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# The Royal Australian and New Zealand College of Ophthalmologists (RANZCO) Position Statement: The myth of a ‘tracking’ disorder in children with reading difficulties

## 1. Purpose

This position statement was developed by The Royal Australian and New Zealand College of Ophthalmologists (RANZCO). The purpose of the statement is to educate the public on reading difficulties in children with learning disabilities and specifically the lack of evidence to support eye movement problems being important causes of reading difficulties.

## 2. Background

It is well-accepted among health and education professionals that disorders in children that affect their ability to read and comprehend are a major obstacle to learning, which may have long-term educational, social, and economic consequences ([AAP, AAPOS, AACO & AAO Hoskins Center for Quality Eye Care, 2014](#)). Difficulty learning to read is commonly called dyslexia and is one of the ‘specific learning disorders’ ([American Psychiatric Association, DSM-5 Task Force, 2013](#)). Specific learning disorders are defined in the Diagnostic and Statistical Manual of Mental Disorders: DSM-5 as persistent difficulty learning key academic skills that lag significantly behind age expectations and are not explained by other cognitive impairment ([American Psychiatric Association, DSM-5 Task Force, 2013](#)). These difficulties may include “reading of single words accurately and fluently, reading comprehension, written expression and spelling, arithmetic calculation, and mathematical reasoning (solving mathematical problems)” ([American Psychiatric Association, DSM-5 Task Force, 2013](#)). Specific learning disorders are considered to be biologic in origin and result from the “interaction of genetic, epigenetic, and environmental factors, which affect the brain’s ability to perceive or process verbal or nonverbal information efficiently and accurately” ([American Psychiatric Association, DSM-5 Task Force, 2013](#)).

There is strong scientific evidence that dyslexia is explained by the phonological coding deficit theory, a language-based disorder in which individuals have difficulty recognising how the sound segments which make up words (phonemes) correlate to the written symbols of those sounds (graphemes) i.e. sound to letter correspondence ([Peterson & Pennington, 2012; Ramus et al., 2003; Shaywitz, 1996, 1998; Vellutino et al., 2004](#)). It is a neurobiological disorder, characterised by changes primarily in the language areas of the left hemisphere in the brain, confirmed on MRI studies ([Al Dahhan et al., 2020](#);

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[Démonet et al., 2004](#); [Handler et al., 2011](#); [Olitsky & Nelson, 2003](#); [Vellutino et al., 2004](#)). In a small subset of cases of dyslexia, a defect in timing visual events and controlling eye movements when reading known as the Magnocellular Deficit theory has been proposed ([Stein & Walsh, 1997](#)). This theory remains controversial. Studies not supporting this theory have found dyslexic readers have the same smooth pursuit and saccadic eye movements as non-dyslexic individuals when tested with non-verbal tasks rather than with reading ([Bucci et al., 2009](#); [Handler et al., 2011](#); [Hutzler et al., 2006](#)). Moreover, individuals who are born with eye movement disorders whereby the eyes are unable to move horizontally do not have a higher incidence of dyslexia ([Hodgetts et al., 1998](#)). Similarly, for acquired eye movement disorders, such as a nerve palsy affecting the movement of the eyes, dyslexia is not associated ([Rucker & Phillips, 2018](#)).

### 3. Eye movements and reading

Children with reading difficulties are sometimes thought to have an eye ‘tracking’ problem, but this is not the case ([Brown et al., 1983](#)). Slow ‘tracking’ or smooth pursuit eye movements are movements that occur as our eyes follow a moving target in space. It is well established that we do not read with these pursuit ‘tracking’ eye movements, but with horizontal rapid, high-velocity, small jumping eye movements known as saccades ([Rayner, 1998](#)). As such, abnormal ‘tracking’ is not relevant to reading.

A typical reading pattern comprises around 85% forward saccades, or jumps, across the page, with the length of the saccades dependent on the difficulty of text, while fixation pauses account for around 80–90% of the time. During the fixation pauses the words are decoded and processed allowing the brain to recognise the words. In addition, around 15% backward (regression) saccades

are used to verify the text that has been processed ([Rayner, 1998](#)).

A child with reading difficulties, including dyslexia, typically has eye movements consistent with a beginner reader or an adult reader reading difficult text ([Handler et al., 2011](#); [Olitsky & Nelson, 2003](#); [Rayner, 1998](#)). These include shorter forward saccades, increased fixation pauses of longer duration to decode individual words, and more backward saccades to verify and confirm what is written ([Olitsky & Nelson, 2003](#); [Rayner, 1998](#); [Vagge et al., 2015](#)). These eye movements are not abnormal and not unique to children with reading difficulties or dyslexia and have been shown to be normal when content is corrected for reading level ([Olitsky & Nelson, 2003](#)).

Children with dyslexia are often noted by teachers to lose their place or skip lines when reading. This has been found to relate to difficulty decoding letters or words as a consequence of their reading disorder rather than a visual problem or ‘tracking abnormality’ ([Olitsky & Nelson, 2003](#); [Peterson & Pennington, 2012](#); [Rayner, 1998](#); [Medland et al., 2010](#)).

It is well established that there is no clear scientific evidence to support the use of eye movement exercises to improve ‘tracking’ eye movements in children with dyslexia ([Rawstron et al., 2005](#)). Such treatments are not recommended and detract from evidence-based treatments.

### 4. Recommendations

Children with suspected dyslexia or learning disabilities should be referred early for an educational assessment to a qualified practitioner, such as an educational psychologist, and may require medical assessment by a paediatrician or an eye examination by an ophthalmologist.

Once dyslexia is diagnosed, children should receive evidence-based educational interventions such as an individualised remedial reading program

designed to give direct, explicit, repetitive instruction in the areas of phonics, phoneme awareness, vocabulary, fluency and comprehension ([National Reading Panel & National Institute of Child Health and Human Development, 2005](#); [Rose, 2006](#); [Rowe, 2005](#)). As has been previously noted, “if the goal is improved reading or math, teach reading or math” ([Fletcher & Currie, 2011](#)).

Treatments such as eye muscle exercises and vision therapies to treat ‘tracking disorders’ lack supporting scientific evidence are not endorsed or recommended ([AAP, AAPOS, AACO & AAO Hoskins Center for Quality Eye Care, 2014](#); [Handler et al., 2011](#)).

### 5. Acknowledgement

RANZCO would like to acknowledge the contributing authors Dr Maree Flaherty (FRANZCO) Senior Consultant in Ophthalmology (Children’s Hospital at Westmead, Sydney), Clinical Senior Lecturer (Discipline of Ophthalmology, Sydney Medical School, University of Sydney) Director, Children’s Eye Centre, Wentworthville, Sydney, and Dr Joanne Dondey (FRANZCO), Paediatric Ophthalmologist, Melbourne, Victoria, Chair – Public Health Committee. The position statement has been endorsed by RANZCO Paediatric SIG (PSIG) and Australian New Zealand Strabismus Society (ANZSS).

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*This position statement originally appeared on the [RANZCO website](#).*

*The Royal Australian and New Zealand College of Ophthalmologists (RANZCO) is the medical college responsible for the training and professional development of ophthalmologists in Australia and New Zealand. This includes maintaining a Continuing Professional Development (CPD) system, a Vocational Training Program (VTP), organising scientific congresses and meetings and much more.*