

Glossary

Above average

This is used in a technical sense, meaning that the performance has a standard score of 110 or more.

Class Profile

This is the matrix of scores in ACE schools for each of the ACE Performance Areas.

Attention

Attention is used here as a technical term. While everyone has an intuitive idea of what attention is, it is common to distinguish between the ability to sustain attention, to switch attention, to divide attention and to focus attention.

Attention deficit hyperactivity disorder (ADHD)

ADHD is a learning disability diagnosed in the UK by Psychiatrists and is one of the most common of the learning disabilities. There are two major sub-types of ADHD, the inattentive type (without hyperactivity) and the hyperactive/impulsive type. Medication is the standard treatment. There is a considerable overlap between children with ADHD (inattentive type) and children with dyslexia.

Auditory problems

Auditory problems reflect difficulty in hearing. It is possible to have auditory problems (see magnocellular system) without a loss of hearing acuity as assessed by a hearing test.

Behavioural level

The level of analysis that considers only performance. The typical measures of behaviour in the ACE tests are the accuracy or speed of making responses.

Below average

This is used in a technical sense, meaning that the performance has a standard score of 90 or less.

Boing test

This is the number of times the user is able to use the mouse to click on a moving target in 30 seconds. It assesses eye-hand coordination. In this first test it is used to familiarise the user with the mouse and the general procedures.

Cerebellar function

Cerebellar function refers to how well the cerebellum is performing. It is a rather vague term, because the cerebellum is a huge structure with more than half the brain's neurons, and in fact different parts of the cerebellum have different functions, much as in the brain as a whole. The

aspects of cerebellar function assessed by ACE are the timing function (assessed by tapping) and the coordination function (assessed by eye-hand coordination tasks).

Cerebellum

The cerebellum (or hind-brain) is the part of the brain responsible for the timing, coordination and learning of motor skills, including speech. It contains more than half of the neurons in the brain, but until recently it was not realised how important a role it played in language. The cerebellar deficit hypothesis proposes that many of the problems (including phonology, reading and automaticity) of individuals with dyslexia are attributable to impaired cerebellar function. Cerebellar function may be improved by consistent training under the appropriate conditions.

Cognitive level

The level of analysis that considers the 'mind' factors that underlie performance. It is possible to make reasonably accurate assessments of cognitive level performance by using appropriately designed behavioural tests such as ACE. The three main cognitive functions assessed by ACE are working memory (both for verbal and for visual information), phonological skill, and processing speed.

Cognitive skills

Cognitive skills are the 'mind' factors that underlie performance. The three main cognitive functions assessed by ACE are working memory (both for verbal and for visual information), phonological skill, and processing speed.

Declarative memory

Declarative memory is a technical term referring to memories that are language-based and available to conscious thought. It is distinguished from procedural memory, which is skill-based memory which is typically not available to introspection.

Diagnose

Diagnosis is a technical term referring to the identification by a trained professional of the problems underlying a particular set of symptoms. In the learning disabilities, diagnoses tend to be classified into one or other of the possible learning disabilities by a learning disability specialist. ACE is a screening test rather than a formal diagnostic test.

Dyslexia

Developmental dyslexia is normally identified by unexpected problems in learning to read for children of average or above average intelligence. It is considered to be 'constitutionally-based' (that is, caused by deep-seated differences in brain function) and may be associated with clear strengths in other areas. Like other individuals, individuals with dyslexia may well be very different from each other, but are very likely to have problems in phonological skill. In ACE we attempt to characterise the weaknesses and the strengths, and to assess the range of difficulties shown.

Dyspraxia

Dyspraxia is now normally referred to as Developmental Coordination Disorder. The key symptom is

marked difficulties in motor coordination (clumsiness) and is generally diagnosed in the pre-school or early school period. There is a considerable incidence of mild to moderate motor difficulties in dyslexia and there is an overlap in diagnoses of these learning disabilities.

Expert system

This is a computer-based system that takes data and applies rules to mimic the performance of a human expert in making judgments. For ACE, the expertise mimicked is that of Prof. Rod Nicolson, and is in terms of interpreting the scores on the individual tests in order to determine the underlying 'factors' and the strengths and weaknesses, and then to use this profile of scores to judge the likely underlying learning styles, to evaluate the potential diagnoses in terms of learning difficulty, and to make recommendations for support or development.

Factors

Technically, a factor is an independent component of a test, allowing the overall performance to be split into the separate factors. ACE is designed to assess six factors of significance in school and post-school. These are Literacy, Phonology, Working Memory, Speed, Coordination and Hearing. The first is an attainment score of obvious school importance, the next 3 are key 'cognitive' factors, and the last two provide indications of any underlying brain-level issues. The ability to determine attainment, cognition and brain-based factors within the same test is currently unique.

Final Boing

This is a repeat of the Boing test, which assesses the number of times the user is able to use the mouse to click on a moving target in 30 seconds. It assesses eye-hand coordination. This final test gives a more accurate indication than the first one. The difference in score between the first and second Boing test also gives a potential indication of tiring (if performance gets significantly worse) or of kinaesthetic learning (if performance gets significantly better).

Fluency

Fluency is used in its usual way to indicate fast, accurate, 'automatic' performance. A lack of fluency in well-practised skills indicates a lack of automaticity and is the hallmark of literacy performance for individuals with dyslexia.

Full report

This is an in-depth, detailed report of the individual's performance in the ACE Test.

Good range

The good range is used here to indicate a standard score of 110 or over.

Hearing words test

The Phonological Discrimination (Hearing Words) test checks whether the user is able to hear the sounds within words properly. Two very similar-sounding (or identical) spoken words are presented and the user has to decide whether they are the same or different. Examples of different real words are 'fan' and 'van'. Examples of different nonsense words are 'vutt' and 'vud'.

High Low test

In the High Low test a pair of tones is presented, close together, and the user has to decide whether the pair was high-high, high-low, low-high or low-low. The time interval between the tones is varied systematically, and the task is much harder when the two tones are very close together, because it's difficult to tell whether a pair was low-high or high-low. Users with abnormal function in the auditory magnocellular system will have difficulties with this task.

Impulsive

The usual meaning of "impulsive" is an act that has not been properly thought through. Technically, it is one of characteristics of attention deficit with hyperactivity disorder (ADHD). ACE assesses impulsivity primarily via the number of mistakes made on the reaction time tasks, because these mistakes normally indicate that the user has tried to respond too quickly, before being sure of the response to make.

Information

Information is of course something that tells us something useful. Technically, though, information processing is a branch of cognitive psychology from which concepts such as working memory and speed of processing were derived.

Intervals

Intervals are periods of time. In general, for the high/low task an interval between the high tone and the low tone of only one twentieth of a second is sufficient for a person with normal magnocellular function to be able to tell which tone was first.

Kinaesthetic learning

Kinaesthetic learning is one of the possible 'learning styles'. In general a kinaesthetic learner is one who like to 'learn by doing', and therefore learns best by repeatedly (successfully) completing the task. In ACE there is little scope for assessing kinaesthetic learning, and the evidence is based on whether there is an improvement following practice on the eye/hand coordination task.

Language skill

Language skill is used here to indicate problems in any area of language, but primarily reflecting problems with receptive language (hearing words precisely) or in expressive language (speaking words precisely) rather than in more declarative aspects of language such as vocabulary and comprehension.

Learning ability

There are many types of learning ability. The idea of different 'learning styles' is current in education, but a more fundamental difference derives from 'deep', brain-based learning. There are several forms of deep learning, with two major types being 'declarative'. Language-based, learning and 'procedural', skill based learning. There is considerable evidence that many learning disabilities arise from difficulties in the procedural learning system, the system that leads to skill automaticity. Difficulties with procedural learning may be overcome either by further improving the strengths in declarative learning or by attempting to improve the procedural learning system.

Learning difficulties

Learning difficulties are often used to mean the same as special educational needs or learning disabilities.

Learning disability

Learning disability is a term used primarily in the USA to indicate difficulties in specific learning abilities, such as dyslexia or ADHD. In the UK the preferred term is Special Educational Needs.

Learning profile

Learning profile reflects the relative strengths and weaknesses on the different types of learning - see entry for learning ability.

Learning styles

There is considerable interest in learning styles. The three extremes of learning style are Verbal, Visual and Kinaesthetic. The style a learner adopts depends upon the material and his or her cognitive capabilities. The ACE tests provide some evidence of these capabilities. It should be noted, however, that learning styles have relatively low validity, and that the style an individual adopts for a particular learning task depends as much on the task as the individual.

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Literacy

Literacy is a broad term including reading, spelling, composition and comprehension, and should also include both accuracy and fluency. Individuals with dyslexia are defined in terms of literacy problems, initially via reading problems but these may well later transpose into spelling and fluency problems.

Motor coordination

Even the simplest skills, such as picking up a cup, or saying 'hello', require the smooth sequencing and coordination of a range of motor 'gestures', either by the arm muscles or by the vocal muscles. There are considerable differences between individuals in their degree of motor coordination.

Motor function

This is a technical terms referring to performance of motor skills.

Motor skills

Motor skills are action-based skills involving movement, timing and coordination. They are distinguished from cognitive skills, which involve thinking. The cerebellum and basal ganglia are key brain structures involved in the learning and execution of motor skills.

Mouse pointer

The mouse is the computer's input device. The mouse pointer is the icon shown on the computer's screen to indicate the position of the mouse.

Nicolson

Prof. Rod Nicolson is an internationally recognised expert in the diagnosis and underlying causes of dyslexia. With Prof. Angela Fawcett (Swansea University) he has previously published 6 best-selling diagnostic screening tests for dyslexia. Also with Dr. Fawcett he has put forward two of the major explanatory frameworks for dyslexia. The Dyslexia Automatisation Deficit hypothesis (1990) was a cognitive level hypothesis claiming that individuals with dyslexia have difficulty making skills automatic - for all skills, not just those involved in literacy. The cerebellar deficit hypothesis (1995) claimed that the automaticity problems (and a range of other problems) could be attributed to weak function of the cerebellum. These remain among the major explanatory theories for dyslexia. He has published over 100 academic articles, book chapters and books, and was the Chair of the British Dyslexia Association 5th International Conference (2001).

Normal range

This is used in a technical sense, meaning that the performance has a standard score greater than 90 and less than 110.

Odd One Out test

The Odd One Out test assesses the user's ability to tell which two of three spoken words rhyme (the task is to indicate the 'odd one out'). Examples might be the pictures of a car, a bus and a jar. The user should click on bus because the other two rhyme. It is designed to assess the user's basic phonological awareness.

On the Ball test

The On the Ball test involves attempting to keep the mouse pointer in the centre of a target that moves around four laps of a fixed six-sided circuit at increasing speed. The score indicates for what percentage of each lap the user stays on target. It indicates eye-hand coordination and 'smooth pursuit' tracking ability.

Parts of Words test

The Phonemic Segmentation (Parts of Words) test assesses the user's ability to identify and manipulate the sounds in words. A typical question [using digitised speech] might be "Say glow without the 'l'" and the user has to choose one of three possibilities - 'glow' 'low' and 'go'. It is a test of phonological ability, the ability to mentally manipulate the sounds of parts of words, which is a key building block for learning to read.

Patterns test

The Patterns test is a test of spatial memory ability. The user is shown an array of squares, and then up to 6 squares are lit up, one after the other. The user has to wait till the end of the sequence and then has to retrace the sequence in the correct order. It is a test of visuo-spatial working memory.

Phonics

The understanding that there is a predictable relationship between phonemes (the sounds of spoken language) and graphemes (the letters and spellings that represent those sounds in written language). Also known as letter-sound correspondences.

Phonological discrimination

Phonological discrimination is the ability to tell the difference between different sounds in the language, and to tell when two sounds are in fact the equivalent sounds. In ACE it is assessed by the 'Hearing Words' test.

Phonological processing

Phonological processing indicates the skill an individual has with phonology. Phonological discrimination is an important early skill, but then the ability to realise that some words rhyme, that words are made of syllables, and to play with words and parts of words 'in our head' are important later skills. In ACE phonological processing is tested in various ways.

Phonology

This is a technical term. It has a wide range of meanings, but generally refers to the sounds within words. The smallest unit of a sound in a word is called a phoneme. A syllable corresponds to several phonemes, and a word may correspond to several syllables. See also phonological processing.

Reaction Speed test

The Reaction Speed test assesses how fast the user can classify and react to a visual shape. If the shape is a green square the user has to press the mouse, whereas if it is a yellow circle the user must do nothing. The speed and accuracy of responding are calculated, and the information used to help assess visual processing speed.

Reading test

The Reading test is a multiple choice test in which a word is spoken and the user has to click on the corresponding word (out of four). Both the percentage correct and the average time taken are measured. It provides a rough assessment of the user's reading accuracy and fluency.

Remembering numbers test

The Remembering Numbers test assesses the user's ability to repeat back a series of digits from 1 to 12. The numbers 1 to 12 are arranged on the page like on a clock face. A series of up to 7 numbers is then 'spoken', one per second. In the straightforward version ('Same Order') the user has to wait to the end and then click on the clock face numbers in the same order. Sometimes, though, after the final number is spoken the user is told to click on the clock face numbers in 'ascending order' (smallest first). The combination provides a sensitive test of the user's 'verbal working memory' - the ability to keep and manipulate things in mind while attending to further information.

Rhyme

Two words rhyme if they have end with the same sound when spoken. The Odd one out test is a simple test of the ability to detect which words rhyme.

Robust

This is a semi-technical term. A test is said to be robust if it generally gives the right answer, even if the conditions under which it is taken are not ideal.

Screening test

A screening test is a relatively short test that is designed to be administered to large numbers of people so as to identify which ones need further support or testing. It is often the first stage in a full support system. ACE is designed as a screening test, but because of the carefully designed range of the tests and the built-in expert system it is able to provide much more detailed and analyses than most full diagnostic tests.

Sensory processing

Sensory processing efficiency means how well our senses work. ACE tests for the function of vision and audition, together with our somatosensory efficiency as reflected by tapping. It should be stressed that ACE does not provide any full sensory tests, and if there is any suggestion of sensory impairment further testing should be undertaken by a suitably qualified professional.

Smooth pursuit tracking

This is where the eyes track a smoothly moving source. This might be an object or projected light beam.

Sounds in words

see Parts of Words test

Sounds test

The Sounds test assesses how fast the user can classify and react to an auditory tone. If the tone is high the user has to click the mouse, but do nothing if the tone is low. It is basically a speed test, but may also pick up auditory (hearing) problems.

Specific language impairment

Specific Language Impairment (SLI) is usually diagnosed pre-school as difficulties in expressive language (speech) or receptive language (hearing). There is a high overlap between SLI and dyslexia, in that many children with SLI go on to have reading problems, and many children with dyslexia show mild problems with receptive or expressive speech.

Speed

Technically, processing speed reflects the speed with which the brain works, and is often assessed by checking the speed of reactions. Speed increases with maturation, but there are significant differences in speed between individuals. Some theorists consider that processing speed is a fundamental attribute of the cognitive system, with faster processing leading to a range of benefits.

Spelling test

The Spelling test is simply the number of graded words the user spells correctly. Each word is 'spoken' and the user has to decide which of three possible (and plausible) spellings is the correct one. The test assesses the user's spelling fluency (speed) as well as accuracy.

Standard score

This is a technical term, referring to a score that has been adjusted for the age of the user, and then translated onto a scale in which 100 indicates the average for users of that age, 115 corresponds to a good score that only 15% of the population would exceed, and 85 corresponds to a weak score that 85% of the population would exceed.

Strong performance

This is used in a technical sense, meaning that the performance has a standard score of 110 or more.

Student Report

This is a report based to the ACE test performance which is designed specifically for teaching and learning.

Tapping test

In the Tapping test, the computer makes 10 beeps at say one per second, and the user has to tap in time with the beat. The beats gradually fade out in intensity, and the user also has to keep tapping for 10 taps after the beat fades away. Different analyses allow both the accuracy and the variability of the tapping to be determined both while the beats are present and in the 'free tapping' stage. Accuracy and variability is assessed for a range of different intervals. Performance on this task is considered to be a sensitive indication of cerebellar function.

Valid

This is a technical terms for psychometric tests. A test is called valid if it really does measure the attribute it is supposed to measure. So, for a dyslexia test, a test is valid if its diagnoses correspond accurately with expert diagnoses. A valid test should have a high 'hit rate', that is, when it diagnoses a user as having dyslexia and the expert judgment is that the user really has dyslexia. It should also have a low 'false positive' rate, that is, when it diagnoses a user as having dyslexia whereas the expert judgment is that the user does not have dyslexia.

Variability

An individual's performance is said to be variable if it fluctuates from day to day, from task to task, or from moment to moment. While everyone shows some variability, many individuals with dyslexia show high variability in all three of these situations.

Verbal learning style

There is considerable interest in learning styles. The three extremes of learning style are Verbal, Visual and Kinaesthetic. The style a learner adopts depends upon the material and his or her cognitive capabilities. The ACE tests provide some evidence of these capabilities. It should be noted, however, that learning styles have relatively low validity, and that the style an individual adopts for a particular learning task depends as much on the task as the individual. Nonetheless, there is longstanding evidence that individuals with dyslexia may have a preference for a visuo-

spatial learning style rather than a verbal learning style. Individuals with weak verbal working memory are likely to show weaknesses in situations requiring verbal learning. The traditional teaching method of 'learning by being told' depends critically on good verbal working memory.

Verbal working memory

Verbal working memory corresponds to how many language-based items we can keep in mind at the same time. In ACE it is assessed primarily by the Remembering Numbers test. Individuals with low verbal working memory may have difficulties remembering what to do if asked to do several things at the same time, and will have difficulties with the usual classroom style of 'learning by being told'.

Visual learning style

See visuo-spatial learning style

Visual working memory

Visual working memory corresponds to how many visual or spatial items we can keep in mind at the same time. In ACE it is assessed primarily by the Patterns test.

Visuo-spatial learning style

There is considerable interest in learning styles. The three extremes of learning style are Verbal, Visual and Kinaesthetic. The style a learner adopts depends upon the material and his or her cognitive capabilities. The ACE tests provide some evidence of these capabilities. It should be noted, however, that learning styles have relatively low validity, and that the style an individual adopts for a particular learning task depends as much on the task as the individual. Nonetheless, there is longstanding evidence that individuals with dyslexia may have a preference for a visuo-spatial learning style rather than a verbal learning style. Visuo-spatial learning style reflects a preference for learning by observation, and perhaps good spatial skills. Visuo-spatial is used in preference to visual learning style because it makes it clear that the cognitive processes also involve spatial imagination as well as vision.

Weak performance

This is used in a technical sense, meaning that the performance has a standard score of 90 or less.

Working Memory

Working memory is a technical term for how well we are able to use our short-term memories - for instance, how many things we can keep in mind at the same time while getting on with our tasks. It is thought that there are several components to the working memory system, with separate components for verbal working memory and spatial working memory, together with a shared 'executive working memory'. There is considerable evidence that individuals with dyslexia often have low verbal working memory, perhaps owing to a slight lack of automaticity in verbal processing. In adults with dyslexia, problems in working memory are often more difficult to cope with than are any remaining literacy difficulties.