

Dore Programme

Evidence for efficacy:

There is some literature linking the cerebellum with learning disabilities, and in particular with dyslexia and ADHD. Most notably, Nicolson, Fawcett and Dean (2001) argue that children with dyslexia experience dysfunction well beyond difficulties with reading and spelling. Dyslexia, they argue, is instead more accurately characterised as a 'skill automatisisation' disorder (skill automatisisation being "the process by which, after long practice, skills become so fluent that they no longer need conscious control" (p. 508) "whether or not the skill is in the literacy domain" (p. 509)). They suggest its symptoms are – theoretically and empirically – best predicted by a cerebellar impairment hypothesis. They do so based on:

- behavioural testing data (Nicolson & Fawcett, 1994a; 1994b) suggesting children with dyslexia show generalised difficulties related to processing speed, memory, motor skill and balance;
- tests of cerebellar function (dystonia and dyscoordination), on which dyslexic children show impaired performance compared with controls matched for reading-age (Fawcett, Nicolson, & Dean, 1996; Fawcett & Nicolson, 1999);
- a PET study (that article) involving learning (by trial and error) a sequence of button presses, during which dyslexic participants demonstrated, compared with healthy controls, significantly reduced activation in the ipsilateral (right) hemisphere of the cerebellum; and
- MR spectroscopy data showing (p. 510) "differences in the ratio of choline- containing compounds to N-acetylaspartate (NA) in the left temporo-parietal lobe and the right cerebellum, together with lateralization differences in the cerebellum of the dyslexic men but not the controls" (Rae et al., 1998).

Moreover, there are two articles in peer-reviewed journals supporting Dore's efficacy for dyslexia. These (Reynolds, Nicolson, & Hambly, 2003; Reynolds & Nicolson, 2007) report the results of two phases of a Dore intervention trial at a primary school in Warwickshire. The 2003 study ostensibly found that children receiving Dore treatment demonstrated increased performance (relative to controls) in the number of words they could read in one minute, in semantic fluency, and in rapid naming. They also found Dore improved phoneme segmentation and nonsense passage reading, as well as SAT literacy scores for those in the treatment group. The 2007 study concluded that after an 18 month follow-up period gains were maintained (or improved) in semantic fluency, rapid naming and phoneme segmentation (note, however, there was no control group here, as those previously in the control group had subsequently been offered the Dore treatment). There was also an increase in the rate of improvement in reading age as measured by the NFER test. In contrast, improvements in speed reading or nonsense passage reading were not maintained over time. Note that, as is described below, both of these articles have been met with considerable criticism and should be interpreted carefully.

Evidence against efficacy:

There is no strong evidence that cerebellar abnormality plays a causal role in dyslexia. Given the cerebellum's plasticity, abnormal cerebellum structure or function may in fact be a marker indicative of more generalised abnormal early brain development, or a consequence of dyslexia (Bishop, 2002). Additionally, as Reynolds et al. (2003) themselves admit, it is generally thought the cerebellum is composed of many small and independent areas, and so it is not readily apparent why training on one task (in which certain zones are involved) should generalise to unrelated tasks.

Moreover, a number of other researchers are critical of the Dore intervention research carried out by Reynolds et al. (2003) and Reynolds and Nicolson (2007). The 2003 article was followed by nine critical commentaries (Hatcher, 2003; McPhillips, 2003; Peer, 2003; Rack, 2003; Richards et al., 2003; Singleton & Stuart, 2003; Snowling & Hulme, 2003; Stein, 2003; Whiteley and Pope, 2003), and its publication prompted one member of the editorial board of *Dyslexia* to resign. The 2007 follow-up prompted five further resignations (Bishop, 2007). Issues identified with the research include the following:

- *An untreated control condition, and no control condition for the 2007 follow-up study:* the authors consider but then reject using an active control group because “it is difficult to envisage just what such an activity would entail given the need for 180 separate parent-administered sessions over the 6 months” (Reynolds et al., 2003, p. 54), because doing so might lead to “boredom and alienation” (p. 54) and therefore inflate the outcomes of Dore treatment, and because doing so would in their view be problematic on ethical grounds. However without such an active control group, differences between the groups might represent a Hawthorne effect, where an effect is seen simply as a result of the treated group receiving more time/attention (Snowling & Hulme, 2003). Arguably, there were available and ethical active control methods – such as parents spending an equivalent amount of time with their children helping them read (Snowling & Hulme, 2003), or perhaps an equivalent amount of time spent doing physical exercise.
- *Pre-existing literacy differences between the treatment and control groups:* it is generally considered best practice in intervention research to randomly assign participants to different conditions. Random assignment was not employed in this study, however — and despite efforts to match participants based on risk of dyslexia as assessed by the Dyslexia Screening Test — the treatment group turned out to have lower initial literacy scores than the control group (Reynolds & Nicolson, 2007). This complicates the interpretation of the results as the treatment group might be expected to improve its initial scores more than the control group simply because of statistical phenomena (Snowling & Hulme, 2003).
- *Inappropriate measures:* Singleton and Stuart (2003) are critical of the appropriateness of the literacy measures used by Reynolds et al. (being the Dyslexia Screening Test/‘DST’, the NFER-Nelson Group Reading Test, and the Standard Assessment Tasks/‘SATs’).
 - First, Singleton and Stuart argue that the DST measures are not appropriate measures of literary improvement in this kind of study. The DST is a screening test and it is not clear whether it produces the desired normal distribution (and appropriate data to this end are not provided). The subtests are arguably overly brief, can require subjective judgement with little guidance, and may in any case not be very ‘pure’ (see Singleton & Stuart, 2003, p. 153). Further problems identified include that three of the subtests used take different forms for different age groups (meaning children may have received different versions of the tests in the pre- and post-intervention testing), and that the measures conflate speed and accuracy – meaning an increase in test score could in fact be due to increased motivation to work faster as opposed to improved skill/accuracy.
 - Second, Singleton and Stuart note that the NFER-Nelson Group Reading Test is an odd choice (given the small number of participants) over individual reading tests. They also raise concerns over the authors’ interpretation of the change between July 2000, 2001 and 2002, arguing the July 2001 result might represent a “temporary blip in a progress curve that is otherwise unexceptional”.

- Finally, Singleton and Stuart are critical of the use of SAT data. Their view is that the SATs do not relate well to other well-supported psychometric reading measures, and are “inherently unreliable because of the vague definitions that accompany the criteria for standards of attainment”. They also question the way Reynolds et al. convert categorical SAT data to numerical scores, particularly for the writing scores.
- *Inappropriate statistical treatment*, even if measures are appropriate: this is explained by Snowling and Hulme (2003) who identify a number of issues with treatment of data relating to the children’s reading and spelling ability. First, they note that scores obtained from the Dyslexia Screening Test were reported as average centile scores for the two groups, which they argue is not appropriate. Ordinal measures, they argue, should not be averaged in this way because one obtains a misleading result where “differences between scores near to the mean that may not be important” are magnified and “large differences in top and bottom of the distribution” (p. 130) are reduced. Secondly, the authors’ use of 22 t-tests is inappropriate — first because no correction was made for the many separate tests carried out, but second and more importantly because they cannot test the most important hypothesis: that the Dore treatment group improved differentially over time compared to the control group. It would have been better, according to Snowling and Hulme, to conduct an ANCOVA on the post-intervention raw scores for both groups using the pre-intervention raw scores as a covariate. This would have allowed the researchers to conclude that “the children in the DDAT group had made more progress in reading than the children in the untreated control group, and this difference could not be explained by uncontrolled differences in the children’s reading scores before the intervention began” (pp. 131-132).
- **However**, this analysis was carried out as requested in a response to Snowling and Hulme’s critique (Nicolson & Reynolds, 2003). They found that “[t]here was significantly greater effect for the intervention group on bead threading, reading and semantic fluency [$F(1,32) = 7.2, p < 0.05$; $F(1,32) = 4.8, p < 0.05$; $F(1,32) = 8.5, p < 0.0001$, respectively]. No other sub-tests reached significance. The pattern of significant results is therefore the same as that found in our published two factor analyses of variance.”
- Failure to report relevant descriptive statistics: Snowling and Hulme further argue the article’s statistical failings are exacerbated by its authors’ failure to include relevant descriptive statistics.
- Odd nonsense passage reading data: Singleton and Stuart (2003) draw attention to the fact that Reynolds et al. claim the treatment group showed a significant improvement on the nonsense passage reading subtest (noting this was at a somewhat dubious significance level of $p < 0.1$ using a one-tailed test), but do not discuss the fact that the control group actually (also) showed a significant improvement (at the $p < 0.01$ level, moreover) on the nonsense passage reading subtest. Given that children with dyslexia tend to have more difficulty with phonological decoding than other key literacy skills, this result does not lend support to the hypothesis that Dore treatment is useful for dyslexia. Singleton and Stuart argue that were it effective, one would expect to see clear improvements differences between the groups in phonological decoding skill.

- A mismatch between the data and the proposed causal explanation: Stein (2003) notes that the treatment group (who were selected for being at risk of dyslexia) had postural stability already greater than average before Dore treatment commenced. It is thus far from clear that the children's reading difficulties were the result of cerebellar abnormality (as indicated by postural instability – i.e., what Dore tries to improve). It consequently seems odd to hypothesise that causes dyslexia/poor reading and can be remediated by postural exercises. A similar point is made by Bishop (2007, p. 654), who argues that “[i]f training eye–hand co-ordination, motor skill and balance caused generalised cerebellar development, then one should find a low rate of dyslexia and ADHD in children who are good at skateboarding, gymnastics or juggling. Yet several of the celebrity endorsements of the Dore programme come from professional sports people.”

Price:

Stephenson & Wheldall (2008) report the programme costs around AUD \$5,000.

What it involves:

The Dore programme is a for-profit intervention targeting dyslexia, dyspraxia and ADHD involving particular physical exercises. Founded by businessman Wynford Dore, it is based on the theory that learning difficulties arise due to a single underlying cause located within the cerebellum (sometimes referred to as a cerebellar developmental delay).

While the Dore programme is proprietary and the specifics of its exercises are not available to the public, it is known to involve “use of a balance board; throwing and catching of bean bags (including throwing from hand to hand with careful tracking by eye); practice of dual tasking; and a range of stretching and coordination exercises” (Reynolds, Nicolson, & Hambly, 2003, p. 55). Exercises are done for ten minutes twice a day, with the programme taking about fourteen months to complete (Stephenson & Wheldall, 2008). Further description can be found in Appendix A of Reynolds and Nicolson's (2007) article “Follow-up of an Exercise-based Treatment for Children with Reading Difficulties”.

Note: the Dore programme was previously referred to as ‘Dyslexia, Dyspraxia and Attention Treatment’ and the abbreviation ‘DDAT’ is consequently sometimes used in the literature.

What claims does the company make / what does the programme target?

Dore (n.d., para. 4) argues their “physical stimulation approach” will “improve cerebellar underperformance” and consequently address the underlying cause of learning and attention disabilities.

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