Australasian Journal of Special Education
Vol. 32, No. 1, April 2008, pp. 67–82

Routledge
Taylor & Francis Group

Miracles Take a Little Longer: Science, Commercialisation, Cures and the Dore Program

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In this article, the evidence regarding a proposed 'cure' for dyslexia and other, arguably related, conditions is examined critically. The origins and history of the Dore program and its progenitors, its introduction to Australia and its advertising claims are reviewed, with a focus on the claims made with regard to dyslexia, and particularly with regard to reading. The article compares the claims made about the program and the existing published research, considers whether the Dore program makes conceptual sense in the light of current scientific research and theory, evaluates the existing specific evidence adduced by its advocates as proof for the efficacy of the program, and compares the claims made by the program promoters with the scientific evidence available. It is concluded that none of the necessary desiderata to substantiate claims for a cure are met by the available scientific evidence for the efficacy of the Dore program.

When children fail to learn from the standard instruction offered in their schools, it is not unexpected that many parents will seek additional tuition or intervention and that teachers may seek additional sources of help to recommend to parents. The difficulty arises when parents are persuaded to invest in expensive programs that may not deliver the desired outcomes. Programs may be aggressively marketed and parents, and those who advise them, may be unable to access accurate information about the suitability of programs for their child, or about the general efficacy of such programs.

Teaching, as a profession, has been relatively slow to follow the lead of its sister profession, medicine, in the pursuit of evidence-based practice, as Carter and Wheldall (2008) make clear in their introduction to this special issue of the *Australasian Journal of Special Education*. It is only in recent years that we have seen any serious movement in this direction. It could fairly be argued, however, that Special Education has been a lone voice in this regard for a longer period and that while general educational research has been flirting with postmodernism and other avowedly non-positivist approaches over the past two decades (Wheldall, 2006),

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ISSN 1030-0112 (print)/ISSN 1833-6914 (online)/08/010067-16
© 2008 Australian Association of Special Education Inc
DOI: 10.1080/10300110701845946

https://doi.org/10.1017/S1030011200025768 Published online by Cambridge University Press

Special Education has been (largely) 'holding the line' as a discipline requiring scientific evidence to justify any claims made. Cook, Landrum, Tankersley, and Kauffman (2003) argued that the 'specialness' of special education 'should be based on the scientific base established for its practices and the precision of implementation of best practices' (p. 356).

In the United States, the movement towards evidence-based practice in education has been a growing force not least signalled by the establishment of the *What Works Clearinghouse* (Carter & Wheldall, 2008). The aim of the clearinghouse has been to provide the public with synopses of the available scientific evidence on programs and interventions in terms of their specific efficacy. To what extent this initiative has been successful is arguable (again see Carter & Wheldall, 2008), but the fact remains that the intent has been to move teachers and others towards a more discriminating approach to teaching and to assist them in evaluating the claims of competing educational 'products.'

A scientific approach to education requires a critical approach to claims about interventions. Direct quantitative measurement should provide data to determine whether or not an intervention caused a particular effect. The evidence collected should be presented in a way that makes it available for scrutiny by other researchers. Careful research design allows conclusions to be drawn from the data gathered (Favell, 2005; Spear-Swerling & Sternberg, 2001). Wheldall (2007; Carter & Wheldall, 2008) has argued for a more measured approach in the quest for evidence-based practice in education since so few programs, interventions and innovations in education are supported by hard, unequivocal evidence for their efficacy. Wheldall (2007) has proposed a sliding scale of levels of acceptable efficacy comprising gold, silver, and bronze and two further unacceptable levels of brass and tin. Placement on the levels is dependent upon whether the program or intervention makes conceptual sense generally within what is currently known, based upon available scientific evidence and accepted theory. Placement also, importantly, depends on whether there is specific evidence for the efficacy of the intervention, preferably drawn from the results of a series of independent, replicated, truly experimental studies (see Carter & Wheldall (2008) for a more elaborated description of this model).

For a product or program to be considered a cure for a disease, there are several desiderata or criteria to be met. First, the nature of the disease must be carefully and specifically operationalised so that it may be objectively diagnosed. Second, the cause of the disease needs to be established unequivocally, and conceptually located within, and building upon, known science while adopting the most parsimonious explanation that fits the available evidence. Third, the proposed treatment needs to be objectively operationalised so that it may subsequently be replicated, and it also needs to be shown to directly affect the known cause of the disease. Fourth, the treatment (the potential cure) must be shown reliably to eradicate or severely diminish the symptoms of the disease in persons who have been reliably shown to have the disease. Fifth, and finally, this demonstration of efficacy must be readily and frequently repeatable by others, external to the original research group.

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Taking the approach of establishing criteria for the identification of practices of dubious value, Smith (2005) summarised the characteristics of pseudoscientific interventions as claiming cures and reporting 'important sounding but vague' outcomes (p. 47). The evidence to support such practices comes from uncontrolled studies or subjective sources such as anecdotes and testimonials. The theoretical underpinning may be inconsistent with accepted knowledge and principles in an area of study and often posits some core deficit that can be corrected to result in improvements in a range of areas. Pseudoscientific interventions may employ high technology, but in an unproven and inappropriate form.

The Dore program (Dore, 2006) has been promoted as an intervention strategy claimed to benefit people with dyslexia, dyspraxia, attention deficit hyperactivity disorder (ADHD) and Asperger's syndrome. In 2007, Wynford Dore toured Australia promoting his new book (Dore, 2006) entitled *Dyslexia—The Miracle Cure* which describes the program and offers evidence to support its efficacy. We shall review the origins and history of the Dore program and its progenitors, its introduction to Australia and its advertising claims, with a focus on the claims made in regard to dyslexia, and particularly about reading. We will compare the claims made about the program and the existing published research, in the light of the characteristics of effective and pseudoscientific practices outlined above. We will consider whether the Dore program makes conceptual sense in the light of current scientific research and theory, and evaluate the existing specific evidence adduced by its advocates as proof for the efficacy of the program and compare the claims made by the program promoters with the scientific evidence available.

History and Origins of the Dore Program

The Dore Achievement Centres (previously called Dyslexia, Dyspraxia and Attention-Deficit Treatment [DDAT] clinics), founded by Wynford Dore, are a recent entrant into the market for programs to assist people with reading and other difficulties. There are currently Dore centres in the UK, USA, New Zealand, Hong Kong, South Africa and Australia. The program in Australia began in 2002 (Dore, 2006) and is currently available in 21 locations across all states and territories (Dore Group Australasia Ltd, 2007a). In Parkes, NSW, the local council supported the establishment of a Dore centre in 2004 and has claimed 'phenomenal success' for the program (Dore Group Australasia Ltd, 2007b).

Dore, a Welsh businessman, who has a daughter with dyslexia, started his search for a cure for dyslexia in 1993. After picking up a book by Dr Harold Levinson at an airport in 2000, he initially explored Levinson's treatment (Berliner, 2001; Meikle, 2001). Levinson offered medical treatment (using motion sickness treatments and other medications) for dyslexia, ADHD, and phobias, based on his theories that these may all be caused by malfunctions in the inner ear or the cerebellum or both. Levinson claimed that these malfunctions lead to problems not only with balance

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and coordination, but also to dyslexia, learning disabilities, and phobias (Levinson, 2004).

While apparently accepting Levinson's theories of vestibular-cerebellar dysfunction, Dore became disenchanted with the use of drugs. He worked with a general practitioner, Dr Roy Rutherford, and Rachel Smith (a specialist in the assessment of hearing, balance, and brain injury) to explore alternative treatments for vestibular-cerebellar dysfunction. With these people, Dore became familiar with the work of Professor Rod Nicolson (who suggested that cerebellar dysfunction was a cause of dyslexia), and that of Peter and Sally Blythe, who claimed that dyslexia is related to the persistence of primitive reflexes. This exploration resulted in his conclusion that cerebellar dysfunction was the cause of dyslexia (and other problems) and that a drug-free intervention could be developed (Dore, 2006; Dore & Rutherford, 2001).

The Dore Explanation for Reading and Other Difficulties

Dore centres claim that people with dyslexia and other disorders may have a condition they call Cerebellar Developmental Delay (Dore Group Australasia Ltd, 2007c). According to the Dore website (Dore Group Australasia Ltd, 2007c):

> if the neural pathways—the connectors that link the thinking brain and the cerebellum—aren't yet fully developed, the cerebellum can't process information quickly enough. We call this Cerebellar Developmental Delay, or CDD. One in 6 people have symptoms of CDD, yet most go undiagnosed.

The claim is that CDD reduces the ability of people to develop automatised skills and this lack of automatised skills impacts on reading and other skill areas.

Assessment and Intervention at the Dore Centres

People attending the Dore centres undergo an assessment process before an individualised series of exercises is prescribed. This assessment includes the SNAP IV for symptoms of attention deficit disorder (ADD) and/or ADHD. Dynamic posturography, in which a computer-controlled machine measures balance and vestibular function, is used as a means of measuring cerebellar function. There is also oculo motor testing (electronystagmography), which is also computer administered and scored. The Dyslexia Screening Test is administered, and testing 'to further confirm cerebellar immaturity' (Dore Group Australasia Ltd, 2007d). The results of these tests are used to prescribe a set of exercises, which are reviewed about every 7 weeks. The exercises are focused on balance and motor skills (and include activities such as balancing on a wobble board and throwing and catching bean bags) and are done for 10 minutes a day, twice a day. The entire program runs for around 14 months and costs around $A5,000 (Dore Group Australasia Ltd, 2007e; Devine, 2007).

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Recruiting Clients

The Dore centres have a website which provides information about the program, gives phone contact numbers, and offers a free DVD. The program is advertised on radio, has featured on current affairs radio and television programs, and regularly appears in newspaper and magazine articles. A screening test listing possible symptoms of Cerebellar Developmental Delay is provided on the website at http://gadget2.dore.com.au/xmlqa.aspx. (The first author completed this test honestly, answering yes to the question about difficulty learning to tie shoelaces and no to the question about enjoyment of sport and no to all the other problematic symptoms, and was surprised to learn that she would benefit from the Dore program.) The program is not offered to children younger then 7, but, otherwise, it is claimed to be suitable for all ages, including adults.

Claims for the Benefits of the Dore Program

The generic claim repeated several times on the website is 'that sufferers of ADHD/ADD, Dyslexia and Dyspraxia can turn their lives around after completing our simple exercise-based treatment program' (see, for example, Dore Group Australasia Ltd, 2007f). For children, the claim is that there will be 'an amazing improvement in academic results … reading becomes less of a chore and they may begin to read for fun' (Dore Group Australasia Ltd, 2007f). General claims for impacts beyond the specified disorders are also made: 'It is certainly the case that most clients who attend the DORE Program show very rapid improvement in symptoms of low self-esteem, anxiety, and low mood and behavioural problems' (Dore Group Australasia Ltd, 2007g).

More detailed claims, including specific claims about reading skills, are also made in a listing that appears after the online screening test is submitted:

> We measure the average improvements made by our clients in a number of other areas—these are the results
>
> Spelling—They make twice the expected progress
>
> Verbal Fluency—They make 3 times the predicted progress
>
> Phonological Skills—They make more than 4 times the predicted progress
>
> Writing—They make more than 4 times the predicted progress
>
> Working Memory—They make more than 5 times the predicted progress
>
> Coordination Skills—They make 6 more than the predicted progress (**sic**)
>
> Working Memory—They make more than 5 times the predicted progress

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> We have also studied many of the children that have completed the program more than a year ago and it is clear that the progress that they have started to make continues after the program has been completed—and there is no sign of them going back to the way they were—it certainly appears to be a long-term solution! (Dore Achievement Centres, 2004)

A Scientific Perspective

What then, are we to make of the assessment, intervention, and efficacy claims of the Dore centres if they are viewed from a scientific perspective (Carter & Wheldall, 2008)? The history of special education, particularly that part relating to students with learning disabilities/difficulties, has been littered with a plethora of programs predicated upon the notion that the integration of perceptual (or sensory) and motor functions is somehow faulty and that, once these integration difficulties are resolved, students will be able to learn academic skills more readily. The clear evidence that such programs have repeatedly been found to be ineffective has done little or nothing to stem the flow of such programs onto the market (Kavale & Mattson, 1983; Stephenson, Carter, & Wheldall, 2007).

Theoretical Underpinnings of the Dore Program: The cause of dyslexia

The program is posited on the theory that dyslexia (and other problems such as dyspraxia, ADHD, and Asperger's syndrome) is due to underlying problems in the cerebellum. Dore stated in the *Four Corners* program broadcast on ABC national television on 6 August 2007 (Carney, 2007) that 'In actual fact, almost invariably, the cause of poor literacy is physiological'. The Dore centres call this difficulty Cerebellar Developmental Delay. This condition appears only to be recognised by the Dore advocates and not by other medical or educational researchers. A Google Scholar search for 'Cerebellar Developmental Delay' only located sources related to the Dore centres and an article by Reynolds, Nicolson, and Hambly (2003) reporting research on the Dore program. On the Dore website (Dore Group Australasia Ltd, 2007h), the term is ascribed to Nicolson; however Reynolds et al. (2003), who used the term once in their article, ascribed it to 'DDAT researchers' (p. 55).

It is generally accepted that the function of the cerebellum is related to motor functions but it also seems to have a broader role related to cognition and perception. There is some evidence that the cerebellum is active during reading in ways that are related to cognition, not just perception and motor planning, and that the activity differs depending on whether the task is phonological or semantic (Fulbright et al., 1999; Pope & Whiteley, 2003).

Some workers have proposed that children with dyslexia have a general, more basic deficit (rather than a specific phonological deficit) in that they fail to fully automatise skills and that it is this more general deficit that underlies the widely accepted phonological difficulties. These workers linked difficulties with motor skills and balance seen in some children with reading difficulties to cerebellar deficits

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(Nicolson, Fawcett, & Dean, 2001). They did not, however, claim that balance and motor difficulties are always associated with dyslexia and 'claim only that the language-related regions of the cerebellum are affected in dyslexia' (Nicolson & Fawcett, 2006, p. 261).

Some researchers have concluded that there is little evidence to support the cerebellar deficit theories (White, Milne et al., 2006), while others have suggested that the association between reading difficulties and sensorimotor difficulties does need explaining and that cerebellar deficits, if present, could make reading difficulties worse (Bishop, 2006).

In summary, the theoretical cause of reading difficulties as put forward by the Dore centres is not widely accepted, especially in the simpler form of a single underlying cerebellar deficit. Although there are some theorists who argue that cerebellar deficits may underlie phonological difficulties, these theorists do not claim that the parts of the cerebellum related to balance and movement are the same as those related to reading (Reynolds et al., 2003). Indeed, in the first article exploring the effects of the Dore program, Reynolds et al. (2003) stated that deriving the Dore program from current theories about cerebellar deficits required 'a leap of faith' (p. 52). The Dore theory seems congruent with Smith's (2005) description of pseudoscience in that the theoretical underpinning is not consistent with current understanding of reading difficulties, or even with current theories of cerebellar deficits held by a minority of reading researchers. It is also fulfils the characteristic of an intervention that posits a single underlying deficit that affects a wide range of behaviours.

Theoretical Underpinnings of the Dore Program: Intervention for Dyslexia

The debate over the neurological underpinnings of reading difficulties is interesting, but of much more practical importance is the efficacy of intervention strategies proposed. Although the Dore website states, 'Of course, it does mean that reading skills improve only with exposure to print and practice' (Dore Group Australasia Ltd, 2007g), this disclaimer is only presented once, and the general thrust of the site is that the program alone will bring about improvements. There is a focus on purported deficiencies in the cerebellum as the underlying difficulty causing people to have problems with reading. The Dore centre treatment is premised on the idea that the cerebellar deficits purported to cause reading difficulties can be remediated by an exercise program that focuses on balance and motor skills and acts through the vestibular system to change the cerebellum (Dore Group Australasia Ltd, 2007i).

The evidence for the efficacy of perceptual motor programs in remediating academic skills such as reading is generally lacking, despite their continuing popularity. Kavale and Mattson, in 1983, reported in a meta-analysis that perceptual-motor programs had little effect on reading and academic skills. A recent review of research on the Brain Gym® program, which also claims to improve academic skills through exercise, found no sound evidence to support these claims

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(Hyatt, 2007). Similarly, Hammill's (2004) extensive review of the correlates of reading found only small correlations between perceptual motor skills and reading and noted that 'training in these skills is not useful for remediating reading problems' (p. 463).

On the other hand, some success has been reported for an alternative exercise-based approach. In a well-designed study, McPhillips, Hepper, and Mulhem (2000) reported positive effects on reading in children with reading difficulties from a program, the Primary Movement program, that used exercises based on primitive reflexes. A control group that performed similar movements that did not replicate the primary reflex movements did not show as much improvement in reading. Jordan-Black (2005) also reported positive effects of this program on student achievement, particularly in reading and maths. A longitudinal component of this study included all students in Years 3, 5, and 7 in 13 schools, and a quasi-experimental component compared two parallel groups within two schools, and thus it did not specifically target students with reading difficulties. The primary reflex movements, however, unlike the Dore program exercises, do not appear to have contained any exercises concerned with balance and vestibular function or eye movements. Given the long and consistently unsuccessful history of perceptual-motor programs, these findings (Jordan-Black, 2005; McPhillips et al., 2000) should be treated with caution until they have been independently replicated.

Given these findings, it makes sense to ask what specific kinds of exercises might be responsible for any effect. If there is a demonstrable effect, one would expect a relationship between the kinds of exercises and the effects noted. It seems that the only potentially demonstrated effects on reading emerge from exercises that are different from those used in the Dore program. Even theorists who support the cerebellar deficit hypothesis have agreed that balance and motor difficulties are not necessarily associated with reading difficulties and that the cerebellar deficit that gives rise to reading difficulties is present only in the language-related regions (Nicolson & Fawcett, 2006). Reynolds and Nicolson (2007), whose research is claimed by the Dore centres to support their intervention, stressed that the idea that the cerebellar deficit can be ameliorated by exercises 'goes beyond the cerebellar deficit hypothesis' (p. 79). It is hard to see how remediating a non-reading related part of the cerebellum through exercise (even if this could be shown to happen) would result in improvements in reading and other language-related skills.

Balance and motor difficulties are not always associated with dyslexia, and may be associated with other developmental disorders; again, separately from reading difficulties. White, Frith, Milne, Rosen, Swettenham, and Ramus (2006) compared sensorimotor impairments in children with dyslexia and those with autism and concluded that sensorimotor impairments are found in a wide range of developmental disorders and are 'general, non-specific markers of neurodevelopmental disorders' (p. 759). This finding supports the conclusions drawn by Rochelle and Talcott (2006). Their meta-analysis compared studies of participants with and without dyslexia that examined the occurrence of balance difficulties.

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Rochelle and Talcott also concluded that the lack of association between balance and reading difficulties casts doubt on the efficacy of interventions that employ balance and motor exercises with the aim of directly improving reading.

Although the causes of reading difficulties may be undetermined and open to some debate, there is little doubt that there is robust evidence that effective intervention for reading problems should include explicit instruction in phonological awareness and phonics and that such instruction should be intensive (daily with individual or small group instruction) (Department of Education, Science and Training, 2005; National Institute of Child Health and Human Development, 2000; Rose, 2006).

The Scientific Evidence for the Efficacy of the Dore Program

There have been two peer-reviewed studies of the effect of the Dore program, both published in the journal *Dyslexia* (Reynolds et al., 2003; Reynolds & Nicolson, 2007). We will not provide a detailed critique of these studies here; the reader is referred to the commentaries published on the studies (Hatcher, 2003; McPhillips, 2003; Rack, 2003; Rack, Snowling, Hulme, & Gibbs, 2007; Richards et al., 2003; Singleton & Stuart, 2003; Snowling & Hulme, 2003; Whitely & Pope, 2003) and to Bishop (2007). Recently, Bishop (2007) provided a brief review in a medical journal and warned family doctors and paediatricians that the available evidence does not support the claims made by the Dore centres in relation to ADHD, dyslexia, dyspraxia and Asperger's syndrome. We shall overview the evidence presented and report the responses of those taking a scientific stance towards those studies, and to the use of those studies by the Dore centres. An unprecedented nine critical responses from reading scientists were published in response to the first study (Reynolds et al., 2003), pointing out the various flaws in the research design and the overstated claims made by the study's authors on the basis of the very limited evidence available.

Nature Neuroscience saw fit to devote an entire editorial to the scientific basis for the efficacy of the Dore program headlined: 'A cure for dyslexia?' (2007). The editorial concluded:

> until an independent evaluation has been published in an academic journal, claims that the treatment has been scientifically proven cannot be supported. More importantly, parents must be able to rely on experts in the field to give their honest professional opinion about a treatment's efficacy, without interference from commercial interests or legal concerns. (p. 135)

So what was it about the research that other reading scientists took exception to? First, the original Reynolds et al. (2003) study did not specifically target students who were experiencing severe reading difficulties, let alone dyslexia. In fact, some of the 18 participating students were already reading above grade level before they undertook the program and many were scoring above average on the measures of semantic fluency and writing. Moreover, as the *Nature Neuroscience* editorial

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succinctly summarises: 'Only six were diagnosed with dyslexia, two with dyspraxia and one with ADHD, suggesting that most subjects did not have the conditions that the Dore program is supposed to remediate' (p. 135). Concerns were also expressed about the comparability of the experimental and control groups and the control group condition that may not have controlled for novelty/placebo. Since the second study (Reynolds & Nicolson, 2007) was a follow-up of the original experimental group students plus the control group students who had subsequently received the Dore treatment, there was no control group for the second study.

What the studies did show was that the exercise group, after treatment, performed better than the untreated group on the tests for vestibular/cerebellar signs (posturography, visual tracking, saccade accuracy and saccade latency) and on 3 of the 11 subtests of the Dyslexia Screening Test: the one-minute word list reading, bead threading and semantic fluency. Students who completed the Dore program were reported to have made greater gains in standardised school testing after they completed the program than in the year before (Reynolds & Nicolson, 2007). Comparisons could not be made with a control group for these results, so they should not be over-interpreted. There was also the assumption that the gain scores derived from these results actually reflected the effects of the intervention, and only the effects of the intervention. The use of the standardised school testing has been criticised by several commentators (see, for example, Rack et al., 2007; Snowling & Hulme, 2003). These contentious results from the standardised school testing are one source of the claims quoted earlier in this article that the program results in students making greater gains than would be predicted.

The claims made in publicity materials for the Dore program go far beyond the effects that have been demonstrated in the research, or, to be fair, the claims of the researchers. The program is marketed as helpful for people with dyslexia, ADD, ADHD, dyspraxia and Asperger's syndrome. The published research, however, included only six students with dyslexia, two students with dyspraxia, one with ADHD and none with Asperger's syndrome (Reynolds et al., 2003). The Dore group claims that research carried out at the University of Exeter showed 'remarkable progress in reading, comprehension, writing, self-esteem, social skills and coordination among children who completed the program at DORE' (Dore Group Australasia Ltd, 2007j), but the published and peer-reviewed research does not mention social skills or self-esteem and does not support the claims about reading, comprehension and writing.

Concerned scientists did not limit their actions to writing critiques. Publication of the original study led to one resignation from the Editorial Board of *Dyslexia* (the journal where both studies were published), and five more resignations from the Board followed the publication of the second study. The editorial in *Nature Neuroscience* also noted that concerns were expressed about the funding of the authors by Dore and the propriety of aspects of the editorial review process, although Wiley, the publishers of the journal, found on investigation that the editor had acted appropriately (A cure for dyslexia?, 2007).

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The scientific evidence to support the claims of the Dore program has not yet been established. There are two flawed studies, both carried out by the same group who were not independent of the Dore program. The details of the exercise program were not reported because of their commercial sensitivity (Reynolds et al., 2003), which clearly limits the capacity of other independent groups to replicate the research. Consistent with Smith's (2005) characterisation of pseudoscience, the Dore program relies heavily on anecdotal evidence and testimonials in its promotional materials, such as those contained on their promotional DVD (Dore, n.d.), the website (Dore Group Australasia, Ltd, 2007k) and Dore's book (Dore, 2006).

In his book, Dore referred to a number of different research projects and findings, but only the two already described have been published in the peer-reviewed literature. Results from non-peer reviewed studies are included on the website (Dore Group Australasia, 2007l). Moreover, Dore himself (Dore, 2006) argued against the use of control groups in the research on the Dore program and was critical of the peer review process as it operated for the Reynolds et al. (2003) paper. But as the eminent Australian Nobel laureate Peter Doherty (2006, p. 74) makes clear:

> Anonymous review can be open to abuse, but most behave responsibly as everyone lives by the same rules. In my experience the famous aren't cut any slack in the peer review process, and indeed they shouldn't be. The integrity rests in the validity of the data and the intrinsic interest of the conclusions, not in the personality or prominence of a particular author.

The Dore Reaction to Criticism from Reading Scientists

Both Professor Max Coltheart, an eminent and distinguished Australian scientist, who is a leader in the field of reading research, and Professor Margaret Snowling, in the UK, have received letters from Dore's legal representatives as a result of making public criticisms of the program (A cure for dyslexia?, 2007; Devine, 2007). The current lack of scientific evidence to support the Dore program is one concern, but what concerned the reading scientists most was not so much the shortcomings of the research but the perceived attempts by Dore to gag public criticism by means of threatened legal action. As the *Nature Neuroscience* editorial (A cure for dyslexia?, 2007) makes clear, and this in large part must have prompted the editorial, it is this attempt to stifle the legitimate concerns of science that is of gravest concern. Threatened legal action of this nature strikes at the very heart of science.

The fact that the two published evaluation studies (Reynolds et al., 2003, Reynolds & Nicolson, 2007) are closely connected to a commercial operation means that the authors have some responsibility to place the findings in context. Moreover, proper and careful scrutiny of the findings by other scientists must be allowed, without fear of legal retribution. Two arguably flawed studies are not convincing evidence for the efficacy of the Dore program, but these two studies are being used to support the ongoing marketing of the program through the Dore centres.

https://doi.org/10.1017/S1030011200025768 Published online by Cambridge University Press

The Case for a Cure and the Frances Urquart Defence

In the celebrated political television drama series *House of Cards*, the Machiavellian prime minister, Francis Urquart (played brilliantly by Ian Richardson), is frequently heard to remark, when briefing journalists: 'You might say that; I couldn't possibly comment'. In his book, *Dyslexia—The Miracle Cure*, Wynford Dore (2006) adopts a subtle variation of the Francis Urquart defence. He personally does not claim that his program is a cure, he says, but many others do and so who is he to argue otherwise. This approach might be viewed as disingenuous and does not provide escape from the claim for a cure since the very title of the book promotes it. We might then consider the extant evidence to support the notion that the Dore program is a cure for dyslexia, ADHD, dyspraxia, or Asperger's syndrome by examining the program against the five criteria presented earlier.

First, the proponents of the Dore program seem unclear about just what it is that they are attempting to cure—dyslexia, dyspraxia, ADHD, Asperger's syndrome or all of the above? Some of these hypothesised conditions may be vaguely defined but they are certainly not interchangeable. Dore (2006) made the odd assertion that in Australia the term dyslexia is far less used and that the term ADHD is used instead. He offered no clear operational definition of dyslexia and most of the participants in the studies reporting the success of the Dore program with students with dyslexia did not appear to be dyslexic, at least in the way that it is commonly understood. Moreover, the idea that dyslexia is the manifestation of cerebellar dysfunction is not, as we have shown above, a mainstream position and enjoys little support among reading scientists.

Second, this problem with the operationalisation of the condition or disease carries over (perhaps necessarily) into the hypothesised cause that bears no resemblance to any current widely accepted theoretical model for dyslexia. It is almost universally agreed among reading scientists that dyslexia is fundamentally a phonological processing problem. Proposed solutions to the problems of children experiencing difficulties in learning to read and spell are not only legion but have also been extraordinarily eclectic in their approach. What is particularly surprising is the popularity of approaches that appear to have no logical relationship to the problem whatsoever.

In order to understand why many approaches to reading remediation or 'cures' for dyslexia are quite simply wrong-headed, we need to understand what scientific research tells us about how reading works and is best taught. The consensus among the scientific reading research community is that reading disability is almost exclusively a language-processing problem. In order to be able to learn to read and spell, children need to be able to recognise that spoken words can be decomposed into their component sounds; what is known as segmenting. Equally importantly, they need to be able to combine discrete sounds into words known as blending. This ability to decompose words into component sounds (segmenting) and to compose words from individual sounds (blending) is known as phonemic awareness. Phonemic awareness is widely regarded by the scientific reading community as

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essential to being able to learn to read along with a knowledge of letter–sound correspondence or phonics. Children who can use their phonemic awareness skills to segment and blend and their knowledge of letter–sound correspondences are well on the way to being able to learn to read (Department of Education, Science and Training, 2005; National Institute of Child Health and Human Development, 2000; Rose, 2006).

Unsurprisingly, then, the scientific literature and the reports of national inquiries into the effective teaching of reading have all reached the conclusion that phonemic awareness and phonics (along with fluency, vocabulary and comprehension) form the bedrock of instruction for teaching both beginning and low-progress readers. None of these reports recommended remedies such as magnets, travel sickness medication, coloured lenses, or perceptual motor programs based on exercises such as those promoted by Dore (Department of Education, Science and Training, 2005; National Institute of Child Health and Human Development, 2000; Rose, 2006).

Third, little is known about the proposed treatment in specific terms, for reasons of commercial confidentiality, and this makes it impossible to attempt to replicate independently the findings of the Dore funded researchers. Part of the scientific tradition is to provide research reports in sufficient specific detail so as to allow others to replicate the experiment if they should so choose. This is impossible without the details of the program.

Fourth, the demonstration that the treatment (the Dore program) reliably eradicates or severely diminishes the symptoms of the disease in persons who have reliably been shown to have the disease has not been met. The students in the two studies published in *Dyslexia* (the only studies as yet published in scientific journals) did not reliably show radically reduced symptoms of dyslexia on the most relevant reading tasks and only six of the participants had a diagnosis of dyslexia anyway.

Fifth is the replicability requirement: that the observed effects are truly replicable in other studies completed by independent research groups. There is, as yet, no evidence at all for such replicability. Nor does it seem likely given the reservations expressed above about the commercial confidentiality of the program. To carry out a completely independent experimental evaluation, the independent researchers would have to have full knowledge of the exercise programs in sufficient detail to attempt to replicate the original findings.

Thus it may be seen that the Dore program clearly has problems associated with every one of the above five criteria for establishing a credible claim for a cure, 'miracle' or otherwise. The disease targeted is vague and ill defined and both the hypothesised cause and the proposed treatment are predicated upon a model to which very few subscribe. Moreover, the scientific claim for a cure rests on just two published studies, funded by the Dore organisation with a commercial interest in the product. They have been criticised as severely flawed by other eminent reading scientists in the same journal in which the two papers were originally published, as well as by Bishop (2007) writing for a medical audience. There seems to be no possibility of truly independent studies being carried out since the specifics of the

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exercise program have not been made available to external researchers. At best the Scottish verdict of 'not proven' is in order. One does not have to be a devil's advocate to suggest that there is little evidence here for a miracle. Miracles take a little longer.

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