The SAGE Handbook of
Autism and Education

Particular Learning Needs of Individuals on the Autism Spectrum

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INTRODUCTION

In some respects, autism can be regarded as an educational problem. This does not mean that it is the result of difficulties accessing education, as might be the case with dyslexia for example, but rather that those on the autism spectrum require education for aspects of development that others just acquire instinctively or intuitively. Human beings are born with very underdeveloped brains so that the way the brain develops depends on environmental as well as genetic influences; we inherit 'memes' as well as genes (Shennan, 2002). Unless we have autism, we have instinctive processes that create a 'social brain' (Brothers, 2002; Frith & Frith, 1999; Frith, 2007) that appears dedicated to processing social information. Apart from sexual instincts, the main human instincts are those that enable us to recognise and tune into the social signals of our species from infancy (and even before birth, for example, in responding to the human voice) and thus enable us to benefit from the social tutoring that (often quite literally) points out relevant aspects of the environment and models appropriate ways of responding.

Thus, the vulnerable infant depends on eliciting the nurturing and care of others, for survival, but also for education and guidance on how to interact with and understand the world around him/her.

Those with autism are just as vulnerable as other infants but their difficulties in tuning in to others means they are 'on their own' in vital respects. They have to try to make sense of their environment without being able to benefit from that social guidance and support. That is an extraordinarily difficult cognitive task and made even harder when there are additional difficulties, such as intellectual disability. It also means that each individual on the spectrum is likely to develop their own idiosyncratic understanding of the world. The lack of instinctive processes for acquiring social understanding means they need explicit teaching of how to attend to and learn from others. The problem is that, because this need is unique to autism, caregivers may not be aware of this need for specific education and, because such education is not normally necessary, parents and teachers may struggle to know how to teach what is usually acquired instinctively.

INDIVIDUAL DIFFERENCES AND CO-MORBIDITY – RANGE OF INTELLECT

Those on the autism spectrum form an extremely heterogeneous population. Autism itself varies in severity and that severity varies independently

from intellectual ability. Thus, high levels of autism severity may be accompanied by high levels of cognitive disability or by little or no intellectual impairment. There is also a very uneven profile of skills and abilities within individuals so that there are often spikes of high ability (occasionally even near-savant skills) alongside very low functioning in other areas. There is nothing in autism that protects the individual from developing other developmental problems or other disabilities; in fact, some conditions are common co-morbidities of autism, either because of some common developmental cause or because autism has led to the development of the co-morbidity, as in stress-related conditions.

In spite of the fact that all those on the spectrum will by definition have problems in social understanding, Wing & Gould (1979) pointed out that there are great individual variations in the extent to which they wish to socialise – their level of sociability. These authors suggested four different social 'types' within the spectrum on this dimension of sociability. At one extreme were those they described as 'withdrawn' and socially isolated. The next group was the 'passive' group, who would respond to social overtures but did not initiate social contact. Then were those Wing and Gould described as 'active but odd' in that the individuals in this group were very keen to have social relationships but did not know how to make that happen, constantly getting it wrong. Later on, Wing added a fourth group of those with mild autism whom she described as being 'eccentric' in their social contacts, just needing a buddy to act as a model for them. Wing and Gould suggested that these 'types' were not set in stone and could change through development or education. Generally, the direction of change to be expected was from 'withdrawn', through 'passive' and then 'active but odd' with a few even moving to 'eccentric'. However, it was also proposed that there could be movement in the reverse direction from more to less sociable in response, for example, to additional stress or depression.

Although these social 'types' have face validity, there has not been scientific support for their validity, beyond the original study. Nevertheless, Jordan (2015) has suggested that they should be taken into account when decisions are made on the best teaching approach to use for particular individuals. She suggests that 'withdrawn' individuals need approaches on two fronts: for basic skills teaching they need directive approaches with clear and explicit goals so they 'notice' they are being taught and so that they can learn without engaging in social interaction. This might be through

the medium of information technology or visually mediated structured teaching. The second teaching front for withdrawn individuals is one that helps them become desensitised to social stimulation so they learn to be comfortable with other people.

Those in the passive group, Jordan suggests, learn best from teaching approaches that use their interests to motivate their learning, but they also need structure to show them how to proceed once their interest has been aroused. Those in the 'active but odd' group are the ones who respond best to rules coupled with a cognitive approach to help them make sense of the rules. Finally, those in the 'eccentric' group are best taught in meaningful contexts with 'buddies' (actual or electronic) to provide models and to remind them to take account of context in applying learnt rules.

NEED FOR 'THERAPEUTIC' EDUCATION AND ACADEMIC ACCESS

Jordan (2013a) has claimed that education has a dual function for individuals with autism. As a human right, they need access to the skills, knowledge and understanding that enable them to participate fully in their communities and, as Howlin et al. (2004) have shown, academic skills are an important contributor to success as an adult with autism, just as they are for the rest of the population. The issue then becomes one of how meaningful access to that education can be achieved. A report for the Council of Europe (Jordan, 2009) showed that nearly all the European countries officially recognised that children with autism should be included in educational provision but there was considerable variation in how that right to education was interpreted. In some countries, children with autism were 'included' in mainstream provision as a matter of right but the onus was on the child to adapt to the system (often with the support of a classroom aide) rather than a fully inclusive system that adapted to the needs of all the pupils. This kind of locational integration cannot be considered to be inclusive; the child with autism may well be socially isolated (Jordan & Powell, 1994) and meaningful access to the curriculum is far from guaranteed. In other cases, especially where the child has intellectual impairment as well as autism, access to education was in fact access to clinical services, albeit that these may have a label of 'education'. There is every reason to suppose that similar

issues occur across the world and may be more acute in countries where autism has only recently been recognised or indeed where there are inadequate services for diagnosis and support. True access to the academic curriculum requires that educators understand the learning needs and style of those with autism, which in turn depend on the training available in initial training of teachers and in their continuing professional development.

However, access to the curriculum available to others is not sufficient in autism. The unique needs for explicit teaching of social and emotional understanding, identified above, mean that those with autism also require what Jordan (2013a) has referred to as a 'therapeutic curriculum': one that addresses the needs that arise directly from the autism. This is not just about teaching social skills, which may be a part of the curriculum for many children who lack social skills for a variety of reasons other than autism. The issue in autism is not the lack of social skills itself, but the reasons underlying that lack. A simple lack of social skills could be dealt with by a programme of teaching social skills. Individuals with autism need this, but it is insufficient on its own. Since the difficulty in autism is the lack of instinctive understanding of, and responsiveness to, social signals, it is that understanding that has to be taught; it is very difficult, if not impossible, to teach social skills without understanding. Other skills may be taught procedurally but social skills are differentiated from other skills in that they vary according to context. There is no one way in which social skills are performed or understood; the context has to be processed alongside so that the variation is meaningful. Typical instincts allow us to process this meaning as part of the skills but the individual with autism may just see the variations in the skills and not the contextual factors that determine that variation and thus that meaning.

ENGAGEMENT AND MOTIVATION

Individuals with autism are just as capable of being engaged and motivated as others, but there are differences in what may serve to engage or motivate them. For those without autism the main motivators and sources of engagement are other people. There are people who prefer to be alone (Wolff, 1995) and this does not necessarily mean they are on the autism spectrum. They remain capable of understanding others but may prefer to be engaged with 'things'. Some relatives of individuals with autism, for example, are sometimes identified as having 'the broader autism phenotype' (Gerdts et al., 2013) which may mean that, although they do not fit the criteria for autism, they share aspects of the cognitive style, including a preferred interest in systems (engineering, science) compared to social activities.

There are other factors that may affect our interest in others. Young children may have had traumatic experiences (such as abuse) that cause them to withdraw from social contact. Severe neglect or social isolation can also lead to social withdrawal and reactions that may be similar to the behaviour shown by those on the autism spectrum. The study of children adopted from Romanian orphanages, where they had suffered extreme neglect (Rutter et al., 1999), showed that initially a significant proportion showed behaviour that met criteria for autism. However, after experiencing warm loving relationships within their adopted families, most of them no longer met criteria for autism. The few that continued to show 'autistic symptoms' also had severe intellectual impairment so, although they may actually have had autism, it is also possible that the early neglect had meant the social instincts had not been activated and the social skills had consequently not been learned; the intellectual impairment might have meant they were unable to acquire these skills later on, in spite of their instincts being intact. We do not know whether the neglect, allied with the intellectual impairment, 'caused' the apparent 'autism' but this study shows that neglect can lead to behaviour that looks like autism but is shown not to be so because, at least in some cases, the 'symptoms' can be reversed if the child is exposed to effective nurturing.

Other factors may lead to early development that, at least at a superficial level, closely resembles that seen in autism in its neglect of social stimulation. Prime among these are sensory disabilities. Many young children with autism are often first thought to have a hearing impairment because they are not responding to their name being called or other aural social stimulation. It is only when observations show that the infant responds to nonsocial sounds (a sweet being unwrapped, perhaps) that a diagnosis of autism is made. It should be pointed out, however, that, although it is not of itself a sensory disorder, autism does affect the way in which aural stimulation is received (now recognised in diagnostic criteria: DSM-5, APA, 2013). There are sensory issues that often mean the person with autism is hyper-responsive to certain sensory stimulation, particularly aural stimulation (Jordan, 2013b; Bogdashina, 2016), which in extreme cases may even be experienced as pain.

Visual impairment may also lead to development that resembles that of autism, especially in early development. It has been shown that congenital blindness leads to development that is even harder to differentiate from autism (Hobson, 2002). This is thought to stem from the fact that our social instincts are triggered by joint visual attention, mutual eye contact and the recognition of communicative gestures. The difference is that those who are congenitally blind develop joint attention through other senses (aural joint attention, for example) and, although this takes time to develop, this provides access to social awareness. Thus, the similarities between autism and blindness diminish as the infant develops.

Individuals on the autism spectrum right from the beginning are characterised by their lack of a preferential response to social stimuli. It is not that individuals with autism avoid eye contact but that they do not seek it out nor establish any mutuality of social signalling (Kasari et al., 1988). As the child with autism develops, however, some do begin to avoid eye contact (Prizant & Fields-Meyer, 2015). One reason for this seems to stem from their initial inability to engage in the mutual exchange of social signals through which typically developing infants learn to make and break eye contact and thus modulate their levels of arousal. Thus, when they do make eye contact, especially when this is not on their own volition (when eye contact is demanded, for example), they get a surge in levels of arousal that many find uncomfortable, or even painful. At the very least, sustaining that eye contact requires concentrated effort and often prevents them from taking in other stimulation, such as verbal information. If teachers demand, or even teach, eye contact, they risk preventing the child from paying attention to what is being said, and also risk making the child more vulnerable as s/he becomes an adult. Normal human communication is not conducted by people staring into one another's eyes; we make and break eye contact in correspondence to the social messages we intend to send. In Western societies there are only two social messages that are conveyed by prolonged eye contact between individuals: one is a sexual invitation, the other is a sign of aggression. In many other societies, there are even fewer situations when direct eye contact is appropriate. It would be considered rude for someone to make eye contact with someone of higher social status, for example. Individuals with autism, even if they are able to tolerate direct eye contact, will not know how to 'read' the meaning of these social signals nor how to adapt their behaviour to fit social or cultural norms. Teaching them to make eye contact without understanding the social messages they may be giving will only make them vulnerable to misunderstanding and the consequent dangers that may follow from that.

This lack of understanding of social situations means that social motivation is seldom effective in autism. As pointed out above, there are considerable variations in sociability in the autistic population but even those with high levels of social desire are likely to lack the ability to manage social situations, including lacking an understanding of how to please others. Trying to get children with autism to do things 'to please others' is mostly ineffective because of their not understanding how others think or feel, but may be even more counter-productive in leading to reactions from adults that are seen as punitive by the child with autism. When others (teachers or parents, for example) are pleased, it may well be that their behaviour becomes less predictable. How they respond will depend very much on the context, as well as their personality, and current mood. The teacher may respond with verbal praise, which, if loud and intrusive, may shock and even upset the child with autism. The long-term effects of praise may also prove counter-productive, if the child is anxious. It is important to give the child feedback on how s/he is doing but effusive praise may make the child feel that the standard of work that has been praised is now the standard that must be reached each time. Since the child may have little conscious awareness of how s/he was successful, s/he may become very anxious about reliably achieving that standard. This increase in anxiety may make the child unwilling to attempt that challenge so that s/he becomes unwilling/unable to attempt that task in the future and this may even generalise to the child becoming unwilling to try any new task and even to the child developing school phobia.

However, praise is only one possible response of the teacher being pleased. The teacher may stick a 'gold star' on the work but the symbolisation may be missed by the child with autism who may just see it as something that spoils the appearance of the work. If there are other children in the class that require attention, being pleased with a pupil may mean that the teacher ignores that pupil and directs attention elsewhere. This may well be a desired outcome for the child with autism but the point is that this response is only one of many reactions the pleased teacher might show. Predictability is usually the most important reinforcer for the child with autism. If the teacher is not pleased, and especially if the teacher is made angry, s/he is likely to behave in a much more predictable way (going red, shouting, finger-wagging, perhaps). In a world that those with autism find

frighteningly unpredictable and confusing, there-fore, it is not surprising that they may choose to opt for tried and tested ways of provoking those predictable responses.

If social praise and pleasing others are not effective as motivators for those with autism, then it makes sense to use those things that do interest and involve them. Structured teaching as used in the TEACCH (Schopler et al., 1995) programme teaches the child with autism a sequence of 'work then play' where 'play' is the opportunity to engage in a favoured activity. This can be effective in the short term but there are potential problems in using special interests purely as rewards for work. Many people on the spectrum use their spe-cial interests to regulate their anxiety and enable them to cope. If the time with their special interest is contingent on successful periods of work, then this may increase anxiety and so interfere with the regulatory function of the special interest experi-ence. In time, this may mean that those special interests cease to function as effective motiva-tors. Some people on the spectrum have suggested that an optimum approach would be to preserve the regulatory function of the special interests by allowing some access to them during the day as an 'entitlement' rather than as something that has to be 'earned'. Then some extra time, or enhanced experience of the special interest, can be contin-gent on work or good behaviour, but the individu-als are not over-anxious because they know they have their minimum 'allowance' guaranteed.

Well-intentioned attempts to adapt to the moti-vational needs of autism have led some practi-tioners to use special interests throughout the curriculum. This can work initially in getting the child interested in the curriculum but also has long-term dangers. If a curriculum is completely adapted to fit the specific interests of a child at a particular time, there will be complete disrup-tion if the child's interests change. Although many special interests do remain unchanged over long periods of time, change does happen when a child suddenly switches to a new 'obsession', without warning. This then leaves practitioners with the problem of completely revamping the curriculum each time a change occurs. It is also the case that some special interests are more suited to being incorporated into an educational curriculum than others. Some special interests are harmful to indi-viduals' long-term interests in that they focus on early behaviours, such as smearing or playing with spittle, with little educational benefit. They may have value to individuals in that they help them reduce their anxiety but the educational goal would be to teach the children a 'better' way to reduce their anxiety and build their resilience. Even if the special interest is not harmful of itself,

it is, by its nature, narrow and specific. One goal of education should be to broaden interests, as far as possible, rather than 'feed' those that already exist. Initially special interests should be accepted for their role in helping the child self-regulate, but the goal should be not to eliminate all special interests, but to try to develop new ones so that, eventually, there is no time for any single interest to overwhelm the child's attention. In introduc-ing new experiences, it is important to provide a clear timeline for structured experiences of the new activity and when it will be over, recognising that any new experience will be rejected initially because of its unfamiliarity. This needs a clear visual timetable showing start and finish times for the 'trials' of the new activity and a clear com-mitment that if the child does not like the activity after a set number of 'trials' then the activity will be discontinued.

JOINT ATTENTION AND 'MONO ATTENTION'

Teachers sometimes complain that the child with autism has a 'short attention span' but this is rarely the case in any general sense, unless the child has additional intellectual impairment. What the teacher usually means is that it is difficult to get the child to attend to the things the teacher regards as important or that the child is easily distracted from work tasks. There are many prob-lems with attention in autism but they are not well described as being due to a short attention span. The same child who is apparently unable to sus-tain more than a few seconds of attention on a work task may be completely absorbed in a self-chosen activity for hours and it can be difficult to get the child to shift attention away from that special interest activity. Most children with autism find it hard to control their impulses and avoid distractions, especially if they also have ADHD. Such children are not able to respond to com-mands to 'stop' certain actions but must always be told what to do instead, if there is to be a chance of compliance. Although some teachers interpret fidgeting or holding something in one's hand as signs of lack of attention, this is seldom the case in hyperactive children. Such children may need a level of fidgeting in order to concentrate and direct their attention. Holding something against one's palm is also a good way of calming down (consider how babies sleep with tight fists) so teachers should not automatically make children put objects down but help them to manage in gradually less obtrusive ways.

Some attention difficulties in autism stem from their difficulty in recognising and responding to social signals; this is the case with joint attention. Typical infants of five months will look at items that are held up for them. Considering all the stimulation that surrounds the infant, it is remarkable that they should 'know' to attend to that held-up item. In fact, it is hard to see how this is possible unless there is an innate capacity to recognise holding up objects as communicative gestures, which the infant is programmed to notice and respond to. It is also difficult to see how engaging another in direct eye contact and then looking away should invariably mean (unless the other person has autism) that the person follows the direction of the eye-gaze. The same pattern can be seen with infants following a point, at first when the object pointed to is in front of the child but later on also turning to look when the pointed-to object is behind them. This direction of the infant's attention in typical development enables the world to be quite literally 'pointed out' to them, drawing attention to what is relevant to attend to and allowing other aspects of the environment to fade into the background. Children with autism, in spite of being able to do the geometry of following a gaze or point, do not do so spontaneously or innately, so they do not benefit from this social scaffolding of their attention. This failure has an even bigger effect on development when items are not just held up or pointed at for attention but are also labelled. If the child's attention is elsewhere than on the intended item, then the label may be attached to whatever has attracted the child's attention. This helps explain why individuals on the spectrum are said to have 'idiosyncratic references' for vocabulary items. Without being able to follow automatically the attention directions of eye or finger pointing, they may have little idea of the intended reference.

There are also difficulties, particular to autism, in the development of all aspects of joint attention. Visual joint attention involves seeing something, being aware one is seeing it and also being aware that another is seeing it. Baron-Cohen (1995) and Baron-Cohen and Cross (2007) have suggested a developmental sequence of brain mechanisms leading to understanding of mental states (or 'Theory of Mind') in which the 'Eye Direction Detector' (EDD) plays a vital role. Baron-Cohen has suggested this mechanism is intact in autism and that it is only at the next stage that there are problems, when the EDD feeds into the 'Shared Attention Mechanism' (SAM) that in turn feeds into the 'Theory of Mind' (TOM) module. This assumption has been queried by Jordan (1999) who points out that, although those with autism can work out where people are looking, they are not instinctively programmed to follow the direction of the eyes or points and that has important implications for development. In any case, it is clear that parents and educational professionals have to recognise that they cannot rely on the attention of children with autism being automatically triggered by holding items up or pointing to them with eyes or fingers. They need to draw the attention of those with autism to the referenced item in explicit ways.

In the same way, it is common for teachers and others to switch, in the middle of a discourse, to a new topic, triggered by some sound in the environment. The teacher assumes that because s/he has heard the sound, and that the children have also heard that sound, they will all be aware of this joint attention to the new sound and so will understand the new reference when the teacher switches to commenting on that sound. This assumption will be valid for nearly all of the children, but not for those with autism. A person with autism has described her experience as a secondary school pupil in a mainstream school in the UK, attending a history lesson. She coped with different school subjects by colour-coding all the items (textbooks, notebooks) connected with that subject and by preparing herself for a lesson by reminding herself of its topic as she attended that lesson ('this is History, the topic is Queen Victoria; the teacher will talk about Queen Victoria'). The school was in an old building; it was winter, and the central heating system, based on heated water circulating in radiators, was switched on. In the beginning the pupil was able to understand and make notes as the teacher spoke about the reign of Queen Victoria. But then the radiators started to make a loud rumbling noise, probably due to an air lock in the system. On hearing the noise, the teacher interrupted her discourse on Queen Victoria, to make a comment about the old radiator system and her speculation on the causes of the noise. She had not introduced this new topic, since she had assumed the joint attention of her pupils. Nor did she reintroduce the Queen Victoria topic when she switched back to it. The pupil with autism had heard the noise but just as something that was making it harder for her to hear the teacher; she was not aware that she and the teacher were sharing that experience of the noise. So she maintained her focus on her understanding that the teacher would be talking about Queen Victoria; she did not register the change of topic. Her 'mistake' in assuming the history teacher was talking about Queen Victoria throughout the history lesson was not apparent until the examination at the end of the term included a question on Queen Victoria and the pupil with autism 'answered' it by referring

to the annoying properties of central heating systems and their liability to develop air locks. As the pupil complained many years later: 'How do you all know when the teacher is talking about what she was meant to be talking about, and when she has switched to speaking about something else?' Clearly, it is not a matter of intelligence, or failure to learn or attend; it is failure to understand and register joint aural attention. This same individual reports how she spent years searching for the reference for 'that'. She described many puzzling situations when she was told to 'Get that!' in response to a telephone ringing or was told to 'Look at that!' when something happened, but she had no idea what or where this 'that' was.

One other important aspect of attention in autism is related to what has been called 'monotropism' (Murray et al., 2005). Murray et al. examine the diagnostic criteria for autism and reinterpret those characteristics in terms of what they contend is a fundamental difference in attention. They make the case for autism being at the extremely focused, as opposed to distributed, end of the attention dimension, and claim that apparent difficulties in integrating information and taking account of context come from this highly focused attention, where it is hard to shift attention or take account of anything not present in that narrow attentional frame (Jordan, 1990). Teachers need to teach their pupils signals (e.g. their name) that will get their attention and then remember to use those signals and not assume that the pupils will automatically pay attention as the teacher addresses them. The child's name will need to be taught explicitly as an attentional signal since children with autism do not seem naturally to develop awareness of the significance of their name (Murray et al., 2005). Once the children are responding to their own names, they then need to be taught to respond to all the other identifiers that might be used to get their attention in school ('everyone', 'all the boys', 'Mrs X's class', and so on). Even if the child has learnt to pay attention to such identifiers, the adults still have to remember to use them as attention signals. For example, if the instruction precedes the signal (Do x, John!) John will only alert once he hears his name and so may miss the instruction. Children with autism are often accused of being non-compliant when the truth is that they do not know what adults want them to do.

Another feature of 'monotropism' is that those on the spectrum are only able to attend to one thing at a time. This is true of most people, especially under conditions of stress, but once again those with autism are at the extremes in having this singularity of attention. This helps explain why they may not be able to listen if forced to look at faces and why they need warning to take their attention

from their own interest if they are to be expected to attend to something else.

LANGUAGE AND COMMUNICATION: DIFFERENCES AND DIFFICULTIES

There are many special needs that lead to problems with language development but only in autism can speech develop without communicative ability. Some individuals with autism do have problems developing language but there is nothing in autism itself that prevents language developing. Autism affects communication and, since communication is usually the key that helps the child understand and develop language, that will make it harder for language to develop if there are any other reasons for difficulties in that development. In all other groups, however, communication development always precedes language development and developing speech without the ability to use it for communication is unique to autism. Children with autism who speak but do not communicate face the most difficulties in school since there will usually be an assumption that the failure to use the speech for communication is a deliberate act and thus that the child's failure to obey instructions or participate in communicative exchanges is a behaviour problem rather than a difficulty with communication.

Under DSM-5 (APA, 2013) the subcategories of the autism spectrum that had been a feature of DSM-4 were removed and with that removal went the distinction between 'autism' and 'Asperger syndrome'. Up until then the only distinction between Asperger syndrome and what was known as 'High Functioning Autism' was that the latter group had delayed language development whereas in Asperger syndrome language developed at the normal time or even precociously. The reason why this distinction between the two groups was removed was that, as long as those who had delayed language development went on to develop good language skills eventually, by the time they reached adulthood it was impossible to tell which group had had the delayed language development. It is counter-intuitive to find no difference between those who developed early language and those who may not have started to speak until they were 5 and not started to speak in sentences until several years later. However, that appeared to be the case. This reinforced the view that the characteristic problem in autism was not to do with language development but with communication itself.

That does not mean that there are no language problems associated with autism. Because

language appears to develop separately from communication in autism, it is understood in isolation. The meaning is often taken as fixed and literal, leading to problems with all aspects of pragmatics (the aspects of language that vary with context).

The process of speech development is also different in autism. The typical process starts with intonated babbles, often associated with communicative gestures, and then develops into speech sounds which are gradually put together to make words, then phrases, sentences, and so on. Speech development in autism, however, is often a process of 'breaking down' rather than 'building up' speech structures. The first speech to appear is usually echolalic, often copied from television or computer games, and retaining the intonation and accent of the original. To begin with, these are exact copies, completely unadapted to fit the current context. As an example, the use of personal pronouns is as in the original utterance, taking no account of the fact that the child is now the speaker, not the listener. The computer game may voice something like '*It's time for you to go to the next stage!*' and the child copies that exactly; the child does not change the 'you' to 'me' to reflect the speaker role. The utterances may have no connection with the situation in which they are uttered and no communicative purpose. Over time (a process that can be hastened with training) the child begins to break down these set phrases and can be helped to isolate phrases that can be applied to a variety of situations, e.g. '*time to go … dinner/school/bed etc*'. This process develops from what is known as 'delayed echolalia', where the phrase that is copied may have occurred hours, days or even months earlier.

There is also 'immediate echolalia', where the echo is of something that has just been heard. Sometimes a whole phrase or question is copied; sometimes it is just the last few words that in itself is a symptom of problems in short-term memory. Usually, immediate echolalia is a sign that the child has not fully understood the utterance s/he is echoing. There was a time when echolalia was regarded as an 'autistic habit' and efforts were made to try to prevent it. It is now regarded more positively, recognising that it represents a strategy the child is using to try to manage the situation and teachers target ways of helping children adapt their echolalia rather than aiming at elimination. If children are using echolalia in a 'conversational' exchange, for example, it shows they recognise the need to respond and take their 'turn' in a conversational exchange, but it also shows that they do not understand other people's utterances and we may need to work on reducing the length and complexity of the utterances we are using with the child.

Particular attention needs to be paid to the meaning of echolalia when giving language tests to children with autism. The teacher or speech and language therapist may use a test of understanding that requires the child to point to a picture that represents the concept being tested out of a choice of four. If the child echoes the request to 'Show me *the cat is under the table!*' (with the therapist intending to test understanding of the preposition 'under') then that would indicate that there is something the child does not understood, but it is not clear exactly what it is that is not understood. There may simply be a problem with making a point to indicate a choice; is this procedure clear to the child or does s/he often respond, when required to make a choice, by tapping all the choices? Choice is often a difficult concept for children with autism (and this difficulty is apparent right through the ability spectrum and into adulthood; Hatton et al., 2016) and many do not understand that choice means choosing one thing while rejecting all the others. The next thing to query is understanding of phrases like 'Show me!'. 'Show' is a communicative word and its meaning may well be opaque to the child with autism. The children may be better able to show their actual understanding of the preposition if they are told to 'touch', or even 'put a brick on' the picture '*the cat is under the table*'.

Echolalia is one sign of difficulties in language processing and it is often the case that those with autism have more difficulty in receptive than expressive language. This reverses what is typically the case and so a child's speech may seriously mislead teachers and others into thinking the child's understanding is greater than it is. A young woman with autism, interviewed for a television documentary (Blackburn, 2003), voiced the view that her '*greatest ability* [her language skills] *was proving to be her biggest disability*'. In typical development, fully grammatical speech indicates that the child knows how to communicate, understands concepts, is able to recognise her/his own needs and wants, understands intentions and emotions and that people have minds that can differ from the child's own. None of that may be true of the child with autism but, unless they understand this, teachers, therapists and parents may assume that the child's problems in understanding and expressing these things stems from behaviour rather than communication problems. In a curious way, although children with autism who do not speak have more problems to overcome (and lack of language is a big barrier to development) they often find a more sympathetic and helpful environment in education. Teachers and others may not understand why they are not talking, but at least they recognise the problem and, moreover, they

are biologically programmed to adjust their own speech (speaking in shorter sentences and leaving longer gaps in between; Bruner, 1983) in a way that is very helpful for the child's understanding.

Some problems in understanding language persist into adulthood, Idioms may be painfully learnt but things like sarcasm remain a problem because understanding requires some understanding of intentions and of the context. Sarcasm is also conveyed by facial expression and intonation and these are both cues that the child with autism finds hard to interpret. Sometimes, it is our very teaching that adds to the confusion. The children may be taught that in most situations 'Can you do x?', although phrased as a question, is in fact a command. This helps them in many social situations but then they will be thrown by the genuine 'can you?' question. A potentially tragic outcome occurred when someone with autism was asked 'Can you swim?' before being allowed to get onto a boat for a holiday trip. He had spent many years learning that the correct response to 'Can you?' questions was not to answer 'yes' or 'no' but to obey the command. So he jumped into the water, fully clothed, when in fact he was unable to swim. He was rescued, but imagine the humiliation and frustration. Yet when he challenged his educators as to how he was to know which 'can you' it was (the question or the command) no one could tell him; the truth is that there is so much deeply embedded knowledge that we 'just know' without knowing how we know it and thus how we should teach it.

INTENTIONALITY AND RELEVANCE, INCLUDING CONTEXT

Typical development happens under the influence of what Dennett (1987) called 'the Intentional Stance' and which has more recently been subsumed in theories of 'Theory of Mind' (Goldman, 2012) and 'Agency' (Russell, 1996). The world is observed not as an objective system of behaviours but through the meaning that can be derived from those behaviours. People on the autism spectrum, however, see the world in an objective way, which makes them very well adapted to understand physical sciences and engineering and able to produce original art representing a kind of 'pure' view of the world. Yet this objective view makes it hard for them to feel part of the world themselves (seeing themselves as observers rather than participants; Grandin, 2006) and makes them accurate and detailed observers of behaviour but with no understanding of the intention behind those

actions and thus no idea of agency. An illustration of this is the child with autism who had been taught many aspects of joint attention in his specialist class; he had been taught to follow eye direction and gestural points and thus to make sense of the references underlying these actions. He had also been taught to make some of these referential gestures himself – to draw the attention of others to things of interest in the environment and to comment on those items or events. One day, out for a walk with his class, he passed an area where rubbish bins had been put out for collection. A lid had come off one of the bins and a squirrel had got inside and was pulling out the rubbish. Just as he had been taught, the pupil pointed to the squirrel while commenting 'Look miss!'. His teacher was delighted until he followed up with the comment 'Someone's thrown away a perfectly good squirrel.'

This is a powerful example of the differences in information processing in autism. After all, the pupil knew what the bin was for and it is logically possible (but not a thought that would even occur to anyone else) that someone possessed a squirrel they no longer wanted and so had placed it in the bin. Once again, it is not a failure of intelligence or language, but a failure to appreciate agency. Anyone other than those with autism will recognise the squirrel as an agent – with its own intentions – and different from a mechanical toy squirrel, a puppet squirrel, or a robot. Someone with autism does not perceive these differences, which is one reason why they often find it easier to learn from puppets or robots, where agency can be clearly detected and does not have to be inferred.

Difficulty in understanding agency, including their own, makes it hard for children on the spectrum to take responsibility for their own actions and to feel a true participant in their surroundings. Their difficulty with 'interoception' (the sense of oneself in space and the interpretation of signals from their bodily functions and movements) adds to these problems. It is a curious fact that children on the spectrum tend to perform better in virtual environments than in real situations (Herrera et al., 2008), and Herrera et al. (2006) have suggested that the explicit cues to 'presence' provided in virtual environments may be easier for those with autism to read, than the natural cues in actual environments.

Vermeulen (2015) has drawn attention to another feature of the way children with autism process information, to explain some of the difficulties they face in understanding the world. He discusses how context is not attended to as part of perception (what he refers to as 'context blindness') which leads to failures to adjust according to context. Such a failure would also lead to

difficulties in making sense of the world since the context could not be used to make sense of the details.

CONCEPT AND SCHEMA FORMATION

It is often reported that individuals with autism have problems understanding abstract concepts, but this is probably a misunderstanding. If they have an intellectual impairment, it is true, they may struggle with abstract concepts but autism itself does not necessarily imply this. The confusion is probably twofold. On the one hand, individuals with autism are usually visual thinkers (Grandin, 2006) which means they find it difficult to conceptualise and memorise concepts unless they are able to visualise them. That is easier to do for nouns and verbs but, once the child has language (either verbal or mathematical), s/he can often use that to conceptualise, as long as the concept or idea has been clearly and explicitly described. Individuals on the spectrum usually succeed well with abstract studies such as mathematics, science and music, so in those cases the 'abstractness' is clearly not the problem.

The second reason there may be a misconception about the ability of those with autism to handle 'abstract' concepts is that the term 'abstract' is used in different ways in English. As Grandin (2006) has shown, her problems with concepts are not with those described as 'abstract' (she is, after all, a professional scientist and deals with scientific concepts on a daily basis) but rather with everyday concepts – those described by psychologists as 'fuzzy' concepts. Scientific concepts (as with many abstract concepts) are not acquired naturally, but are defined explicitly and so, as long as the language is understood, they too can be understood by those with autism. But fuzzy concepts are not defined for us; they are 'picked up' through experience. Thus, in Western cultures we understand what 'chairs' are, not because we have been taught a definition of a chair but because we have experience of chairs and we are able to 'abstract' (the verb, not the adjective) from that experience the 'chairness' of chairs, and so on. It is this active process of 'abstracting' that is hard for those on the spectrum because, while they find it very easy to detect differences, they find it hard to pick out what is the 'same', unless items or experiences are identical. Grandin (2006) has tackled her problems in dealing with everyday concepts in a way that is similar to that used in artificial intelligence. She creates a memory bank of each item of an everyday concept (such as 'chairs') that has been identified and, when she meets something she thinks might be a chair, she runs through her memory bank comparing each item. If she finds a match, she will decide it is a chair; if she does not find a match, she will decide it is not a chair unless she is told it is a chair, in which case she will add it to her memory bank. This is only possible because Grandin is highly intelligent with a large cognitive capacity but, even so, it takes her time to go through this process each time she meets something she needs to identify, so it is far from efficient. Jordan (2015) has suggested a better approach would be to make more explicit (and thus more accessible to those with autism) the typical process of seeing the commonalities among items in a concept. It would be the opposite of discrimination learning (which would just reinforce the problems people with autism have in recognising similarities); it would be 'general case programming' (to use behaviourist jargon) or 'sorting'. For example, learning to sort all red items from all non-red items would make the 'redness' explicit. Whether this would solve the problem altogether is an empirical question that needs to be tested.

MEMORY

Memory has often been assumed to be functioning well in autism and it has been found to be the most common 'savant' ability in autistic savants (Howlin et al., 2009; Clark, 2016). The commonly reported, highly developed (even savant) memory abilities are things like dates (calendar calculators), places, musical pieces, and facts. Yet this does not mean that memory processing is intact in autism and even those with apparent savant abilities do not seem able to generalise their skills to affect their everyday memory abilities (Boucher & Bowler, 2008). Most memories have to be cued or prompted and personal episodic memories in particular are a problem in autism possibly, as suggested by Jordan and Millward (1997), because of difficulties with an 'experiencing self' (as discussed above in relation to problems in feeling part of their own experiences). This makes it hard for individuals with autism to store and report memories in relation to themselves so they rely on responding to external cues or on semantic memory (stored knowledge of 'facts').

Difficulties in abstracting the 'gist' of events, as referred to above in relation to concept formation, also compound the memory problems. As a result, those on the spectrum often rely on one of

two strategies: they may repeat everything associated with the memory (as when they give the full soundtrack of a film when asked to say what it was about); the second strategy is to pick one personally meaningful image of an event to 'stand for' that event (as when they give one single frame of a film in response to being asked what the film was about). They need to be taught explicitly how to use a range of memory strategies and to judge which strategy is the most appropriate for a given situation.

CONCLUSION

Although the learning needs of those with autism have considerable overlap with those found in other developmental disorders, there are also some that are unique to autism. These are characterised by problems in responsiveness to social signals and in developing a social perspective on understanding the world and the people within it. The autism spectrum is heterogeneous and so it is important to adopt an individualised perspective in education, informed by an understanding of the direct consequences of autism.

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