Autism Spectrum Disorder

The term Autism Spectrum Disorders is an umbrella term used to refer to autism, Asperger Syndrome, Rett's Disorder and pervasive developmental disorder – not otherwise specified. They share a set of diagnostic criteria based on two areas, social - communicative impairment and restrictive and repetitive behaviours (American Psychiatric Association, Diagnostic Statistical Manual DSM -5, 2014). Under the DSM-5 criteria, individuals with ASD must show symptoms from early childhood, even if they are not diagnosed until later. The criteria for ASD include two domains: social-communicative impairment and restrictive and repetitive behaviours, interests, or activities (Volkmar & McPartland, 2014). The DSM-5 criteria also include "severity levels" which describe different levels of support and impact on an individual's functioning level. The idea of a spectrum captures the wide individual variation within both domains how in which they manifest themselves and their severity (Frederickson & Cline, 2009). The DSM-5 states that individuals with a "well-established" diagnosis of autistic disorder, PDD-NOS, or Asperger Syndrome should receive a diagnosis of ASD.

Identification/Diagnosis
The diagnosis of autism has no biological marker; there is no blood test which can confirm the presence of this complex disorder. It is not something that is immediately evident at birth. The diagnosis is based on sets of behavioural characteristics that cluster together often enough to form a syndrome (Jordan, 1999). The National Initiative for Autism: Screening and Assessment Working Group have developed guidelines for identification, assessment, diagnosis and access to early interventions for preschool and primary school children with ASD (NIASA, 2003). Howlin and Moore (1997) reported that diagnosis is usually made after the age of 24 months, even though it is possible to recognise and diagnose by the age of 18 months. Social and communication skills are only emerging in the infant and young toddler. They are more advanced in the three or four year old. In this age group, deficits are much more noticeable. Therefore educators and other professionals may encounter children with ASD who have not yet been diagnosed.

The deficits in social communication and social interaction can be recognised across multiple contexts and the following examples are not exhaustive (DSM-5, 2013).
- Deficits in social - emotional reciprocity for example, responding inappropriately in conversations.
- Deficits in nonverbal communicative behaviours used for social interaction for example, abnormalities in eye contact and body language or misreading/ misusing nonverbal gestures.
- Deficits in developing, maintaining and understanding friendships for example, difficulties in sharing imaginative play or a lack of interest in peers.

The deficits in restricted, repetitive patterns of behaviour, interests, or activities, are recognised through its' manifestation in at least two of the following, currently or by history (examples are illustrative, not exhaustive):

- Stereotyped or repetitive motor movements, use of objects, or speech, for example echolalia.
- Overly dependent on routines or verbal nonverbal behaviour for example, extreme distress from routine changes.
- Intensely focused on inappropriate items (e.g, strong attachment to or preoccupation with unusual objects).
- Hyper- or hyporeactivity to sensory input or unusual interests in sensory aspects of the environment (e.g., apparent indifference to pain/temperature, adverse response to specific sounds or textures, excessive smelling or touching of objects, visual fascination with lights or movement).

Severity is based on social communication impairments and restricted, repetitive patterns of behaviour. The severity describes the wide variation within the umbrella term of ASD. It is important that symptoms must be present in the early years, that these symptoms cause significant impairment in social, occupational, or other important areas of the child's life and these behaviours are not better explained by intellectual disability (intellectual developmental disorder) or global developmental delay.

Intellectual disability and autism spectrum disorder frequently co-occur but to make this diagnosis social communication should be below that expected for general developmental level.

History of Causes

There are many theories of the causes of ASD. In 1943, Leo Kanner was the first to describe a group of young people presenting a pattern of behaviour he referred to as "early infantile autism" (Silberman, 2015) These children were aloof, mute, echolalic, or had idiosyncratic speech. There were four main characteristics for diagnosis of these children:

- Autistic aloofness
- Delayed or abnormal speech development
- An obsessive desire for sameness
- Onset in the first two years of life

This was referred to by Kanner as 'early childhood autism' and today is described as Kanner's or 'classic autism'. Kanner described similar behavioural patterns among a number of children he had seen working as a psychiatrist in John Hopkins University. The understanding of causes of autism has progressed a long way since Kanner's autism, leading to Bettelheim's (1967) psychodynamic theory of the 'refrigerator mother' suggesting that a cold, detached mother could make the child turn inward on themselves and withdraw from the world. His theory was based on case studies and pre-dated experimental methods. Recent research reverses the idea of poor attachment between these children and their mothers but indicates instead that they form a different pattern of attachment.

Following the emergence of autism as a diagnosis there was a period when the condition was equated with childhood schizophrenia and listed under psychosis. Some clinicians had a bias towards mental illness as an explanation for autism and this perspective continued right through the 70's and on to the early 1990's. However, research found that it was difficult to link comparisons with autism and childhood schizophrenia or psychosis.

Michael Rutter reformulated the features of autism by placing an increased emphasis on the social and communication difficulties (Rutter, 1978). In doing so, he moved away from the whole relationship to psychosis. He suggested four essential criteria for diagnosing autism:

- Delayed and deviant language development
- Impaired social development
- Insistence on sameness
- Onset prior to 30-36 months of age

These formed the basis for diagnostic criteria in the diagnostic and classification manuals used both in Europe (International Classification of Diagnosis, ICD, WHO, 1992) and in America (Diagnostic and Statistical Manual, DSM, APA, 1994). These classification systems are reviewed and updated regularly. The current versions are the DSM 5 and the ICD 10. Autism Spectrum Disorder has been overhauled a number of times across versions of these diagnostic manuals.

At around the same time as Kanner was shaping his theory of autism, Hans Asperger (1944) wrote about another pattern of behaviour in older children and adolescents. Asperger syndrome, like autism, is characterised by impairments in social function and an obsessive or narrow range of interest and routine. Children with AS may lack pragmatism and interrupt current conversations by embarking on totally unrelated conversation topics (Attwood 2008; Smith, Cowie and Blades, 2003; Wall 2004). There is no marked delay in language development, although speech can be monotone or stilted (Wing & Gould, 1979; Wall 2004). These children are of normal intelligence and this is perhaps why some professionals use the term 'Asperger syndrome' interchangeably with 'high-functioning autism' (HFA).

Building upon the work of Hans Asperger, Lorna Wing developed the idea that autism and Asperger syndrome were not distinct and separate, but were part of a continuum of disorders. The proposed continuum spanned classic or Kanner's autism at one end and high-functioning autism or Asperger syndrome (AS) at the other.

In the early '80s, Wing and her colleagues (Burgoine & Wing, 1983) described the main features of Asperger syndrome which coincided with many of those diagnosing Autism, for example, little or no ability to form friendships. The notion of the continuum became popular and was then called a spectrum of disorders to reflect the overlap in categories along the continuum. Building on the model of a continuum of disorders Lorna Wing went on to propose a triad of deficits to facilitate diagnosis (Wing, 1992). The triad includes:

- Impairments of social interaction

- Communication impairments
- Lack of flexibility in thinking

There is some debate in the literature as to whether autism and Asperger syndrome are two distinct categories. It is now accepted that both of these are part of the autistic spectrum disorders with classic autism at one end and high-functioning autism or Asperger syndrome at the other. This is reflected in the recent revisions to the DSM-5 where Asperger syndrome is no longer a distinct category but part of Autism Spectrum Disorder.

The DSM-5 moved away from the triad of impairment by combining social communication skills together. The DSM-5 diagnosis of ASD is based on two areas of difficulty:

1. Social communication and interaction
2. Restricted, repetitive patterns of behaviour, interests, or activities

The main change in the DSM-5 is to shift from giving a name to the condition to identifying all the needs someone has and how these affect their life. Other changes include adding for the first time sensory behaviours in the criteria, under the heading restricted, repetitive patterns of behaviours descriptors. There is also a 'dimensional element' to the diagnosis which indicates the severity of the condition. Individuals are rated level 1 to level 3 – indicating what level of support is needed (Lord, 2013).

The theories on ASD that we will examine can be divided into two categories, cognitive and biological theories.

Cognitive theories

Cognitive theories of ASD look at the deficits in functioning in the now dated concept of the triad areas of - communication impairments, impairments in social communication, and lack of flexibility in thinking underlying this disorder. They attempt to explain them in terms of the processing of thoughts in the brain. There are three main theories in this area (1) Theory of mind / mind-blindness (Baron-Cohen and other (1985), (2) Weak central coherence theory (Frith, 1989) and (3) Executive function deficit (Ozonoff, 1997). However none of these theories provides a standalone explanation of ASD.

Biological Theories
The biological theories include genetics, metabolic theories and the role of vaccination as causal factors in autism. This disorder has a strong neurobiological basis, with definite evidence of a genetic component. We know also that there is definitely more than one gene involved.

Genetic

Kanner was before his time in postulating a genetic element for ASD. Recent research by the National Institute for Mental Health (NIMH, 2009) suggests that autism could be a genetically-based brain disorder that develops during the first few weeks of foetal growth. Research also indicates that, in families with one autistic member, that social, communicative and repetitive behaviours are more common in biological relatives (Szatmari 2000, quoted in Rutter, 2005). Other evidence for a genetic component to ASD is that the condition has a high familial loading. ASD is 50 times more frequent in siblings of people with ASD (Smalley, 1997). There is also a high rate of language disorder and social impairment in siblings (Bolton and others, 1994). In addition to this 10% of children with ASD may have a co occurring genetic or chromosomal disorder (NAC, 2014).

Paternal age
Recent research on a small sample in Iceland (Kong and others, 2012) indicates that paternal age may have an influence on the likelihood of children developing autism as a consequence of increased mutation of genetic material in older fathers. The researchers suggest that the current apparent increase in ASD may be due to the increase in the age at which fathers in western cultures wait to have children, and therefore the number of potential genetic mutations they pass on to their offspring.

Metabolic theories
There are two metabolic theories, one which involves a hormone supplement, **Secretin**, and a food supplement, **Dynothinolisean Dimethylglycine (DMG)**. A review of research on impact of secretin on children with ASD (2000-2010) found that there were no significant improvements in cognition, language or autistic symptoms. The authors concluded that secretin as an intervention was not effective (Krishnaswarmi, McPheeters and Veenstra-VanderWeele, 2011).

Dynothinolisean Dimethylglycine (DMG) is a food substance found naturally in liver and brown rice. It has been used as an intervention for children with ASD and some parents report improvements in eye contact, speech, social behaviour and attention span.

Adding Vitamin B6 to the diet is reported to improve behaviour and reduce hyperactivity. Again, there is no defined research to support these anecdotal reports of improvements yet also no evidence that it does harm.

Vaccination theories: the controversy
There has been much media publicity regarding vaccinations, in particular the alleged link between the MMR vaccination and autism spectrum disorder. The research originally presented was a study conducted by Wakefield, Murch and Anthony (1998). The study was based on 12 patients who were diagnosed with bowel disease and ASD. The authors speculated that, based on parents' memories, the symptoms had occurred around the time of the MMR and so that there could be a causal link. It was proposed that, as a result of the

MMR vaccination, the intestine would not absorb minerals essential to brain functioning. This deficiency would cause the developmental disability and possibly ASD.

The Centre for Disease Control commissioned an independent study into the vaccines. A report entitled *Immunisation Safety Review: Measles-Mumps-Rubella Vaccine and Autism* (Stratton and others, 2001) rejected any causal link between the vaccine and ASD. Other groups have also investigated this issue (World Health Organisation and the American Academy of Paediatrics), reaching similar conclusions.

The MMR controversy points to an increase in the prevalence of ASD. It must be noted, however, that this phenomenon may be a reflection instead of increased screening and changes in definition and diagnostic techniques. On the other hand, while Rutter (2005) rules out a link between MMR and ASD, he says that is it is possible that there are idiosyncratic responses to MMR that involve ASD.

The growing prevalence of ASD: A global concern

ASD has been on the rise. Since the 1990s there has been a dramatic worldwide increase in the reported incidence of ASD. There have been many difficulties with estimating the prevalence of ASD. Various studies have cited rates ranging from 3 to 20 instances per 10,000 births. The most recent study from the Centre for Disease Control and Prevention (2014) suggests that it affects 1:68 children in the USA. It can be found in all cultures of the world, and does not discriminate based on race, socioeconomic status, education of parents, or other demographic variables (Wong, Hui, & Lee, 2004; Howlin & Asgharian, 1999).

Gender ratios

Research suggests there is a higher ratio of boys to girls across both ASD and Asperger syndrome. Approximately three to four times more boys than girls are diagnosed with ASD. Again, figures on this vary from a 4:1 to an 8:1 ratio (Hanbury, 2012). The most recent data from the USA suggestion that ASD is almost five times more likely to occur in boys than girls (National Autism Centre, 2014). It has also been noted that there are more boys diagnosed at the top or at the Asperger's end of the spectrum, with a ratio of 14:1 males to females (Fredrickson and Cline, 2009).

Conclusion on prevalence

Is prevalence increasing or are we better at detecting it? Fombonne (2003), for example, gives two reasons for the increasing prevalence:
- Better diagnosis
- Broader definition of ASD

There may also be factors such as the availability of better educational services to children with a diagnosis of ASD in certain school districts. Parents may also be actively looking for a diagnosis in order to access services for their children. According to Rutter (2005), it is

possible that there has been a true increase in ASD. If this is the case, in his view, then an environmental risk factor is most likely.

Assessment

The diagnosis of autism has no biological marker; there is no blood test which can confirm the presence of this complex disorder. It is not something that is immediately evident at birth.

It is instead inferred from behavioural patterns: diagnosis requires close observation as well as a developmental history.

We rely on early social skills as the marker for early onset of autism. The lack of social relatedness is considered to be the main symptom and deficit in ASD. This trait, however, often presents much later, when children are exposed to social life outside their homes. In early assessment or screening devices, it is this quality of the child's social interaction which is the key.

Parents often report the onset of symptoms from 16 to 18 months. However, many parents do not get a formal diagnosis until the child is five years old (Howlin and Moore, 1997). Social and communication skills are only emerging in the infant and young toddler. They are more advanced in the three or four year old. In this age group, deficits are much more noticeableAssessment consists of rating scales and checklists or using the categories of the ICD 10(UK) and the DSM-5 (USA/Europe).

Among the professionals who can diagnose Autism Spectrum Disorders (ASDs) are psychologists, psychiatrists, speech and language therapists, paediatricians and neurologists. No one professional involved in the assessment of ASD can reach a sound diagnosis without the gathering of information from a range of sources and the contributions of the views of key people in the child's life.

Central to the process are the accounts of parents, school staff and the child themselves. The purpose is not only to arrive at diagnosis but also, crucially, to identify the youngster's strengths, skills and supports: these form the basis of successful interventions. The emphasis, therefore, should be on the positive aspects of the child's abilities and motivating factors, not exclusively on problems.

Process of Assessment

The process of assessment for ASD typically includes some or all of the following elements listed here. In this section we will examine each of these elements in turn.

1. Direct observation
2. The clinical interview
3. Behaviour rating scales/checklists
4. Educational reports
5. Formal testing
6. Occupational therapy and physical therapy assessment
7. Psychosocial assessment
8. Paediatric and/or neurological investigation

Interventions

The National Autism Centre (NAC, 2011) in the USA reviewed the educational and behavioural intervention literature published between 1957 and 2007 that targets the core characteristics and associated symptoms of ASD. They graded all interventions according to an evidence-base which included established interventions for which there is evidence, emerging interventions where there is some evidence and emerging interventions where there is no evidence or the intervention is in the process of being researched, see table below.

Established interventions	Emerging interventions	Interventions with no evidence-base
• Behavioral Interventions • Cognitive Behavioral Intervention Package • Comprehensive Behavioral Treatment for Young Children • Language Training (Production) • Modeling • Natural Teaching Strategies • Parent Training • Peer Training Package • Pivotal Response Training • Schedules • Scripting • Self-management • Social Skills Package • Story-based Intervention	• Augmentative and Alternative Communication Devices • Developmental Relationship-based Treatment • Exercise • Exposure Package • Functional Communication Training • Imitation-based Intervention • Initiation Training • Language Training (Production & Understanding) • Massage Therapy • Multi-component Package • Music Therapy • Picture Exchange Communication System • Reductive Package • Sign Instruction	• Animal-assisted Therapy • Auditory Integration Training • Concept Mapping • DIR/Floor Time • Facilitated Communication • Gluten-free/Casein-free diet • Movement-based Intervention • SENSE Theatre Intervention • Sensory Intervention Package • Shock Therapy • Social Behavioral Learning Strategy • Social Cognition Intervention • Social Thinking Intervention

	• Social Communication Intervention • Structured Teaching • Technology-based Intervention • Theory of Mind Training	

Phase 2 of this project was launched and looked at studies from 2007 to 2012. This is referred to the NSP 2 – Phase 2 and the report was launched in 2014 (NAC, 2015).

Interventions for younger children

The UK-based approaches, while not listed in the NAC report, are well-known and widely used with success. Some but not all of them are evidence-based.

The interventions most commonly used in the USA include LEAP and Walden (Handleman, and Harris , 1994).

The USA also use the general intervention approach HELP and the language-based intervention Hanen.
In the UK, Earlybird is most common preschool programme developed by the National Autistic Society (NAS, 2003). Hanen is also sometimes used in the UK with pre-schoolers and early school-aged children with language difficulties.

Modelling has been successfully used to teach social skills in a range of areas and the use of videotaped models appears particularly effective (Charlop - Christy and others, 2000). There are three types of video modelling reported in the literature (Mechling, 2004).

Type	Details
Basic modelling approach	An adult or peer 'model' demonstrates a social behaviour that can be imitated in a short video segment (five to 15 seconds long). The child and adult review the tape and the adult prompts the child to try it.
Self-modelling approach	The learner's best performance or advanced performance of a skill is created by editing video segments to show perfect performance.
Virtual reality modelling	A video is created from the perspective of the person performing the task so a recording is made of what the person would see while engaging in the task. This is a type of virtual reality approach, recreating on video what the person would encounter in real-life experience. This has been used to teach and also to

	help students become accustomed to situations and experiences.

Interventions for those who are verbal and have a diagnosis of High Functioning Autistic Spectrum Disorder

The difficulties of children are unique. These children attend mainstream schools and (some argue) are of normal intelligence but they have significant deficits in social skills. They can respond to interventions that are at a higher cognitive level. You can explain social situations to them and how their behaviour impacts on others. There are a number of packages which involve teaching children with ASD by using peers (Attwood, 1998; Aarons and Gittens, 1998; Sng, Carter & Stephens, 2014). Typically they involve facilitating play and social interactions. Peers can be siblings or classmates.

- Circle of Friends
- Social skills groups
- Peer-mediated interactions
- Peer-mediated techniques
- Peer-tutoring
- Buddy systems
- Script-fading procedures

More recently video technology is been used to support these students in learning social skills. Video technology is readily available to most parents and school staff and it can be operated easily (Goldsmith and LeBlanc, 2004; Hayes and others, 2010). Goldsmith and LeBlanc caution that:

- The video models should display clear and detailed behaviours
- The relevant stimulus feature must be made as salient as possible while minimising other distracting features

Modelling has been successfully used to teach social skills in a range of areas and the use of videotaped models appears particularly effective (Charlop Christy et al., 2000). Ying Sng, Carter and Stephenson (2013) reported that audio scripts are more effective than scripts and video modelling in teaching conversational skills to people with autism spectrum disorders.

Best Educational Practices for children with Autism Spectrum Disorder
 As the complexity of each child with autism varies, careful assessment is of needs and ongoing evaluation of progress should allow the construction of tailored programmes (Frederickson & Cline, 2009). Features common to working interventions for teaching children with autism include; structure in practice, procedures and the physical environment, clarity in purpose, expectations and outcomes, consistency across environments and between people, modification of practice and the environment to the culture of autism and acceptance of the culture of autism, its differences and strengths (Jordan & Powell, 1996). The DfES Autism Working Group (DfES 2002) advises that educational programmes for individual children consist of; a programme with a focus on communication, regardless of the language ability of the child a programme which involves social interaction, play, leisure and life skills access to the academic curriculum which may emphasise structure, visual learning and modelling of activities and behaviours.

Digital interventions could be based on known approaches such as TEACCH (Mesibov, Shea & Schopler, 2004) (Treatment and Education of Autistic and related Communication handicapped children) which is a structured teaching method based on a recognition of the characteristic strengths and impairments of people with autism. Strengths are typically special interests, rote memory skills, visual processing, attention to detail and affinity for routine. Whilst impairments are generally; verbal expression, auditory processing, high distractibility, organisational skills, generalisation of skills and difficulty with change.

Guidelines for effective interventions for students with children with ASD can be summarized as follows

- Simple instructions presented one at a time

- Set clear expectations –use visual cues if possible

- Clear reinforcement for work on task and achieving small goals

- Focusing on success

- Build emotional literacy help identify emotions in situation as presented on screen

- Build language and communication using visual cues

- Build comprehension of social situations

- Build frustration tolerance with waiting and cues and reinforcement for waiting

- Create positive emotion through positive experience

- Check for repetitive behaviour

- Limit sensory input on screen volume, light, etc

- Link games to area of interest

- Reminders to stay focused and on task
- Limit distractions on screen
- Cue the beginning and end of an activity
- Use pictorial cues to show sequences of activities
- Show the end results and steps along the way
- Allow them to compare results against a visual checklist or photo of proposed end result
- Reminders of the goal and achievements to date.

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