

Chapter 20

The Overlap—Dyslexia

Attention, Coordination, Auditory Processing and Numeracy

Introduction

This chapter will look at the overlap between dyslexia and other learning challenges. There will also be a specific focus on the areas mentioned in the title—attention, movement and coordination, auditory processing and numeracy difficulties. Therefore, there will be a focus on attention deficit hyperactivity disorder (ADHD), dyspraxia and dyscalculia, auditory processing difficulties and central auditory processing difficulties, and dyscalculia. Initially I felt it might be more practical to allocate these to separate discrete chapters, but on further reflection I felt this would be imposing what can be quite artificial boundaries on these different areas of learning and performance. It is noted below that the overlap between these factors is more prevalent than the discrete condition. This has been known about dyslexia for many years now but, as can be seen later in this chapter, more recent research has also highlighted the association between ADHD and the autistic spectrum, and there are many examples of other overlapping factors.

As indicated above, it can be argued that the overlap between dyslexia and one or more of the other specific learning difficulties is more prevalent than one would anticipate, and this needs to be carefully considered in both diagnosis and intervention. Gillberg (2010) points out that clinicians have become focused on dichotomous categories of disorders. This has led to a preoccupation with increased specialisation and, as a result, difficulties not within their immediate sphere of interest tend to be overlooked. Gillberg has argued that the coexistence of disorders is the rule rather than the exception, and dyslexia overlaps with other syndromes in both cognitive and behavioural features (Reiersen and Todd, 2008; Simonoff et al., 2008).

Gavin Reid, *Dyslexia: A Practitioner's Handbook*, Fifth Edition.

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Snowling (2012) suggests a new dimensional classification of disorder. She argues that deficits in different components of learning should be seen as 'additive', rather than classing children into dichotomous 'disorder' categories.

Taylor (2011) notes that for many children it is better to think of changes in cognitive style, learning and motivation rather than symptoms. Taylor concludes that it is important to examine children for evidence of co-occurring disorders, and not simply to continue to examine the areas we expect to be impaired according to categorisation. The practical application of assessing children for a range of difficulties is that children will be best helped not by an all-encompassing diagnosis, but by individual analysis of their strengths and weaknesses. Reid et al. (2006) suggest that ADHD is a chronic condition that affects 3–5% of children. They indicate that there will be an impairment in behaviour and academic performance in school and/or at home, and this overlap with other factors is the most common type of comorbidity that occurs in schools.

The Overlap Dilemma

One of the major issues facing teachers is the dilemma concerning the overlap between the various syndromes and how this can be associated with learning difficulties or differences. The term normally used in the UK is specific learning difficulties, while in the USA it is learning disabilities, and now with DSM-5¹ the term specific learning disorder is used. Within these broad terms there are a number of more specific labels such as dyslexia, dyspraxia, attention difficulties, dyscalculia and specific language disorder and auditory processing difficulties (APD or CAPD).

There will very likely be overlap between these syndromes, and the student identified as dyslexic will likely have some of the characteristics of the other syndromes. In fact, Weedon and Reid (2002, 2005) identified 17 specific learning difficulties during the development of a screening procedure for identifying a user-friendly matrix for specific learning difficulties. It was indicated during the piloting of the instrument that at least seven of these had strong correlations (Weedon and Reid, 2003).

Like dyslexia, many of the other specific learning difficulties can be seen within a continuum. The term 'comorbidity' is commonly used to describe the overlap between the different specific learning difficulties. This is an acknowledgement that specific learning difficulties can be found within a continuum and that there is likely to be some overlap between several of these. Moreover, since neurological processing activities tend to be interactive rather than independent, it is likely that,

¹ See <http://www.dsm5.org/Documents/Specific%20Learning%20Disorder%20Fact%20Sheet.pdf> for a factsheet on DSM-5-specific learning disorders.

for example, children with dyslexia may share some of their characteristics with children diagnosed as having a specific language impairment.

Came and Reid (2008) propose the view that teachers should focus on a set of core concerns. This implies that many children will share some of the same difficulties even though they have been identified with different syndromes. For example, many will have:

- attention difficulties;
- memory problems;
- organisational difficulties;
- difficulties with processing speed.

They propose, therefore, that tackling those four areas alone will help to meet the needs of most children identified with dyslexia, dyspraxia, ADHD and dyscalculia. So, rather than focus on the label, they suggest that teachers should be focusing on core concerns. This means that teachers will not feel deskilled (often, when faced with children with labels, teachers who have not been on any specialist training courses can easily feel deskilled).

Attention Issues

There has been considerable debate regarding the concept of attention disorders. A number of perspectives can be noted, ranging from the medical to the educational and social. It is, however, interesting to note that in the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; APA, 2013), ADHD is still noted as a prevalent neurodevelopmental disorder of childhood. DSM-5 uses the same diagnostic criteria as DSM-IV and suggests 18 symptoms. It also uses the same symptom domains—inattention, hyperactivity and impulsivity. DSM-5 does add some aspects that were not present in DSM-IV. For example, application across the lifespan and the cross-situational requirement have been strengthened to several symptoms in each setting. Additionally, the onset criterion has been changed from 'symptoms that caused impairment were present before age 7 years' to 'several inattentive or hyperactive-impulsive symptoms were present prior to age 12'. Further, a comorbid diagnosis with autism spectrum disorder is now allowed in DSM-5.

Discrete Syndrome?

Although there has been a considerable amount of literature on attention deficit disorder (ADD) and ADHD, there is still controversy regarding the condition as a discrete syndrome. There is also ongoing debate on the nature of the syndrome

and particularly its primary causes. For example, Barkley (1997) suggests that it is a unitary condition and that the primary impairment relates to behaviour inhibition, which has a cascading effect on other cognitive functions. This view is, however, countered by Rutter (1995), who suggests that a cognitive deficit specific to ADHD has still to be determined and that even if the majority have cognitive impairments, the trait is not common to all children with ADHD. It is perhaps useful at this point to attempt to place the symptoms and characteristics of ADHD into some form of framework to help understand the different strands and various characteristics that can contribute to ADHD. Chia et al. (2010) view ADHD as a classification of behavioural difficulties.

These key markers typically manifest as a loss of self-control, poor self-regulation and a deficit in inhibitory control (Taylor et al., 2006). But it is encouraging that DSM-5 classifies ADHD as a neurodevelopmental disorder, separate from the disruptive behaviour disorder classification that it was under in DSM-IV. Al-Yagon et al. (2013) suggest this can provide a clearer mapping for intervention and will in fact be less restrictive. It is well accepted that children with ADHD will have self-esteem issues and, although medication is often sought, Fox et al. (2005) argue that 20% of children with ADHD do not respond to stimulant medication.

Framework for Attention Difficulties

The causal modelling framework used to describe dyslexia in Chapter 2 (Morton and Frith, 1995) can also be applied to ADHD. This framework focuses on the neurological, cognitive, behavioural and environmental levels. These categories can be applied to all of the specific learning difficulties, as the framework presents an overview that highlights both the different dimensions that can impact on the child and also the notion of how the impacts of these can overlap—e.g. attention/impulsivity can be due to all four of the dimensions. This will have some effect on the intervention required. It indicates that even if the cause is found to be neurobiological, the behaviours can be controlled through intervention at the cognitive or classroom (educational) level.

Neurological Level

At the neurological level, in relation to attention difficulties, the following factors may be relevant:

- *Hemispheric preferences*—Usually, a child with ADHD would be a right hemisphere processor.

- *Saliency determination*—That is, recognising what is relevant. Often, a child with ADHD would have difficulty in recognising the relevant features of conversation or written work.
- *Auditory distractibility*—This would imply that they will be easily distracted by noise of some sort.
- *Tactile distractibility*—Similarly, touch could be distracting and, often, the child with ADHD may want to touch in order to be distracted.
- *Motor inhibition*—Often, children with ADHD may have difficulty in inhibiting response and may react impulsively in some situations.

Cognitive Level

In relation to the cognitive dimensions, the following factors may be significant:

- *Depth of processing*—If the child is not attending to a stimulus, then it is likely that the processing will be at a shallow as opposed to a deep level. Clearly, if this is the case, then the child will not gain much from the learning experience, either in understanding or in pleasure; therefore, the learning experience will not be automatically reinforced.
- *Information processing*—Just as in the case of dyslexia, the information-processing cycle of input, cognition and output can be influential in identifying the types of difficulties that may be experienced by children with attention difficulties. This would therefore have implications for teaching.
- *Metacognitive factors*—These are important for reinforcing learning, for transferring learning and for developing concepts. It is likely the child with attention difficulties will have poor metacognitive skills, and this will also make learning less meaningful and have a negative effect on attention span.

Classroom Factors

In relation to educational or classroom factors, the following can be considered:

- *Factors associated with free flight*—This means that the child will have little control over the thinking process (essentially, what may be described as a right hemisphere processing style). This would mean that the individual would require some structure to help direct their thinking processes.
- *Unpredictability, inconsistency and impulsivity*—This again indicates that there is little control over learning and that many actions would be impulsive.
- *Pacing skills and on-task factors*—These again indicate a lack of control over learning and that students with attention difficulties have a problem with pacing the progress of work and, therefore, may tire easily or finish prematurely.

Identifying and Defining Attention Difficulties

Examining the factors described above would lead one to believe that attention difficulties and ADHD can be easily confused and that the condition would be difficult to identify as a discrete syndrome.

It is not surprising, therefore, that a number of definitions of ADHD are currently used and a considerable amount of literature on the subject has expounded different views and a variety of interventions. Essentially, however, identification seems to be through the use of diagnostic checklists or observations, such as the Brown Rating Scale (Brown, 1996, 2001) and the Conners rating scale, 3rd edition (Conners, 2008, 2015). This edition of the Conners rating scale has been updated to provide a new scoring option for the DSM-5 Symptom Scales. The Conners scale is very comprehensive and well evaluated.

Criteria

It is, therefore, possible to identify attention difficulties within an education setting, although in practice much of this type of diagnosis appears to be undertaken by medical/clinical professionals, even though presenting difficulties are usually more obvious in school. If a child is said to have attention difficulties, then these should be obvious in every subject and in all activities. In practice, this is rarely the case and must cast some doubt on the validity of the diagnosis.

As in previous editions, DSM-5 acknowledges that there is no single test to diagnose ADHD and it can overlap with other categories. The diagnostic standard set by DSM-5 is recognised internationally and can provide guidance to education authorities in all countries. Some of the important changes made in DSM-5 in relation to ADHD include:

1. symptoms can now occur by age 12 rather than by age 6;
2. several symptoms now need to be present in more than one setting rather than just some impairment in more than one setting;
3. new descriptions were added to show what symptoms might look like at older ages;
4. for adults and adolescents age 17 or older, only five symptoms are needed instead of the six needed for younger children.

It is also important to acknowledge that although DSM-5 provides criteria for diagnosis of attention difficulties, only trained professionals (usually psychologists or medical professionals) will be able to diagnose ADHD.

DSM-5 states that children and adults with ADHD will show a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development. The following provides details of these potential problem areas/symptoms.

Inattention—six or more symptoms of inattention for children up to age 16, or five or more for adolescents aged 17 and older and adults; symptoms of inattention have been present for at least 6 months, and they are inappropriate for developmental level:

- Often fails to pay close attention to details or makes careless mistakes in schoolwork, at work or with other activities.
- Often has trouble holding attention on tasks or play activities.
- Often does not seem to listen when spoken to directly.
- Often does not follow through on instructions and fails to finish schoolwork, chores or duties in the workplace (e.g. loses focus, side-tracked).
- Often has trouble organising tasks and activities.
- Often avoids, dislikes or is reluctant to do tasks that require mental effort over a long period of time (such as schoolwork or homework).
- Often loses things necessary for tasks and activities (e.g. school materials, pencils, books, tools, wallet, keys, paperwork, eyeglasses, mobile telephone).
- Is often easily distracted.
- Is often forgetful in daily activities.

Hyperactivity and impulsivity—six or more symptoms of hyperactivity-impulsivity for children up to age 16, or five or more for adolescents 17 and older and adults; symptoms of hyperactivity-impulsivity have been present for at least 6 months to an extent that is disruptive and inappropriate for the person's developmental level:

- Often fidgets with or taps hands or feet, or squirms in seat.
- Often leaves seat in situations when remaining seated is expected.
- Often runs about or climbs in situations where it is not appropriate (adolescents or adults may be limited to feeling restless).
- Often unable to play or take part in leisure activities quietly.
- Is often 'on the go', acting as if 'driven by a motor'.
- Often talks excessively.
- Often blurts out an answer before a question has been completed.
- Often has trouble waiting his or her turn.
- Often interrupts or intrudes on others (e.g. butts into conversations or games).

In addition, the following conditions must be met:

- Several inattentive or hyperactive-impulsive symptoms were present before the age of 12 years.
- Several symptoms are present in two or more settings (e.g. at home, school or work; with friends or relatives; in other activities).
- There is clear evidence that the symptoms interfere with, or reduce the quality of, social, school or work functioning.

- The symptoms do not happen only during the course of schizophrenia or another psychotic disorder; the symptoms are not better explained by another mental disorder such as a mood disorder, anxiety disorder, dissociative disorder or personality disorder.

Based on the types of symptoms related to ADHD, there are three kinds (presentations) of ADHD that can occur:

1. *Combined presentation*—If enough symptoms of both criteria, inattention and hyperactivity-impulsivity, have been present for the past six months.
2. *Predominantly inattentive presentation*—If enough symptoms of inattention, but not hyperactivity-impulsivity, have been present for the past six months.
3. *Predominantly hyperactive-impulsive presentation*—If enough symptoms of hyperactivity-impulsivity but not inattention have been present for the past six months.

Given that symptoms can change over time, the presentation may change over time as well.

There are some key issues to consider in relation to ADHD and these include:

1. *Situational variability*—ADHD is a condition whose symptoms may or may not be present, depending on the situation. It is important to obtain information from people who observe the child across different settings. This should certainly include input from parents and teachers.
2. *Secondary or co-occurring problems*—Problems children with ADHD experience very often go beyond the disorder itself and overlap with other disorders. This means that an assessment for ADHD should address not only primary ADHD symptoms, but also other aspects of the child's behavioural, emotional and social functioning. In other words, a comprehensive assessment is necessary.

As suggested throughout this chapter, it is important to instigate multidisciplinary assessment and to gather information from a range of sources.

Intervention

Intervention for ADHD can take a number of forms: These can include:

- medical, in the form of drugs such as Ritalin;
- educational, in relation to classroom adaptations, task analysis and investigation of the student's learning preferences;
- dietary, in relation to examining the child's reactions to certain foods.

There is also a view (Lloyd and Norris, 1999; Lloyd, 2006) that ADHD is a social construction. There is certainly a strong commercial basis to ADHD, and this may have fuelled the impetus for acceptance of ADHD as a discrete specific difficulty.

Indeed, there is a view that special educational needs, whatever they might be, can be approached from a situation-centred perspective (Frederickson and Cline, 2002). They quote Deno (1989), who argues that proponents of this view believe that special educational needs 'can only be defined in terms of the relationship between what a person can do and what a person must do to succeed in a given environment' (Frederickson and Cline, 2002, p.40). This view indicates that learning difficulties are in fact environmental and a construction of the education system. This implies that teaching and curriculum approaches hold the key to minimising the effect on the child of what may be termed a 'special educational need'. Along the same continuum of the environmentally focused approach, one can also view the interactional approach to SEN. Frederickson and Cline suggest this is the 'complex interaction between the child's strengths and weaknesses, the level of support available and the appropriateness of the education being provided' (p.420). This can be viewed in the form of three components—the task, the child and the environment—and assessment should include all three aspects.

Adopting a contextual/environmental perspective to assessment and intervention can be just as beneficial as focusing on the child's deficits.

In terms of intervention the following can be beneficial:

- Working in groups.
- Including lots of discussion.
- Allowing scope for creativity but providing some kind of structure.
- Ensuring active and interactive learning.
- Providing 'why' questions.
- Providing a lot of visuals, colour, music.

Hughes and Cooper (2007), in their book on teaching approaches for ADHD, suggest the following:

- Avoid confrontational situations.
- Show the child respect.
- Listen to the child's concerns.
- Avoid distraction.
- Keep instructions to a minimum—one at a time.
- Provide reassurance on tasks.
- Split tasks up into shorter tasks with breaks.
- Enable the child to complete tasks.
- Scaffold the child's work.
- Provide routine.
- Provide outlets for active behaviour.
- Provide a clear structure in the class.

The overwhelming reaction when one examines this list is very positive. Clearly all of these points will benefit children with ADHD and help to minimise anxiety and disruption in the classroom. Yet, one must consider a fundamental truth—each of these points will also be beneficial for children with dyslexia, dyspraxia and, indeed, it might be argued, all children! This emphasises in many respects the futility of teaching to syndromes and the efficiency and potential effectiveness of identifying the presenting characteristics and the barriers to learning and attempting to restructure the learning experience to help meet those individual needs.

Russell Barkley's *Taking Charge of ADHD* is a comprehensive resource and the CHADD (www.chadd.org) website is also an excellent source of information on ADHD. Some of the main components of this type of programme are:

- guiding self-statements ('Stop, think, do');
- positive self-statements ('You can solve this problem');
- verbal self-instructions ('What are all of my options to solve this problem?');
- relaxation training (controlled breathing, progressive muscle relaxation).

Tridas (2007) emphasises the importance of the environment in children with ADHD. Environmental adaptations should be seen as part of the accommodation put in place and these should be communicated to the home. This is essential to ensure success. Some strategies suggested by Tridas include:

- establish routines;
- create task lists;
- organise the child's study area;
- break routines and tasks down into small chunks to make them easier to accomplish;
- sit child as close to the teacher as possible;
- sit the child away from large windows or open doors;
- use study carrels rather than desks;
- avoid open plan classrooms;
- set realistic expectations.

According to Reid and Green (2006, cited in Muhamad, 2014) preference-based teaching is one approach that can be employed by educators when working with these children. The essence of preference-based teaching involves identifying student preferences and then designing teaching programmes in consideration of those preferences. Items and activities students prefer are incorporated within the teaching process. In addition, activities or events that students dislike are removed from the process where possible (Reid and Green, 2006). This approach can be used with any typical teaching programme for students with disabilities and in the case of this student profile, a child with dyslexia and ADHD.

Reid and Green (2006) indicate that preference-based teaching involves setting the occasion for an enjoyable teaching session, identifying students' preferences and using the preferred ABC model where: A refers to antecedent, which pertains to what is done to promote student performance of a skill being taught, typically through prompting; B refers to the target behaviour that the teacher desires the student to demonstrate; and C refers to the consequences of the student's target behaviour applied by the teacher to reinforce or correct performance.

This approach requires the teacher to build rapport with students by spending time interacting with them so that their enjoyment in participating in the teaching sessions is enhanced as they enjoy interacting with the teacher. Muhamad (2014), using an excellent case study approach, highlights a number of key factors that can lead to success, including parental participation.

ADHD and Creativity

Blodgett (2015), who has ADHD and is employed by the Learning Difficulties Association (LDA) in the Yukon in Canada, describes what he understands by creativity and how it affects him. He says that:

creativity is about seeing alternative ways to achieve the same goals. I have always struggled to follow processes and guidelines, especially when there is a more efficient way to accomplish tasks. One of my real life super powers is understanding a process in its entirety then find ways to make it more efficient. I did this in fast food, carpentry and teaching environments.

My creativity has always been an asset and when around people who value this kind of thinking it has served me well. I was actually hired for my current position as the Adult Learning Coordinator at the Learning Disabilities Association of Yukon because I had a creative mind and thought differently. The question I really nailed in the interview was something like; describe tens ways you could use this pencil, not that you have? I was like, use it as a hair curler, throw it like a dart and stick it in the wall, make a carving on it, break it into two pieces and sell half for a profit.

A big challenge I have is expressing myself in written format. I have an infinite amount of creative ideas, if I can express and dictate them orally.

The most creative people who have inspired me are young people. As a teacher in Rural Yukon communities I found my students were full of inspiring ideas. We would de-rail from the lesson to explore the possibilities of life on other planets and with enthusiasm they would start pulling up YouTube videos and we would connect the conspiracy theories with scientific knowledge and each person would draw their own conclusion. I also created really engaging lessons. MY approach to lesson planning was always this, 'Would I pay attention to this lesson?' Most of my students had better attention spans than me. If the answer was no, then I would scrap the lesson and find a way to present it that I would value.

My creativity helps me creating lasting meaningful connections. I think that often learning disabilities are viewed as vulnerabilities. As with any vulnerability there is an underlying fear that if others knew about it they would not accept us. So I find it ironic that the nature of how my learning disabilities limit me and my subsequent compensatory strengths are the very things that foster deep meaningful connections with others.

Coordination, Movement and Handwriting

According to Jones (2005), many terms have been used to describe developmental coordination disorders (DCD). These include ‘clumsy’, motor coordination problems, motor impairment, movement difficulties, developmental dyspraxia, minimal brain dysfunction and congenital maladroitness. The work of Henderson and Sugden (1992; Sugden and Wright, 1996; Kirby, 2005) has been influential in relation to highlighting this syndrome. The term DCD appears in both the APA DSM-5 (2013) and the World Health Organization (WHO) *Classification of Diseases and Related Health Problems* (ICD-10; WHO, 1993). In DSM-5 it is categorised as a motor disorder in the category of neurodevelopmental disorders. DSM-5 also states that in addition to the physical impairments, developmental coordination disorder is associated with problems with memory, especially working memory. This typically results in difficulty remembering instructions, difficulty organising one’s time and remembering deadlines.

DCD is, however, essentially a motor coordination difficulty, but it can be seen within a continuum from mild to severe and can affect fine motor activities, such as pencil grip, and gross motor activities, such as movement and balance.

Some researchers and practitioners prefer to use the term dyspraxia, and Portwood (2001) describes dyspraxia as ‘motor difficulties caused by perceptual problems, especially visual–motor and kinaesthetic–motor difficulties’. The definition of dyspraxia provided by the Dyspraxia Trust in England is an ‘impairment or immaturity in the organisation of movement which leads to associated problems with language, perception and thought’ (Dyspraxia Trust, 2001).

Jones suggests that there is also a lack of agreement on what is necessary for a child to be categorised as having DCD, and to what extent the condition coexists alongside other ‘specific’ learning difficulties. Kaplan et al. (1998) challenge the view of focusing on syndromes. Their research suggests that there are no pure diagnosis categories of developmental disorders, but rather ‘semi-random clusters of symptoms related to motor coordination, autism, learning and processing factors. For example out of a study measuring 162 children for DCD, reading difficulties and ADHD, 53 children obtained scores which classified them for “pure” cases, 47 children did not meet the criterion for any of the 3 conditions and 62 were classified as “comorbid” cases.’ Kaplan et al. suggest comorbidity is the rule rather than the exception.

Dyspraxia is a more commonly used term for developmental coordination disorders. Therefore, there are several practical approaches available to inform teachers and parents on how to deal with dyspraxia at school and at home. Without doubt self-esteem seems to be a major issue and it is important to look for ways of boosting the child's self-esteem. It is important, therefore, that they experience success in some areas of home and school as this is the best way to boost self-esteem. It is also important to monitor the child's progress and look for signs of emotional tension and stress. Sometimes the child can hide these. Some of the characteristics are shown below.

Characteristics—difficulties with the following:

- gross motor skills—balance, coordination;
- speech and language;
- social skills;
- attention/concentration;
- visual/motor skills;
- spatial awareness;
- laterality;
- fine motor control.

Intervention Strategies—15 Tasks to Try

1. *Drama*—Develop comprehension through active participation—kinaesthetic (experiential) modality. Encouraging drama activities can be beneficial.
2. *Visual*—Some children can only learn visually so even the most basic of information may have to be presented visually.
3. *Listening*—It is important that listening is given a high priority. It is also important that listening should be only for short periods of time along with other forms of activities.
4. *Positive learning experience*—Learning involves the whole person—the emotional aspects of learning are important. It is crucial to identify any anxieties your child may be experiencing around the learning process.
5. *Games*—These can involve aerobic and dance exercises, PE activities—ball sports, running, jumping, hopping, skipping.
6. *Physical activities*—Activities that facilitate control over the use of force—arm wrestling, pushing, pulling.
7. *Mazes*—This type of task can be an excellent learning experience and help to integrate the kinaesthetic and visual pathways. They can also be good fun and very active.
8. *Hoops*—Hoops can be a great activity and it is a good idea to start with a larger hoop than necessary and then reduce the size. Stepping over and stepping under and jumping through hoops is also good fun.

9. *Dance*—Line dancing and other dance routines are extremely beneficial and also good fun. Again, it is best to start with simple routines such as line dancing and advance from there.
10. *Ball games*—Throwing, catching, following moving objects and all sorts of ball games can be useful. They are also very accessible.
11. *Puzzles and board games*—Some of these activities require fine motor control and are also beneficial because they are often team games—it is important for the child with dyspraxia to be part of a team.
12. *Bead threading*—This is an activity that requires a great deal of control and fine motor coordination. It is a good idea to practise this, but do not set targets that are too ambitious for the child.
13. *Card games*—Again, these can be team games and it is a good idea to pair children in teams for card games.
14. *Music*—Switching rhythms—all sorts of music. Karaoke and moving and dancing to different types of music can all be good fun and very beneficial for a child with dyspraxia.
15. All sorts of kinaesthetic activities such as model-making, typing and using PE equipment.

Handwriting

Handwriting difficulties can often be experienced by children with dyspraxia and coordination difficulties. In extreme cases this can be termed dysgraphia. Some of the characteristics of dysgraphia are shown below.

Dysgraphia characteristics

- letter inconsistencies;
- mixture of upper and lower case;
- irregular letter size and shapes;
- unfinished letters;
- reluctant writer;
- poor visual perception;
- poor fine motor skills.

Often children with dysgraphia will need more time for writing, and tests on writing speed will normally reveal slow writing speed if they are asked to write in their best handwriting. The Diagnostic Assessment of Handwriting Speed (DASH) is one such test that investigates handwriting speed under fastest and best handwriting conditions.

Handwriting—Some Points to Consider

- hand dominance;
- pencil grip;
- posture;
- paper position;
- pressure on paper;
- wrist movement;
- letter formation;
- left to right orientation;
- reversal of letters;
- spacing;
- letter size, formation consistency;
- style—joins in letters;
- speed;
- fatigue factors.

All or any combination of these factors can account for difficulties with handwriting and these factors can form a useful checklist.

Dysgraphia Strategies

The following are some points to consider in terms of intervention:

- The provision of blank copies of diagrams, charts and tables, which should indicate where responses should be inserted.
- The consideration and allowance of alternatives to handwritten responses such as the use of a word processor or iPad.
- The student should not be penalised for poor presentation of work or misspellings.
- Provide some guidelines for writing, particularly on the use of paragraph headings. It is likely students with dysgraphia will need support and a structure for extended writing.
- Provide a framework for extended writing and model of different types of writing in each subject of the curriculum.
- The use of Mind Mapping and bullet points as strategies to help with planning and structure will be useful.
- Provide the most up-to-date software on his or her word processor to ensure the editing features and spellchecker are appropriate for a student with dyslexia.
- Ensure the student receives rest periods when extended writing is required.
- Permit the student to use alternatives to writing such as charts, diagrams and pictorial representations.
- Tape/digital recorders to be saved as voice files or transcribed at a later date can also be useful.

It is important to look at the characteristics of the difficulties and to consider fine motor and gross motor activities. Gross motor difficulties such as clumsiness and coordination difficulties noted in running and walking can be picked up very easily. But many researchers now acknowledge the importance of fine motor development and have included fine motor skills as a component in studies and assessments focused on school readiness and scholastic adjustment (Decker et al., 2011; Pagani et al., 2010).

Grissmer et al., in their 2010 study on school readiness, acknowledge the connection between fine motor difficulties and literacy. One possibility that might partially account for a motor–cognitive causal link is that most activities that build or display cognitive skills also involve the use of fine motor skills. Reading, writing and speaking all require fine motor skills with the hands, hand–eye coordination, controlling the production of sound and the use of fine motor skills controlling eye movement for word tracking. Reading and fine motor skills are most certainly connected through vision (St. John, 2013).

Early Intervention

McIntyre (2009) provides very clear guidance on early intervention, which she sees as crucial. She suggests the following need to be focused on and can point the way for further assessment:

- appears uncoordinated;
- poor at naming/locating body parts;
- difficulty judging force in ball throwing;
- poor balance/posture;
- lack of dominance;
- running, hopping, jumping difficulties;
- difficulty with buttons, laces;
- poor kinaesthetic memory;
- cannot use two hands together for skills;
- poor spatial awareness;
- poor directional awareness.

McIntyre indicates that without early intervention or later remediation, many children with motor skill deficits will have these deficits for several years. Difficulties in motor skills do not remediate themselves, nor do they disappear. Avoiding or ignoring fine motor deficits year after year may negatively impact the reading and writing abilities of many students.

Auditory Processing

In the UK, auditory processing difficulties has been known over many decades by different names. These include ‘auditory disability with normal hearing’, in addition to ‘auditory processing disorder’, ‘central auditory processing disorder’ and ‘(central) auditory processing disorder’.

Sirimanna (2012) has been one of the most influential figures in APD in the UK and he raised APD as an important developing area in the field of paediatric audiology at a British Society of Audiology (BSA) (Paediatric Audiology Interest Group, PAIG) meeting, which led to the establishment of an APD Interest Group in October 2003 under the auspices of the BSA.

One of the first actions of this group was to discuss, debate and agree on a definition for APD. This led to the working definition: ‘Hearing disability resulting from impaired brain function and characterised by atypical recognition, discrimination, segregation or ordering of non-linguistic auditory stimuli’, thus dissociating auditory from language processing (Sirimanna, 2016).

Diagnosis and Overlap

According to Sirimanna (2016) a child with APD can display a range of symptoms and these can overlap with other syndromes such as ADD/ADHD, dyslexia, specific language disorder (SLD) and autistic spectrum disorder (ASD).

There are no universally agreed criteria for diagnosis of APD and often the diagnosis of APD is made when there is more than one abnormal test result. When the results are clearly abnormal in only one functional area (e.g. auditory closure) the term ‘auditory processing issues’ or ‘auditory processing difficulties’ is used. The Test of Auditory Perceptual Skills—Revised (TAPS-R) provides useful information in identifying APD. This test covers the age range 4–18 years, which is very useful as it can be quite difficult to diagnose at each of the extremes of the age spectrum. In younger children other factors such as glue ear (Peer 2005, 2009) and intermittent hearing loss can account for the difficulties that can be associated with APD. The other end of the age spectrum (18 year olds) represents a group that has been missed when younger and this could be because of the presence of other specific difficulties which have had a significant impact on performance in class, such as dyslexia. The TAPS-R includes subtests on the following:

- word discrimination;
- word memory;
- phonological segmentation;
- sentence memory;
- phonological blending;

- auditory comprehension;
- numbers forward;
- auditory reasoning;
- numbers reversed.

Management of APD

The learning environment is very important for children with APD, and many of the environmental factors that can help with ADD can also be used for APD, such as quiet or soft music background, being seated near the teacher, working with a 'buddy', and repetition and monitoring to ensure the task has been fully understood.

Class size is also an important factor in dealing with APD. Sirimanna (2016) argues that distractions, e.g. auditory, visual or other sensory, affect the child's ability to concentrate and grasp essential information during lessons. He argues that often acoustic conditions in the class are sub-optimal for most children, with high level of background noise generated within or from external sources and also sometimes with unacceptable levels of reverberation (echoing), especially in classrooms with high ceilings. According to Sirimanna, in these conditions the child with APD will struggle.

Intervention

In terms of intervention it is important to:

1. Ensure that the child is within hearing range of the teacher.
2. Present questions to the child as a matter of routine in order to make teaching as interactive as possible.
3. Try to maintain the child's interest—asking questions should keep him or her alert for longer.
4. Use a variety of materials and plentiful visual materials. When starting a new topic or new piece of learning it is a good idea to commence with a visual introduction. This will help the child with APD engage more easily with the topic and therefore help him or her to understand any difficult ideas or concepts.
5. Keep the instructions simple—bullet points or a checklist are a good idea as this gives learners control over their learning.
6. Listening programmes with enhanced music, e.g. The Listening Programme Mozart Therapy may improve auditory processing abilities (Esteves et al., 2009) and may help to improve the child's ability to listen and sustain concentration. It is worthwhile trying some of these and, if music is to be used, experiment to find the right type of music.

7. Sirimanna (2016) is a strong advocate of a proactive approach. He suggests that this does pay off in the case of APD. It is too easy for a child with APD to switch off and essentially become a 'passenger' in the classroom. That is why it is important to look for the signs of APD as early as possible.

In the UK the National Health Service provides useful information on APD (NHS, 2015). It suggests that APD can affect the ability to locate where a sound is coming from and this can have implications for classroom discussion—it is therefore a good idea if the speaker in a discussion stands up rather than remaining seated. This helps the child with APD to locate exactly who is speaking.

As with dyslexia the child with APD may well have difficulty in distinguishing between similar sounds such as 'seventy' and 'seventeen'. They may also have difficulty in following a discussion if there is background noise—even a lawnmower outside can be enough to affect the child with APD. They may even have difficulty in enjoying music, so it is a good idea to give them the words of a song so they can follow the lyrics (try karaoke).

Their reading and spelling may also be affected because of a phonological processing difficulty and, often, the interventions for dyslexia can also be used.

The National Centre for Auditory Processing Difficulties (NCAPD, 2015) suggests that children with APD can often have the same types of issues as a child with ADD, including behaviour problems. It is therefore important to consider that they may have:

- difficulty in understanding instructions and may mishear them and misunderstand them to the extent that it can seem like deviant behaviour;
- problems following directions;
- problems attending to oral messages;
- problems hearing if background noise is too loud;
- poor organisation of verbal material;
- difficulty with oral and written expression;
- difficulty in remembering what they hear;
- difficulty in learning to read.

Treatments

Sirimanna (2016) suggests the following treatments are worth considering:

- Tomatis (www.tomatis.com)—requires use of special equipment.
- The Listening Program (www.advancedbrain.com or www.thelisteningprogram.com, also <http://www.smart-processing.com/ListeningProgram.html>).
- Samonas (www.samonas.com).
- Therapeutic Listening (www.vitallinks.com).

- Earobics (www.earobics.com)—inexpensive, home versions, children through adults.
- Fast ForWord (www.fastforword.com)—more cost and time, access to internet (see also Chapter 22).
- Lindamood-Bell Programs (www.lindamoodbell.com).

Auditory Training

Auditory training can be done using professional services such as a hearing specialist or one who is specifically trained in APD. Some computer programs or CD programmes can also be used effectively. These can involve a range of tasks, such as identifying sounds and guessing where they are coming from or trying to focus on specific sounds when there is some slight background noise. The tasks can be adapted for people of different ages, with children often learning through games (Sirmanna, 2016).

Home or School—Transitioning to Different Environments

It is important to be aware of the acoustics in a room, whether it be at home or school. Sirimanna (2016) suggests that rooms with hard surfaces can cause echoes. Therefore, rooms with carpets and soft furnishings may be better as there will be less of an echo. Even slight noises such as those from fans can be distracting. Switch off any radios or televisions and move away from any noisy devices such as fans. A speaker system in the class that is connected to the teacher's microphone can also help to cut out any background noise.

As indicated earlier in this section on APD it is important to ensure that the child suspected of having difficulties processing auditory information is identified early. Awareness is half the battle and, if this is present, then it is more likely children will receive sufficient classroom accommodations to help them deal with the challenges they face.

Difficulty with Numbers

Introduction and Definition

Dyscalculia is the term usually used for children who have extreme difficulty with numbers which affects their ability to acquire arithmetical skills in general. Learners with dyscalculia:

- may have difficulty understanding simple number concepts;
- may lack an intuitive grasp of numbers;
- may have working memory issues;

- may have difficulties in learning number facts and procedures;
- may rely on the same method or procedure for obtaining a response and therefore may lack the flexibility and versatility needed to deal with problems that do not follow the same rules;
- may use inefficient methods which means they will take longer to work out a response to a question.

One of the most esteemed figures in the mathematical area and in dyscalculia is Dr Steve Chinn from the UK. He is a prolific researcher and practitioner, as well as an author in this area. Chinn (2016), I think, strikes the right chord when he says that ‘the objective is not to just make a temporary improvement, but to maximise long-term learning’. This means that the aim is to help the learner become a better learner and this, in turn, will help him or her deal with the range of problems encountered and become a better, more versatile learner. Chinn also indicates that children with dyscalculia tend to opt for inefficient methods for tackling a problem and as a result will take many more steps than necessary. This means they will need more time for maths—even what might be considered basic number work.

Definitions

The definition proposed by the Department for Education and Skills (DfES, 2001b) for dyscalculia is shown below.

Dyscalculia is a condition that affects the ability to acquire mathematical skills. Dyscalculic learners have a difficulty understanding simple number concepts, lack an intuitive grasp of numbers, and have problems learning number facts and procedures. Even if they produce a correct answer or use a correct method, they may do so mechanically and without confidence.

In the USA, developmental dyscalculia (DD) is defined as:

a specific learning disorder that is characterized by impairments in learning basic arithmetic facts, processing numerical magnitude, and performing accurate and fluent calculations. These difficulties must be quantifiably below what is expected for individual’s chronological age, and must not be caused by poor educational or daily activities or by intellectual impairments. (APA, 2013)

Bugden and Ansari (2015) indicate that there is no clear conclusion as to what causes DD. They also state that there are no universally agreed criteria for diagnosing children with DD. This, therefore, can make it tricky to diagnose and often it is undiagnosed as a result.

Chinn (2016) points out that the interesting point about both definitions is the focus on basic mathematical skills rather than higher-order skills. The point is that

mathematics is developmental—that is, it depends to a great extent on the foundations being in place and subsequent learning is essentially building blocks which should fit in to the learner's schema if the foundations are in place. Often children with dyscalculia do not have those foundations and therefore more advanced learning is very challenging.

Additionally, they can have difficulties with basic number bonds and will likely make arithmetic errors in calculation unless they are using a calculator. So again, for this reason, their responses need to be monitored and they will need more time for responding to questions.

Reading in Mathematics

The reading aspect of mathematics is a real challenge for children with dyscalculia, particularly since it can also overlap with dyslexia. It is not unusual, therefore, that many children with dyscalculia require a reader in exams. Jones and Kindersley (2013) suggest that the 'co-occurrence rates (between dyscalculia) with the other SpLDs are considerable and therefore the potential for overlapping characteristics is high' (p.90).

It is important that the text is simplified and that any technical words—even words such as 'calculate' or 'estimate'—are explained. It is also important to engage in pre-reading discussion so that the problem is read to the child before he or she embarks on it independently. It is also important to monitor children with dyscalculia to ensure that they are following the 'gist' of the question.

Often, simple words as well as the technical words highlighted above can cause problems. Words such as 'more' and 'less' in the context of a mathematical problem can cause difficulties. It is therefore important to be aware of this when supporting children with dyscalculia.

Diagnosing Dyscalculia

Butterworth (2003) has developed a 'Dyscalculia Screener' (2003), a computer-based tool, which has test items that assess enumeration and number comparison as pre-requisite skills that underlie ability with numbers. The screener identifies dyscalculic tendencies in pupils aged 6–14+ years and the test recommends intervention strategies to help them achieve their potential. The screener has been designed to enable non-specialist and specialist teachers to investigate if dyscalculic tendencies are present. The assessment should help to distinguish between those individuals with poor mathematical attainment and those whose difficulties are likely to be associated with dyscalculia. It comprises three core subtests and an additional one. The subtests are: simple reaction time, dot enumeration, number comparison (also referred to as numerical stroop) and arithmetic achievement (addition and multiplication).

Standardised scores are available for comparison with other pupils of the same age in years and months and these scores can be compared to the national average.

Chinn (2012) suggests using a range of tests and informal diagnostic activities that probe many of the underlying problems which may result in mathematical learning difficulties. A critical part of the protocol is a dialogue with the child or adult. Chinn emphasises that this is crucial as he suggests that it is important to ask the learner how he or she perceives and tackles mathematical problems. He suggests that diagnosis is something you do with the student.

It is therefore important not to rely too heavily on a formal diagnosis but to obtain sufficient information that can inform practice. In many cases identifying that there is a specific difficulty in maths—whether it be number bonds, arithmetic, working memory or inefficient methods—can pave the way to intervention and this is the key. Of course, a diagnosis, if available, can also be extremely helpful as it formalises that a specific difficulty is present.

Intervention

It is interesting to note that Hattie (2009) indicates in his meta-analysis research that the mathematics programmes with the greatest impact are strategy-based, working out an answer being a significant issue in dyscalculia. As indicated earlier, it is important to recognise the overlap between dyscalculia and other syndromes such as dyslexia. Some support strategies for maths and dyslexia are shown below.

- Always write down the working out of a problem so the student can retrace their steps if necessary and keep the template within view of the student.
- Make the teaching multisensory with the use of age-appropriate concrete materials. Playing cards, dominoes and board games can be used.
- Try to look for creative and different means of rote learning the times tables—this can be a real problem for children with dyscalculia.
- It is very likely that they will have issues with working and short-term memory as well as slow writing speeds and weak knowledge of basic facts. They will therefore require more time to complete tasks.
- Use visual devices to help children remember formulae and rules. It is a good idea to start teaching a new concept using visual materials.
- Mind Maps can help to explain some basic and difficult concepts.
- It is important to provide clear worked examples as posters around the room and to highlight signs in colour. This is a visual reminder of key points.
- Use maths puzzles and games. It is a good idea to get the students to develop their own puzzles.

Figure 20.1 Support strategies for maths and dyslexia

Some other strategies include:

- Learning challenging words visually.
- Talking through the method to be used and encouraging the noting down of each step of the mathematical investigation so the student can acquire the sequence.
- Numbering the steps used to solve the problem and writing the calculation required at each step.
- Giving instructions one step at a time.
- Teaching visualisation and techniques such as highlighting, mnemonics and colour coding.
- Talking about the topic to ensure that the student has understood the instructions.
- Making visual fact cards for the properties of different shapes.
- The programme Maths Blaster and other technology for mathematics can also be useful.
- Establishing the student's preferred learning style.
- Teaching more than one way to solve mathematical operations.
- Concentrating on one concept at a time.
- Language should be kept to a minimum and specific cues given for various mathematical operations in word problems.
- It is a good idea to ask the child to explain verbally how he or she arrived at particular solutions.
- Limiting copying from the board.
- Directly teaching the language of mathematics.
- Making use of mnemonics and visual prompting cards to assist students in memorising rules, formulae and tables.
- Overlearning and repetition are very important, and time should be allocated for these.

Professor Mahesh Sharma, a well-known international mathematics expert, suggests the following procedure:

1. Explain the linguistic aspects of the concept.
2. Introduce the general principle.
3. Let students use investigations with concrete materials to discover these principles.
4. Give many specific examples using concrete materials.
5. Allow students to talk about their discoveries about how concepts work.

(Source: <http://www.dyscalculia.org/accessibility>, accessed 6 October 2015)

There are also many computer games and activities that can be used for maths—these can be fun and exciting, and some are highlighted in the next chapter on technology. As Chinn emphasises, the key point is to know the student and this can only

be achieved through direct interaction with the student and preferably in a range of settings.

Points for Reflection

- Comment on the advantages and disadvantages of looking at individual syndromes and using specific labels as opposed to descriptive criteria of the condition.
- Discuss what you may look for in each of the areas discussed in this chapter—i.e. attention, auditory processing, movement and number work—if you were to implement early identification practices.
- Comment on the advice you can give parents for each of the conditions discussed in this chapter. Think of some home strategies that parents may be able to use.