** is a term introduced by Baron-Cohen (2005) to refer to ‘The ability to identify another person's emotions and thoughts and to respond to these with an appropriate emotion.' Thus, the system comprises affective empathy, cognitive empathy, and sympathy, as defined above.

* 'Empathy' and 'sympathy' are often used loosely and interchangeably in everyday speech. Moreover, these terms may be differently defined in other specialist literatures. The definitions given here are those most commonly used in the autism literature.

The ability to experience **basic emotions** is intact in people with ASD: they smile when they are happy, cry when they are sad, scowl and shout when they are angry – even if the actual sounds they make, the facial expressions and bodily gestures they produce, are not always quite like those of other people (Yirmiya, Kasari et al., 1989). By contrast, the ability to experience **complex emotions**, such as pride or embarrassment, involves ‘seeing ourselves as others see us’, i.e. theory of mind, and is therefore inevitably impaired. So, for example, many adolescents and adults with autism have to be taught that completing a task successfully may win praise, or that appearing in public in states of undress will embarrass others.

The ability to **identify either basic or complex emotions of other people** from their facial or vocal expressions is generally impaired (Golan, Sinai-Gavrilov & Baron-Cohen, 2015; Webb, Neuhaus & Faja, 2017). Moreover, when others’ facial expressions of emotion are correctly identified it is generally thought that success is achieved in ways that are qualitatively different from **neurotypical** processing of facial expressions (Harms, Martin & Wallace, 2010).

**Affective/contagious empathy** has been shown to be unimpaired in individuals diagnosed with ASD (Jones, Happé et al., 2010; Mazza, Pino et al., 2014). Children with autism are not oblivious to the emotion of others, and one screaming child in a room full of children with autism will produce signs of **arousal** and even distress in the other children. **Cognitive empathy**, on the other hand, is impaired (Jones, Happé et al., 2010; Mazza, Pino et al., 2014). Mandy, for example, one of the children described in the thumbnail sketches in Chapter 2, does not appear to understand why the child she knocks over is crying.

**Alexithymia** is commonly present in people with ASD (Hill, Berthoz & Frith, 2004; Kinnaird, Stewart & Tchanturia, 2019). This may explain why children with ASD ask questions such as ‘Did I like it when I went on the bouncy castle?’ or ‘Was I frightened when I went on the aeroplane?’ They may remember going on the bouncy castle or the trip on the aeroplane, but be unable to identify or name how they felt at the time. Alexithymia is one aspect of ‘impaired sense of self’ (see below).
Sympathy is also, inevitably, impaired. Because people with ASD do not intuitively know what another person’s emotion is about, they do not have the usual impulse to make an appropriate response. Higher-functioning individuals with ASD may consciously work out what another person’s expressions of emotion are about, and they may act on what they know, consciously, to be an appropriate response – for example, offering to find a plaster for someone’s bleeding finger. However, this process lacks the immediacy and intimacy of intuitive sympathy.

Emotion regulation (ER) is impaired in people with ASD, and excessive emotional reactions, including tantrums and self-injury, may occur in response to frustration, overstimulation or other sources of emotional stress which the individual is unable to moderate or control (Mazefsky & White, 2014).

A fuller account than can be given here of emotion-processing abilities in ASD can be found in Hobson (2014a).

Communication impairments
Communication is always, by definition, impaired in people on the autism spectrum, including the most able. It could not be otherwise, given that impaired social interaction is at the heart of autism, and communication and social interaction are inseparable, as noted in Chapter 2.

It is important to appreciate that both the means of communication used by humans, and also the rules for engaging in communicative episodes, are impaired. The means of communication are language (whether spoken, written, signed, or conveyed in some other way), and nonverbal signals including facial expressions, body orientation and movements, gestures, and vocalisations such as laughing or crying. Speech prosody, i.e. the acoustic patterns of pitch, rhythm, etc. that help to convey meaning, as well as conveying states of mind and the emotions of speakers, may also be considered a form of communication (see Box 4.2). Language is sometimes but not always impaired across the spectrum. By contrast, the understanding and, to a lesser extent, the use of nonverbal communication signals is invariably impaired (Peppé, Cleeland et al., 2011; Watson, Crais et al., 2013), as is prosody (McCann & Peppé, 2003).

The rules and conventions for using language and nonverbal communication signals to communicate come under the heading of pragmatics (Perkins, 2007). Pragmatics is invariably impaired across the spectrum (for a short review, see the section on ‘Language Use’ in Kim, Paul et al., 2014). Some examples of the kinds of pragmatic impairments commonly observed in people with ASD are given in Box 3.3.

Box 3.3 Examples of pragmatic impairments in people with ASD

Inappropriate topic initiation and topic maintenance, e.g. introducing a novel topic midway through a conversation and without warning; talking repetitively about their preferred topic even if their interest is not shared; not responding to a question; repeating questions which have already been answered.

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**Lack of conversational ‘coherence’,** e.g. failing to identify what or whom they are talking about; recounting events in a disconnected order; making remarks that are irrelevant to the ongoing conversation.

**Failure to take account of ‘where the other person is coming from’,** e.g. recounting the story of a film to someone who they know has seen it; failure to modify their conversation when talking to a teacher as opposed to a classmate; making tactless and/or personal remarks.

**Poor ‘conversational rapport’,** e.g. ignoring conversational approaches from others; not paying attention when someone is talking to them; not looking at the person they are talking to.

**Repetitiveness,** e.g. using ‘favourite’ words, phrases or sentences, regardless of appropriacy; turning conversation to certain preferred topics and repeating information or views they have aired many times previously.

**Mutism**  In addition to the communication impairments that are universal in people with ASD, a communication impairment called selective (or elective) mutism occasionally co-occurs with autism. In this condition, which is not confined to people with ASD, the individual understands at least some spoken language; and they may speak in some environments and situations, but not in others. So, for example, a child may speak at home but not at school; or with adults but not with other children. Selective/elective mutism is generally an anxiety-related or phobic condition (Cline & Baldwin, 2004). A rare minority of individuals with ASD have a form of mutism that appears to result from a physical difficulty in initiating and/or co-ordinating actions required for language output, regardless of whether speech, writing, signing or typing is used (Rapin, 1996). People with this kind of **pervasive mutism** can understand at least some spoken (and possibly written) language, but can only express themselves nonverbally.

**Restricted, Repetitive Behaviours and Sensory-Perceptual Anomalies**

**Restricted, repetitive behaviours**

Two broad categories of restricted, repetitive behaviours (RRBs) are generally recognised: ‘repetitive sensory-motor stereotypies’ (RSMs) and ‘insistence on sameness’ (IS). RSMs referred to in DSM-5 can affect movements (e.g. hand-flapping), use of objects (e.g. lining up toys), or speech (e.g. echolalia). One important form of RSM not mentioned in DSM-5 is self-injurious behaviours (SIBs), such as head banging, eye-poking or hand-biting. Forms of IS identified in DSM-5 cover a wide range of behaviours, all of which serve to effectively reduce novelty and promote predictability in the individual’s immediate environment and experience.

It is recognised in DSM-5 that RRBs tend to change over time. For example, RSMs such as hand flapping or SIBs are common in young children with ASD.
but less common in adults, except those who are very low-functioning. Similarly, echolalia is quite common in young children but less common in adults, except those with little or no language. Older as well as more able people with ASD are more likely to have IS behaviours which have adaptive value for the individual. So, for example, the habit of lining up toys may be replaced by routines such as always putting on clothes in the same order, or laying the family meal table in exactly the same way. Similarly, as comprehension improves, echolalia may be replaced by use of formulaic phrases and monologuing on a preferred topic (forms of IS). So the repetitiveness remains, but is manifested in different ways.

**Sensory-perceptual anomalies**

*Sensory* information may be understood as raw, or unelaborated, data from the senses, in contrast to *perception*, which involves the elaboration and interpretation of sensory data – making sense of it. Sensation and perception are, however, so closely linked and interactive, including top-down influences from perception to sensation as well as bottom-up input from sensation to perception, that for present purposes the two will not be differentiated.

First-hand accounts of what it is like to be autistic invariably emphasise anomalies in the processing of sensory-perceptual information (see Box 3.4; see also the reviews by Baranek, Little et al., 2014 and by Robertson & Baron-Cohen, 2017). Summaries of observations across the senses are given below.

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**Box 3.4 First-hand accounts of sensory-perceptual experiences in high-functioning individuals with autism-related characteristics**

*Darren White* (quoted in White & White, 1987: 224): ‘I was rarely able to hear sentences because my hearing distorted them. I was sometimes able to hear a word or two at the start and understand it and then the next lot of words sort of merged into one another and I could not make head or tail of it…. Sometimes when other kids spoke to me I could scarcely hear them, and sometimes they sounded like bullets. I thought I was going to go deaf. I was also frightened of the vacuum cleaner, the food mixer and the liquidiser because they sounded about five times as loud as they actually were. Life was terrifying…’

*John van Dalen* (quoted in Boucher, 1996: 84, 85): ‘My way of perceiving things differs from that of other people. For instance, when I am confronted with a hammer, I am initially not confronted with a hammer at all but solely with a number of unrelated parts: I observe a cubical piece of iron near to a coincidental bar-like piece of wood. After that, I am struck by the coincidental nature of the iron and the wooden thing resulting in the unifying perception of a hammerlike configuration. The name “hammer” is not immediately within reach but appears when the configuration has been sufficiently stabilised over time. Finally, the use

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of a tool becomes clear when I realise that this perceptual configuration known as a “hammer” can be used to do carpenter’s work.’

Temples Grandin (Grandin & Scariano, 1986: 32): ‘Wool clothing is intolerable for me to wear … I dislike nightgowns because the feeling of my legs touching each other is unpleasant.’

Jim Sinclair (reported in Cesaroni & Garber, 1991): ‘Sometimes the channels get confused, as when sounds come through as colour. Sometimes I know that something is coming in somewhere, but I can’t tell right away what sense it’s coming through.’

Donna Williams (Williams, 1994: 22): ‘In my dark cupboard … the bombardment of bright light and harsh colours, of movement and blah-blah-blah, of unpredictable noise and the uncontrollable touch of others were all gone. Here there was no final straw to send me from overload into the endless void of shutdown.’

Hearing  The prevalence of hearing impairment in ASD is uncertain, with some studies showing increased prevalence, while others report negative findings (Beers, McBoyle et al., 2014). People with intellectual disability, with or without autism, have higher rates of hearing impairment than the general population (McClimens, Brennan & Hargreaves, 2015), which may help to explain the discrepant findings on hearing loss across the spectrum in ASD.

Apart from increased incidence of hearing impairment (at least in less able people with ASD), certain hearing anomalies occur, corresponding to some of those reported in first-hand accounts (see Box 3.4). In particular, increased sensitivity to sound, or hyperacusis, is quite frequently observed in people with autism (Danesh, Lang et al., 2015). Particular sounds may become the focus of a phobic resistance to certain places or situations, such as travelling on the underground, or going to an event where fireworks may be let off. Whether or not hyperacusis is, strictly speaking, a hearing problem is, however, open to question (Stiegler & Davis, 2010). Similarly, reported difficulties in discriminating speech against background noise may reflect an attentional rather than hearing anomaly (Alcántara, Weisblatt et al., 2004). Certain facets of the perception of sound may be better than those of ordinary people of similar age. For example, people with ASD often have a superior sense of musical pitch (Heaton, Hermelin & Pring, 1998).

Vision  Visual impairment in the sense of decreased visual acuity is relatively common in people with ASD (Dakin & Frith, 2005). Certain anomalies of vision and visual perception also occur, as in the case of hearing. In particular, peripheral vision may be utilised to an unusual extent (Yoshida, Nakamiz et al., 2011). Over-sensitivity to visual stimuli also occurs. For example, some people with ASD prefer to watch television with the brightness turned down. Impaired processing of visual motion (seen movement) has been reported in several studies (Milne,
Swettenham & Campbell, 2005; Annaz, Remington et al., 2010). Visual detail may be perceived in place of whole objects or scenes, making the perception of whole objects effortful and slow, as described by John van Dalen in Box 3.4. However, good perception of detail has some advantages: for example, it enables people with ASD to notice small changes in familiar surroundings, and to outperform people without autism in certain psychological tests. Further evidence of the processing of detail as opposed to wholes is presented and discussed in Chapter 9.

**Taste, smell and touch**  Hypersensitivity to taste, smell and/or touch is not uncommon, according to parental reports and first-hand accounts. One girl with autism commented that nearly everyone has bad breath (Stehli, 1992). A child I worked with had a habit of approaching strangers and putting her face close to theirs in order to sniff them.

**Pain**  Sensitivity to pain, on the other hand, is generally considered to be low, making people with ASD vulnerable to injury, and it has been suggested that self-injurious behaviours are experienced as pleasurable self-stimulation, rather than as painful (Allely, 2013). However, see Moore (2015) regarding incidents of hyper- rather than hypo-sensitivity.

**Synaesthesia, amodality and overload**  Information from the various senses may be confused, as in the condition known as synaesthesia, where, for example, sound may be perceived in terms of colour, or colours may be perceived in terms of taste and smell (Baron-Cohen, Johnson et al., 2013). Or incoming sensory stimulation may be experienced as amodal in that the individual knows he is experiencing something, but is unclear as to the sensory modality of his experience (see the quote from Jim Sinclair in Box 3.4). Information arriving from the different sensory channels can also be experienced as confusing to the point of being overwhelming, as vividly described in the quote from Donna Williams, in Box 3.4.

**Over-focused attention**  Wendy Lawson, a very able person with ASD, has suggested that people with ASD have ‘monotropic’ attention, in the sense of only being able to attend to a limited range of sensory inputs at any one time (Murray, Lesser & Lawson, 2005). This suggestion is consistent with early studies reporting over-selective attention in people with ASD (Rincover & Ducharme, 1987) and is also consistent with some of the superior abilities noted above, such as unusual sensitivity to musical pitch and to visual detail. It might also help to explain why complex or multi-sensory inputs are experienced as confusing and overwhelming, leading to the defensive reaction of ‘shutdown’ referred to by Donna Williams (Box 3.4) and endorsed in many other first-hand accounts. However, an understanding of the precise nature of processes associated with attention in ASD has proved elusive (Ames & Fletcher-Watson, 2010).

Comprehensive reviews of evidence on sensory-perceptual processing in people with ASD can be found in Baranek, Little et al. (2014) and in Robertson & Baron-Cohen (2017).
Links between sensory-perceptual anomalies and repetitive restricted behaviours

The inclusion of sensory anomalies within the set of RRBs in DSM-5 was based on research showing that repetitive behaviours and sensory anomalies in ASD are related. This relationship had, in fact, been noted and discussed decades ago (see, for example, Hutt, Hutt et al., 1964; Ornitz, 1976), but then dropped below the threshold of most researcher/theoreticians’ attention until around the turn of the century. At that time, a review of sensory anomalies in ASD by O’Neill and Jones (1997) and empirical studies by Gal, Dyke and Passmore (2002) and others brought this relationship back under the spotlight.

These researchers concluded that individuals who frequently engage in repetitive sensory-motor stereotypies (RSMs) may do so either to mitigate over-stimulation – ‘sensory soothing’ – or to compensate for under-stimulation – ‘sensory seeking’. Subsequent research studies confirmed the relationship between RSMs and hyper- or hypo-sensitivity to sensory stimuli (e.g. Gabriels, Agnew et al., 2008; Boyd, Baranek et al., 2010). Other studies established relationships between hyper-sensitivity and anxiety (Pfeiffer, Kinnealey et al., 2005; Green, Ben-Sasson et al., 2012), and between anxiety and insistence on sameness (IS) (Rodgers, Glod et al., 2012; Lidstone, Uljarevic et al., 2014).

SOME ADDITIONAL SHARED CHARACTERISTICS

Imagination and Creativity: Strengths and Weaknesses

Data from the influential ‘Camberwell Study’ (see Box 2.4) showed that all children on the autism spectrum had ‘impaired social interaction, communication, and imagination’. The impairment of imagination was hypothesised to entail an impairment of ‘creativity’, with the net result that behaviour in autism is abnormally repetitive and restricted in character. RRBs and ‘impaired creativity’ were, therefore, conceived as two sides of the same coin. Although attention has shifted towards emphasising RRBs, as opposed to problems of imagination and creativity, it is not in reality possible to separate one from the other. In what follows, therefore, some examples of impaired imagination and creativity are briefly outlined.

Pretend play

Children’s pretend play, or ‘pretence’, is generally considered to be of two distinct kinds. The simpler, earlier-occurring kind of pretence involves play with miniature versions of real objects (e.g. moving a dinky car along the floor as if being driven; combing a doll’s hair with a toy comb). This kind of play is generally known as functional pretend play/pretence. The later-occurring, more imaginative kind of pretence involves using objects as if they were something else (e.g. a stick as a gun; a broom as a ride-on horse), or behaving as if something were present or happening,
when the imagined thing or event is absent (e.g. pretending to drink from an imaginary cup; pretending to be a lion). This is sometimes called symbolic pretend play/pretence.

Early clinical observation of children with autism suggested that symbolic play is impaired (Wing, Gould et al., 1977), an observation subsequently confirmed in numerous experimental studies (Jarrold, 2003). So, for example, typically developing children presented with a toy car plus a cardboard box or a matchstick and encouraged to ‘Show me what you could do with these’ often ‘drive’ the car into ‘the garage’, or ‘park’ the car beside the ‘petrol pump’ to ‘get petrol’. By contrast, children with ASD are more likely to pick up the car and put it onto or into the box, or place the car and the matchstick side by side (Lewis & Boucher, 1988). By the time DSM-IV was published in 1994, impaired symbolic play was included as one type of aberrant behaviour indicative of autism.

Functional pretend play is, by contrast, consistent with mental age (MA). Moreover, in their tests of pretend play, Lewis and Boucher (1988) found that if children with ASD were instructed to ‘drive the car into the garage’ they turned the box onto its side and moved the car along the ground towards and into the box – just as children without ASD had done spontaneously when asked to ‘Show me what you could do with these’. Similarly, if instructed to ‘make the car get petrol’ children with ASD held the matchstick on its end and ‘parked’ the car close up beside it. This inability to access ideas for, or to spontaneously initiate, behaviour is referred to again in Chapter 9, in the section on RRBs.

Imagining the ‘unreal’ or ‘impossible’

‘Imagination’ in its most basic sense of ‘being able to think about, or to envisage, things that are unreal or impossible’ has also been shown to be impaired. For example, one well-known test of this ability asks the person being tested to change some detail of a picture of a house to make the picture ‘unreal’ or ‘impossible’ (e.g. by putting the front door at first-floor level, or showing a chimney extending horizontally from the side of the house). Studies by Scott and Baron-Cohen (1996) and by Low, Goddard and Melser (2009) showed that children with autism are impaired on this task.

Generativity

The term generativity as used by psychologists refers to the ability to produce ‘out of one’s head’ numerous varied and original words, drawings, ideas, etc. Generativity is commonly assessed using fluency tests. These could involve asking someone to shut their eyes and say as many single words as they can within a given time – a test of verbal fluency; or asking them to ‘draw as many different things as you can’, testing design fluency; or asking someone to name as many uses of a brick or a piece of string as they can think of, assessing ideational fluency. Generativity is impaired in people with ASD when using the above type of ‘open’ or ‘non-prompted’ instruction, but is not impaired when a cue is provided, such as ‘words beginning with /f/’, or ‘names of animals’ (Boucher, 1988; Turner, 1999). Similarly, if the instructions for generating drawings do not stress that each new
drawing should be ‘quite different’ from previous drawings, children with ASD can produce categorically related (e.g. different vehicles, or different fruits) or perceptually related (e.g. circular objects such as a face, a lollipop, a sun, a ball…) drawings as readily as children without autism (Lewis & Boucher, 1991; Liu, Shih & Ma, 2011) – see Figure 3.2.

Figure 3.2 A series of drawings by a boy with autism in response to requests to ‘Draw something different from what you drew before’, showing the tendency to produce a run of related pictures. In this case, the pictures are related by both category and shape

Generativity is closely related to creativity, and despite experimental evidence of impaired generativity, some striking examples of spared generativity/creativity have been reported. For example, Hermelin and colleagues (summarised in Hermelin, 2001) reported improvisational ability in lower-functioning individuals with ASD who could play the piano. Hermann, Haser et al. (2013), as well as Kasirer and Mashal (2014), have shown that adults with ‘Asperger syndrome’ (now known as ‘higher-functioning ASD’) can generate novel metaphors better than their neurotypical peers. Examples of metaphors generated by these able individuals included comparing a feeling of success to ‘Seeing the view from a mountain top’, and a feeling of sadness to ‘Offering a salad to someone from South America’(!). A poem written by a very high-functioning adult with ASD is reproduced in
Box 3.5, partly to demonstrate unusual creative language ability, but also because the poem is so moving in itself. It is rightly well known, being frequently reproduced on the internet.

**Box 3.5 ‘The Bridge’ – by Jim Sinclair**

I built a bridge
out of nowhere, across nothingness
and wondered if there would be something on the other side.
I built a bridge
out of fog, across darkness
and hoped that there would be light on the other side.
I built a bridge
out of despair, across oblivion
and knew that there would be hope on the other side.
I built a bridge
out of helplessness, across chaos
and trusted that there would be strength on the other side.
I built a bridge
out of hell, across terror
and it was a good bridge, a strong bridge,
a beautiful bridge.
It was a bridge I built myself,
with only my hands for tools, my obstinacy for supports,
my faith for spans,
and my blood for rivets.
I built a bridge and crossed it,
but there was no-one there to meet me on the other side.

*From Cesaroni & Garber (1991)*

**Generalisations** about ‘lack of creativity and imagination’ must also be tempered by the fact that some of the most creative people that the world has known – including scientists, musicians, philosophers and mathematicians – have had autism-related behavioural traits, and it has been speculated that some might have qualified for a DSM-IV diagnosis of ‘Asperger syndrome’. Nobel prizewinning physicist Paul Dirac is one such individual – see Box 3.6. As Lyons and Fitzgerald (2013) point out in an extended review of ‘special gifts and talents’ in people with autism: ‘A significant challenge to ... perceived lack of creativity is the enormous achievement that some people with ASD show in creative and scientific fields.’
Examples of notably spared abilities, some occurring across the large majority or all individuals on the spectrum, some occurring only in rare, exceptional individuals, are considered next.

**Islets of Ability**

**Relatively spared abilities across the spectrum**

Uneven abilities are characteristic of people with autism across the spectrum. Even people with very low-functioning autism have some ‘splinter skills’, or islets of relatively good ability – i.e. things they can do significantly better than would be predicted by their overall level of functioning, even if not completely normally (Hermelin, 2001).

Pairs of closely related spared and impaired abilities are referred to in the autism literature as ‘fine cuts’. Fine cuts are theoretically important because they are informative about the causes of autism: if skill A is impaired but closely related skill B is unimpaired, this narrows down possibilities concerning the cause of the impairment of skill A. In what follows, some fine cuts are identified within the domains of social interaction, communication and cognition.

**Spared social interaction ability: Attachment**

An important area of predominantly spared social ability is attachment. Attachment, as used in psychology, refers to the emotional bond between two people, especially between young children and their primary carers (Bowlby, 1969, 1982). Several studies have shown that young children with autism generally do form attachments to their primary carers, although there are some differences in the ways in which attachment is expressed, and less able children with ASD are less securely attached than more able children.
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(Grzadzinski, Luyster et al., 2014). Adults with ASD are less likely than neurotypical adults to form secure attachment relationships. Nevertheless, a minority do form such relationships. Moreover, adults with ASD are no less likely to form secure attachments than are adults with other mental health disorders (Taylor, Target & Charman, 2008). The fact that attachment is frequently spared in people with ASD, at least in children, contrasts sharply with their social interaction impairments more generally.

**Spared communicative ability: Protoimperatives** Most individuals with autism, again excluding those who are most profoundly intellectually impaired, will communicate wants and needs intentionally, whether by using language, or by gesture (pointing to something they want), or by manipulating another person’s hand towards a desired object or to carry out a desired action such as opening a door. Pointing at, or otherwise indicating, a desired object or action is called **protoimperative pointing**, because it constitutes a demand. Protoimperative or ‘demand’ communication contrasts with protodeclarative communication, in which the intention is to share something of interest, as in Figure 3.1.

**Spared cognitive abilities** There are numerous spared, or relatively spared, cognitive abilities common to most or all individuals with ASD, including people with learning and language impairments. Some of these spared abilities are considered below.

**Non-declarative** (or ‘implicit’) **memory/learning** is generally either spared, or very much less impaired than **declarative** (or ‘explicit’) **memory/learning** (Boucher, Mayes & Bigham, 2008). Most notably, implicit **procedural learning**, subsuming what has been termed **systemising** (Baron-Cohen, Richler et al., 2003; Baron-Cohen & Lombardo, 2017; see Box 3.7; see also Box 10.2), may constitute a relative peak of ability. **Rote memory** may also be spared, or relatively spared, as is evident from children with ASD’s good echoing ability, and their ability to memorise tunes, or the words of advertising jingles, without necessarily understanding them.

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**Box 3.7 ‘Systemising’ and ‘procedural memory’**

‘Systemising’ is defined by Baron-Cohen in terms of a drive to analyse and build rule-based systems that can predict ‘non-agentive events.’ ‘Hypersystemisers’ tend to be interested in impersonal topics and activities such as how machines or technical devices work, how objects – whether buildings or pieces of furniture – are constructed, in computer programming, maps, routes and travel networks, weather forecasting, and numerical systems of all kinds from betting systems to higher maths. Unusually strong systemising tendencies in people with low-functioning autism are argued to cause repetitive behaviours and an inability to cope with change. However, in higher-functioning individuals ‘hypersystemising’ tendencies can be harnessed to achieve academic and professional success, contributing to outstanding achievements in fields such as maths, physics and computer programming.

(Continued)
‘Systemising’ is not a concept widely used by psychologists or neuropsychologists other than Baron-Cohen and his collaborators. Phrases such as ‘pattern perception’ and ‘rule extraction’ are more commonly used to refer to the kinds of functions ascribed to ‘systemising’. Novel concepts in psychology and neuropsychology are welcomed and quickly utilised if judged to have validity and practical usefulness – (the speed with which the concept of ‘mentalising’ was adopted illustrates this). It is notable that the concept of ‘systemising’ has not been widely adopted, although it is used in a handful of studies on gender differences in neurotypical populations. This may be because the functions ascribed to systemising are those more generally ascribed to procedural memory (see Box 10.2).

Spared, or relatively spared, visual-spatial reasoning and constructional skills – sometimes referred to as fitting and assembly tasks – are also well known, and occur even in individuals with profound learning difficulties and ASD (DeMyer, Barton et al., 1974).

‘Mechanical reading’, or hyperlexia, is another well-known peak ability (although some individuals with autism are dyslexic – see Chapter 4). In people with lower-functioning autism, hyperlexia takes the classic form of an ability to read individual words accurately with no understanding of their meaning. In people with higher-functioning autism, hyperlexia manifests as mechanical reading that is superior to reading comprehension (Nation, Clarke et al., 2006). Both hyperlexia and also hypercalculia were reported in a study by Jones, Happé et al. (2009).

**Spared abilities in rare, exceptional individuals**

A small minority of individuals on the autism spectrum have abilities that are very significantly superior not only to their overall level of function, but also significantly superior to abilities found in the general population. These rare individuals are referred to as savants, and their special talents are referred to as savant abilities (Hermelin, 2001; Happé & Frith, 2010). Most frequently, savant abilities involve feats of visual or musical perception and the exact reproduction of what has been seen or heard (Heaton, 2003; Mottron, Dawson & Soulières, 2009); or feats involving estimation (of number, size, weight, etc.) or numerical calculation (Thioux, Stark et al., 2006; Soulières, Hubert et al., 2010). Occasionally, however, some unusual form of savant ability occurs, as in the case of ‘Grace’, described in Box 3.8.

**Box 3.8 ‘Grace’: A young woman with a special talent for humour**

Grace, when I knew her, was a young woman whose autism and moderate learning difficulties were combined with a striking capacity for verbal humour. Humour is not generally considered to be characteristic of people with ASDs, let alone jokes based on word-play, which made Grace all the more unusual. Examples of her jokes are shown below.
Puns

‘Here’s the weavery looming up’ (on approaching the weaving centre when showing a visitor around her residential village).

‘Smashing windows’ (when asked to write in a local church Visitors’ Book).

Riddles

Question: ‘What does the ant aerial get called?’ Answer: ‘Antenna’.

Question: ‘What happens if a boa constrictor argues with another boa constrictor?’ Answer: ‘A boa war’.

Nonsense talk

(Describing two train passengers who were sitting when Grace had to stand, which she resented): ‘There was a man chatting to a colly-girl with miniscule lips and slopping bum, while womping through a burger. God! I thought he was going to burst his trouser-buttons!’

From Werth, Perkins & Boucher (2001)

Comment

In higher-functioning people with autism, spared and sometimes superior abilities greatly outnumber behavioural impairments and underlie the ability to live independently, to earn a living, and sometimes to achieve significant success in a particular field.

In lower-functioning individuals, islets of ability, whether in the form of relatively spared abilities or in the form of savant abilities, provide possibilities for compensatory mechanisms, and may be maximised in ways that enable individuals to achieve success in tasks that they might otherwise struggle with. Spared abilities of any kind also enhance identity (‘This is what I CAN do!’); and savant abilities may sometimes be harnessed (usually by a parent or other family member) to earn money for the individual, and even fame!

Motor Skills: Strengths and Weaknesses

‘Motor skills’ refer to body movement. The term covers a wide range of abilities involving not only nerves and muscles, but also an internalised self-image, or body schema, derived from proprioceptive and kinaesthetic awareness; also complex psychological processes of planning, temporal organisation and control. Fine motor skills, such as are involved in, for example, doing up buttons, typing or tap-dancing, involve a different set of underlying abilities from gross motor skills, such as walking or climbing stairs. Balance is important for some kinds of motor skills (e.g. riding a bike); hand–eye co-ordination for others (catching a ball). Well-learned,
unconsciously executed movement patterns such as doing up buttons or climbing stairs utilise a partly different set of abilities from those required for novel willed actions such as fashioning a clay figure or negotiating an obstacle course.

Motor abnormalities of one kind or another are probably universal in ASD (Bodison & Mostofsky, 2014). The following commonly observed impairments and anomalies were reported by Gowen and Hamilton (2013):

- reduced muscle tone, technically referred to as hypotonia
- impaired or anomalous gross motor skills, including unstable balance, clumsy gait and toe-walking (walking on the balls of the feet with the heels raised)
- poor co-ordination of locomotor skills (e.g. running to catch a ball)
- slower than average repetitive hand movements (e.g. clapping)
- slower and less than normally accurate movement alternation (e.g. alternately flexing and extending an arm, or articulating the speech sounds /b/ and /k/ in rapid succession).

In addition to (or overlapping with) the above, various forms of dyspraxia have been reported, with higher rates (up to 75 per cent) in lower- as opposed to higher-functioning individuals (Dziuk, Larson et al., 2007; MacNeil & Mostofsky, 2012). Dyspraxia is an impairment of voluntary movement in the absence of hypotonia. It can differentially affect the limbs, hands or mouth areas. Someone with limb dyspraxia or apraxia may, without thinking, scratch the back of their neck if it itches, but have great difficulty in bringing a brush or comb into contact with the back of their head in order to tidy their hair. Similarly, someone with oral apraxia may blow out a match or lick an ice-cream without thinking, but if asked to copy someone rounding their lips to make the sound ‘oo’, or if instructed to stick their tongue out, they struggle to achieve these movements voluntarily. Limb dyspraxia may contribute to the clumsiness commented on earlier in the chapter; and oral and manual dyspraxia contribute to language output problems (speech or manual signing) in some individuals (Seal & Bonvillian, 1997; Gernsbacher, Sauer et al., 2008; but see also Shriberg, Paul et al., 2001).

The ability of people with ASD to imitate movements has frequently been questioned. However, in a review of the evidence, Vanvuchelen, Roeyers and De Weerdt (2011) concluded that pervasively impaired imitation is not a universal characteristic of people with ASD; nor – when it does occur – is impaired imitation specific to people with ASD (i.e. it can occur with other conditions). It is probably the case, however, that one particular kind of imitation is universally affected in, and specific to, people with autism. Thus, a meta-analysis of studies of imitation in people with autism suggested that while object-oriented actions (such as pointing to a picture or picking up a spoon) are generally spared, the imitation of bodily actions not involving an object (such as touching one’s nose with a finger or pulling a face) is severely impaired (Williams, Whiten & Singh, 2004). Similarly, acting on objects in ways that involve relationship with the body (e.g. holding a music box close to one ear) was shown to be impaired in a study by Meyer and Hobson (2004). Stewart, Macintosh and Williams (2013) suggest that this kind of imitation impairment derives from a deficit in self-other equivalence mapping (‘I must do to my nose what you did to your nose’; ‘I must hold the music box
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up to my ear like you held it to your ear’). Strictly speaking, therefore, any universal and ASD-specific imitation impairment should not be seen as a movement problem, but rather as a problem associated with sense of self, and perhaps of appreciating equivalences between ‘self’ and ‘other’ (see below).

Despite the common – probably universal – occurrence of motor abnormalities of one kind or another in people with autism, some aspects of motor functioning are relatively unaffected in most individuals, and peaks of motor skill are occasionally observed. For example, Wing (1996) reported that some young children with autism, including some who are not particularly able, may be agile climbers with excellent balance and no apparent fear of heights (with potentially scary implications for parents and carers). Indeed, Kanner’s (1943) original paper included reports of individual children with autism spinning objects skilfully and climbing ‘gracefully’. Impaired and spared motor abilities often co-exist in the same individual. For example, Leary and Hill (1996) noted that ‘the [autistic] individual who typically experiences severe difficulties with the most simple of movements may suddenly perform complex, skilled movements’. Similarly, Rinehart, Bellgrove et al. (2006) reported that a less demanding motor task was worse performed than more demanding tasks, even by participants with an Asperger syndrome diagnosis.

Impaired Sense of Self

An ‘apparent unawareness of personal identity’ was listed in one of the earliest attempts to identify essential features of autistic behaviour (Creak, 1961 – see Box 1.1). However, interest in possible impairment of self-concept, or sense of self, lapsed for nearly three decades, possibly because impaired sense of self appears – superficially – incompatible with the egocentricity and self-absorption that give ‘autism’ its name. Moreover, early studies showed that children with autism recognise themselves in a mirror at about the same age as children without autism, if overall ability is taken into account (Dawson & McKissick, 1984; Spiker & Ricks, 1984). This was, again mistakenly, taken as evidence of intact sense of self.

However, studies by Hobson and colleagues in the 1990s (Hobson, 1990; Lee & Hobson, 1998; see also Hobson, Chidambi et al., 2006) showed that although children and adolescents with mid- to lower-functioning autism could answer questions about their own physical attributes, their activities and abilities, they were impaired in their responses to questions about themselves as social beings, where it is important to be aware of how others see us. Hobson and colleagues interpreted their findings in terms of an impaired ‘interpersonal self’. Also during the 1990s, Powell and Jordan (1993) suggested that people with ASD lack an ‘experiencing self’ that provides a personal dimension to ongoing events – the feeling that ‘I am doing this’, or ‘I was there at the time’. Frith (2003) also noted the loss or impairment of an experiencing self, in her ‘absent self’ theory.

Increasing support for the suggestion that people with ASD, including the most able, have an impoverished sense of themselves comes from demonstrations of alexithymia, mentioned above; also from reports of impaired autobiographical memory (Lind, 2010; Berna, Göritz et al., 2016), and of the diminished salience

**SUMMARY**

Diagnostic criteria for ASD offer a ‘bare bones’ description of the core behaviours (SEC impairments and RRBs) necessary for a diagnosis of ASD to be made. A great deal more is known about these core behaviours – their individual components, their earliest manifestations and later trajectories – than can be stated in a diagnostic manual.

Within the group of SEC impairments, *social interaction* impairments are first evident as impaired dyadic relating; early forms of *triadic social interaction*, such as protodeclarative pointing and joint attention, are then affected, as are both implicit and explicit forms of what may colloquially be termed ‘*mindreading*’. Regarding *emotion processing*, the experience and expression of basic emotions is spared, as is ‘affective’ or ‘contagious’ empathy, whereas the experience and expression of complex emotions, and also ‘cognitive empathy’ and ‘sympathy’, are impaired. Regarding *communication*, both the means of communicating, especially nonverbally, and the rules for engaging in communication (‘*pragmatics*’) are impaired.

Within the set of RRBs, repetitive sensory-motor stereotypies (RSMs) tend to occur in younger or less able individuals with ASD, whereas insistence on sameness (IS) is more common in older and more able individuals. Sensory anomalies include heightened sensitivity to sound, taste and smell, but reduced sensitivity to pain. Perceptual abnormalities may include synaesthesia and monotropic attention. It has been suggested that RSMs may be responses either to excessive stimulation or to under-stimulation. IS has been linked to high levels of anxiety, which in turn may be a response to hypersensitivity and excessive stimulation.

Certain other facets of behaviour are almost certainly universally affected in individuals with ASD, adding to the range and complexity of shared characteristics across the spectrum. In particular, imagination and creativity, motor skills and sense of self are all impaired in certain ways or in certain circumstances, but not in others. In addition to these typically uneven capacities and characteristics, islets of ability occur, sometimes in the form of ‘fine cuts’, or as some relatively spared skill in an otherwise severely learning disabled individual, or – more rarely – as a true ‘savant’ ability.