



Learning difficulties and the development of the adolescent brain

How learning difficulties can lead to behavioural disorders and substance and alcohol abuse in teens – and innovative on-line interventions to help identify and address them

By James Lee, CEO & Founder of Brain Care Ireland. Article abridged.

SOME FACTS ABOUT LEARNING DIFFICULTIES

People with learning difficulties often have an average or above-average IQ, although when it comes to some mental tasks, many do not function well cognitively. In other words, they have the potential but are not able to realise it due to their learning difficulty or impairment. In most cases, successful interventions cannot be achieved in our traditional modus, which often occurs as infrequently as once a week for no more than half an hour. Traditional interventions are of little proven use unless the underlying problems are corrected first; grinds, for instance, are of little value at this stage.

In the case of a child with learning difficulties, what we see is the progression from home or crèche to primary school, where the child becomes academically lost, resulting

in low self-esteem and a lack of confidence and sense of self-worth. The child either withdraws from participation in class or becomes the class clown who jokes to cover up their learning inabilities. This bluster is a façade.

Moving on, we now have a child with learning difficulties who is open to being bullied, further destroying any remaining semblance of self-worth. The victim can enter a 'lost cause' scenario which, research shows, in itself can lead to substance and alcohol abuse, often accompanied by behavioural disorders. The bullied child can further freefall into depression, total lack of self-worth or self-esteem, and sometimes suicidal tendencies.

Research indicates that people with learning disabilities are more likely than the general population

to experience a mental health issue such as depression. Other factors such as fewer psychological and material resources to deal with adversity and lack of meaningful activities in their lives, can increase the chances of people with learning disabilities developing depression (*'Feeling Down'; improving the mental health of people with learning disabilities*, 2013). UK statistics indicate that around 6% of the mainstream population experiences depression in any one year (NHS), but studies suggest that as much as 20% of people with learning disabilities will experience depression (Sikabofori and Anupama, 2012). So there is a pattern to the journey from learning difficulties to substance and alcohol abuse and behavioural disorders.

It is clear that if we can find a way to address learning difficulties, we are

on the way to reducing the incidence of depression in people with such disorders and therefore reducing substance abuse and behavioural disorders.

SOME FACTS ABOUT THE BRAIN

Other scientific research has found that a learning difficulty is a lifelong challenge; in most cases it can only be successfully overcome with interventions that are both 'frequent and intense', as pointed out by Dr Norman Doidge in his book *The Brain that Changes Itself*. Doidge, proclaimed as 'the world's leading researcher on brain plasticity' by Irish neuroscientist Ian Robertson, makes abundant reference to research completed by Dr Michael Merzenich on 'brain plasticity', which found that with the right cognitive interventions, we can alter the way the brain functions.

Merzenich maintained that there are two epochs of brain plasticity:

1. The infant 'critical period' when the brain sets up basic processing machinery;
2. Adult plasticity, during which the brain refines its machinery as it masters a wide repertoire of skills and abilities.

Merzenich found that the brain is organised (mapped) in line with the body; the parts of the brain associated with, say, our fingers, are adjacent to one another as they work closely together to effect the best functioning possible. He demonstrated that brain maps are dynamic and respond to competition for brain space. Brain plasticity is dynamic and can be influenced by use: brain use decides what kind of brain you have.

Merzenich's research demonstrates the 'use it or lose it' phenomenon

and that the brain is endlessly fighting for space. Should we stop using a certain part of our brain, the surrounding brain will take over this space to exercise another mental skill. A case in point is when we play online games. As we play, the part of the brain involved gets bigger and begins to occupy adjacent parts of the brain that are not being used so much, so it expands and we gain and lose different functionalities. This phenomenon is called 'competitive adult plasticity' and accounts, for instance, for the fact that as we get older and the 'critical period' has passed, we find it more difficult to learn another language, as English has become our dominant tongue.

THE ADOLESCENT BRAIN

Adolescents undergo profound development and their brain is particularly adaptable and malleable. One of the major areas of the brain, the prefrontal cortex, responsible for decision-making, planning, inhibition, inappropriate behaviour and self-awareness, is not well developed in adolescents. Thus they have poor impulse control and self-consciousness, as well as a tendency to take risks, especially when with their peers. Extensive compulsive behaviour, such as online game-playing can result in 'synaptic pruning', with the synapses (brain pathways) that are being used being strengthened and the ones not being used killed off or 'pruned', to the detriment of the development of other skills. As other parts of the brain diminish in function, the teen can take on a 'zombie'-like existence.

Impulses are controlled by the limbic system which is involved in emotion and reward-processing and

is supersensitive in adolescents. In other words, it is the 'buzz centre' in the adolescent's brain and accounts for repeated actions that allow the brain to experience that 'buzz factor' again and again, whether it be a bully or a daredevil or an online game-player. Incidentally, there may be a biological basis for bullying in that the bully gains self-satisfaction from being aggressive. Bullies can often develop high self-esteem and confidence arising from the act of bullying itself and the disposition to get a chemical dopamine 'buzz' each time they bully. The brain possesses many different dopamine pathways, one of which plays a major role in the reward-motivated behaviour which lies behind many addictive activities.

Boys especially show enhanced activity in the limbic system. It has been found that teenage boys are especially resistant to the threat of punishment, but hypersensitive to the effect of risk to achieve greater dividends of value, which explains why boys are greater risk-takers than girls.

With use the limbic system can expand. At the same time, the prefrontal lobe does not fully mature until about 25 years of age (although it may take longer or never mature). Until the frontal lobe invades the limbic system, the tendencies of adolescents to be risk-takers will regularly take precedence.

The educational environment, whether school, college or a trade, has been proven one of the most important milieus in which to help develop the adolescent brain. Research has shown that the ideal age for maximum effect is between

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15 and 18 years of age. Transition Year offers a fantastic opportunity to develop pupils' cognition, creativity and learning, as well as to address emotions, social attitudes, personality, well-being and health.

A study took place looking at 213 school-based social and emotional learning programmes involving more than 270,000 students from kindergarten to high school in the United States. The study revealed that students who participated in these school-based social and emotional learning programmes improved in grades and standardised test scores by 11 percentile points compared to control groups (*Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011*). They showed improved social and emotional skills, attitudes, behaviour, and academic performance.

- Children with higher levels of emotional, behavioural, social, and school well-being, have, on average, higher levels of academic achievement and are more engaged in school, both concurrently and in later years.
- Children who are bullied are less engaged in primary school, whereas those with positive friendships are more engaged in secondary school.

- As children move through the school system, emotional and behavioural well-being become more important in explaining school engagement, while demographic and other characteristics become less important.

BRAIN CARE IRELAND'S TELEMEDICINE PROGRAMMES

Brain Care Ireland has been working in the field of telemedicine for over ten years. 'Telemedicine' encompasses online programmes which can be interacted with, and which then rank performance and produce predictive analyses. These analyses can be used to inform the choice and methodology of any subsequent interventions and correction programmes.

Telemedicine programmes have achieved proven results in the area of learning difficulties. Despite being necessary to give every pupil the best start in life, interventions dealing with learning difficulties are usually labour-intensive and often prohibitively expensive to deliver. The Brain Care Ireland telemedicine programmes enable the delivery of interventions to many simultaneously, at low cost.

Arising from years of experience, Brain Care Ireland has launched two new programmes for Transition Year in schools in Ireland, developed in recognition of the need for cost-

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effective interventions in the area of learning difficulties. 'Think Drive' and 'Learn' are targeted at young drivers in Transition Year. The initial baseline test takes just 13 minutes and generates a report ranking the pupil's ratings on twenty cognitions needed to be a good and safe driver and/or to improve academic performance. Threshold levels are determined by top Advanced Driving Instructors in Ireland, to ascertain how a young driver might drive in adverse conditions. While the participant can excel in many of the tests, low scores in important cognitive requirements such as Reaction Time, Focus and Concentration, and Memory, can indicate an increased risk of being involved in an accident. Should the participant fall below the set parameters, these weaknesses and learning difficulties can be focussed on and corrected in a follow-on four- to six-months online corrective programme. On completion, participants are issued with a certificate identifying their strengths and weaknesses, which can be further addressed by their driving instructor.

In summation, these programmes can and do effect changes for the better in the brain, without harm, allowing the young person to achieve their maximum possible potential and reducing the possibility of addiction to alcohol and drug as well as having a positive effect on behavioural disorders.

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