Specific learning difficulties

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Abstract

Specific learning difficulties (SLDs), of which dyslexia is the most widely recognized, may not be identified early and specialist resources for remediation are not always available in mainstream education in the UK. The prevalence, causes and cognitive mechanisms of different types of SLD are described in this article, together with their inter-relationships and association with other developmental disorders such as language disorders, autism and attention deficit hyperactivity disorder (ADHD). Especially when unrecognized, SLDs can contribute to the development of emotional and behavioural difficulties and can complicate the management of ADHD. SLDs are common, especially in boys referred to child and adolescent mental health services, and professionals must be alert to the possible contribution of an SLD to emotional and/or behavioural problems and understand the impact on the individual child's functioning, especially at school. The assessment and management of SLDs are discussed, together with respective roles of health and education professionals to facilitate liaison. Health professionals can, when necessary, support families in making the case for a psychometric assessment, a full assessment of special educational needs and for additional resources in school. Phonological impairment causes persistent literacy, mathematical and subtle language difficulties that, even in highly intelligent children, affect educational progress and contribute to emotional difficulties. Disadvantaged children and those who also have ADHD, dyspraxia or a history of language disorder are particularly at risk of antisocial behaviour and school exclusion. For complex or comorbid SLD, treatment of ADHD with methylphenidate and therapeutic work with the child and his family are vital as early as possible to prevent the development of academic failure, low self-esteem or serious behaviour problems.

Keywords attention deficit hyperactivity disorder; conduct disorder; dyscalculia; dyslexia; dyspraxia; emotional disorder; specific language impairment

What's new?

- Functional MRI studies can demonstrate the areas of the brain involved with specific cognitive impairments in different types of SLD, including dyscalculia, and have shown localized changes after treatment
- The association between dyslexia, dyspraxia and attention deficit disorder is comorbid, the conditions exacerbate each other and contribute to increased academic failure and behavioural problems
- Impairment of phonological processing largely accounts for the association between specific language impairment and dyslexia but a history of expressive or receptive language disorder is associated with poor outcome in adults with dyslexia
- Computer programmes for screening and for remediation of SLD look promising

The existence of specific learning difficulties, of which dyslexia is the most widely recognized, remains controversial. Although the ability to read is the gateway to education, there are still some teachers who believe dyslexia is a 'middle-class excuse' for academic failure caused by emotional problems or low ability. Especially when unrecognised, a specific learning difficulty (SLD) can contribute to the development of emotional and behavioural difficulties and can complicate the management of attention deficit disorder (ADHD), resulting in lack of expected response to stimulant treatment. Specific learning difficulties are strongly associated with other developmental disorders such as language disorders, autism and ADHD, increasing their prevalence in a clinic population. For these reasons it is essential that health professionals are alert to the possibility of SLD as a contributor to emotional and/or behavioural problems. They need to be able to understand the nature, potential causes and the impact of an SLD on the individual child's functioning, especially at school. Knowledge of the underlying psychological mechanisms and remedial approaches should assist in making the case, when resources are stretched, for a psychometric assessment by an educational psychologist and for additional resources in school. It will facilitate liaison with educational colleagues when there is a need for continued treatment for ADHD or emotional and behavioural problems. When problems associated with SLD such as academic failure, low self-esteem, family pressure or indifference, have become entrenched this understanding is vital in therapeutic work with the child and his family.

What are specific learning difficulties?

In contrast to general learning difficulties where there is global developmental delay associated with a low IQ, SLDs are associated with circumscribed cognitive impairments which affect the child's ability to learn in a normal educational environment. All individuals have a range of cognitive strengths and weaknesses which are on a continuum in the general population. These relative strengths and weaknesses may affect learning style and the child's interests (e.g. strong spatial ability or untidy handwriting) but the degree of variation should not affect overall progress at school broadly in line with the individual's IQ.

A child is considered to have an SLD when his attainment in a specific area, such as reading, is significantly below that which would be predicted from his general cognitive ability.[1] There is a discrepancy between actual and expected attainment

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which holds the child back compared with his peers and which cannot be accounted for by other factors such as sensory impairment, absence from school, changes of school, poor teaching or academic failure associated with emotional and behavioural problems. Unfortunately when other potential causes for underachievement are present, especially in disadvantaged populations, SLDs may be missed or identified late so they are difficult to remediate and problems become compounded by secondary behavioural problems and disrupted education as a result of disaffection.

The types of SLD are shown in Table 1. In ICD-10 SLDs are classified as specific developmental disorders of scholastic skills under Axis Two Specific Disorders of Development, together with specific developmental disorders of speech and language with which they are frequently associated.

Prevalence

Using the discrepancy definition, children with SLD can be distinguished from children with global developmental delay using a cut off of 1.5 or 2.0 standard errors of measurement below their expected attainment score, or 18 to 24 months delay. Epidemiological studies show males are three to four times more likely to be affected by dyslexia than females, with a more equal gender ratio in dyscalculia. It has been suggested that fewer females with reading difficulties are identified because they are less likely to have behaviour problems or can compensate in other ways. The frequent combination of dyslexia and ADHD in boys may also lead to more referrals to educational psychologists for cognitive assessments.

Dyslexia is the most recognized and well-researched SLD. Most studies suggest a prevalence rate of 4–7% for dyslexia and around 6% for dyscalculia. Approximately one-fifth of children with dyscalculia have reading difficulties. About 10% of school children have problems with reading comprehension. The rates of dyslexia vary with age and are influenced by home factors and an increasing disinclination to read with age, especially in boys. Prevalence rates are at least double in inner city compared with rural populations. Pure dysgraphia is relatively rare as most children with reading disorder also have significant spelling difficulties. Hyperlexia and non-verbal learning difficulties are rarely identified in clinical or educational settings except as part of specialist assessment for autistic spectrum disorder. Coordination problems are more apparent to parents and teachers than other SLDs and occur in about 7% of children.

Types of specific learning difficulties

- **Dyslexia**[a] **-** specific reading disorder
- **Dysgraphia -** specific spelling disorder
- **Dyscalculia -** specific disorder of arithmetical skills
- **Dyspraxia -** specific disorder of motor function (developmental disorder of fine and/or gross coordination)
- **Non-verbal learning difficulties**[b] **-** difficulty in visuo-spatial organisation and non-verbal integration
- **Hyperlexia**[b] **-** precocious reading ability with impairment of reading comprehension

[a]In practice almost all children with reading difficulties have poor spelling, and spelling problems commonly persist after reading has improved
[b]Association with autistic spectrum disorders

Table 1

Nature and causes of SLD

There is a strong genetic contribution to all SLDs. In the past they often went unrecognized and parents may give a history of struggling in school or dropping out early. Once recognized in their child, a parent often realizes they had similar difficulties. The son of a dyslexic parent has close to 40% risk of dyslexia and a daughter 20% risk.[2] Parental illiteracy, which is often concealed, can exacerbate literacy difficulties as the parent cannot read to their child and may not have books and other printed material at home.

Gene markers for dyslexia have been identified on chromosomes 6, 15 and 18 in several independent studies. It is recognized that the cognitive component which has highest heritability is phonological processing ability, affecting language development as well as ability to both read and spell, whereas reading comprehension is more affected by environmental factors. A study of non-adoptive sibling pairs suggested the genetic contribution to reading performance was stable in childhood and any changes were related to environmental influences.

Structural differences in the brain have been identified in people with SLD using brain imaging techniques. In dyslexia the planum temporale is unusually symmetrical and structural abnormalities have been found in the temporal region of the left hemisphere.[3] Abnormalities in the right hemisphere may be associated with non-verbal learning difficulties. Functional magnetic resonance imaging (fMRI) studies demonstrate increased blood flow in localized areas of the brain associated with specific cognitive tasks and are increasingly demonstrating specific differences in children with dyslexia. Research into dyscalculia is at an early stage[4] but it is now recognized that mathematical ability involves three different parts of the brain: the number sense in the intraparietal sulcus, the area relating to space and location; numerals are dealt with by the visual cortex and numerical words by language areas in the left hemisphere.

Cognitive mechanisms in dyslexia and dysgraphia

Development of literacy

To learn to read and spell the child must integrate its system for processing speech with a system for processing written language. It is generally agreed that the primary difficulty in dyslexia is in processing speech sounds, a phonological deficit which is also associated with speech delay. The ability to develop associations between spoken and written words is more difficult in English, which is irregular (opaque orthography), than in some other languages (e.g. Italian or German) which have consistent rules for spelling and sounds (transparent orthography). The problems of dyslexia are therefore increased in English-speakers, spelling problems are persistent and difficulties are apparent earlier (Figure 1).[5]

Individuals rarely have spelling problems without dyslexia because of the underlying deficit in phonological processing but a few good readers have difficulty spelling irregular words because they spell phonetically or use context rather than individual