

Reversals and Left/Right Confusion

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ABSTRACT

The literature concerning the association between spatial (left/right) confusion and reversals is examined. It has been found that the presence of spatial confusion in adults has been previously underestimated and the conclusion is drawn that it cannot be assumed that children will always grow out of their spatial confusion problems (including reversals) without help. Attention is directed to the desirability of teaching left/right body awareness before children need to discriminate between mirror image letters. Behavioral methods for teaching left/right body awareness to children in preschool, kindergarten and primary classes are discussed. In addition, remedial approaches for eliminating spatial confusion and reversal errors that occur with above age normal frequency are discussed.

KEY WORDS

reversals, spatial confusion, reading, left/right body awareness, directionality

Specific deficits associated with dyslexia are usually described with reference not only to reading problems, but also with respect to writing and spelling difficulties. According to clinical reports, typical manifestations of the problem include rotating, transposing and reversing letters or symbols. A logical hypothesis has been to associate these deficits with a lack of knowledge or lack of awareness of left and right. Not surprisingly, a review of the literature reveals that left/right confusion shows a persistent occurrence in children with reading disability.¹ Vellutino² also cited numerous references and found that it had been amply demonstrated that positional and directional confusions produced by poor readers are in excess of those produced by normal readers of comparable age and grade level. While reversals are not important in real world visual discriminations, they are important for discriminating letters, especially mirror image letters (MILs).³ Thus, the association between spatial confusion and reversals has been documented. Awareness of spatial position and directionality in space is an ability required for reading achievement.¹ Left/right body awareness (LRBA) is essential for discriminating MILs.⁴ If a child can't differentiate left and right on self, it is unlikely he'll be able to differentiate between "b" and "d".⁵

However, these views do not recognise that, when some progress to psycholinguistic ("top down") reading has

occurred, linguistic mechanisms (e.g., phonological, semantic and syntactic clues) can aid discrimination of MILs when LRBA is lacking. In addition, the views that LRBA is essential for discriminating mirror image letters do not recognise that children can be helped to discriminate mirror image letters such as "b" and "d" by teaching them to use one or more of a variety of mnemonic devices. For example, children can be taught to reason that "d" follows "c" in the alphabet and that "d" can be formed by adding a downstroke to the "c". Children can be taught that the bat (vertical component) of a "b" comes before the ball component of "b". Children can be taught to exaggerate the downstroke join on a "d" to represent a tail that is associated with "d" for dog. In this case, however, children may be confused by the choice of whether the tail comes before or after the semicircular component. In fact, these first three mnemonics depend on reliable discrimination of before and after directions on a page.

Such mnemonics are not so much an alternative to letter identification based on left and right discrimination, but are really just another way of describing left and right. The direction of reading and writing means that before (or backward) corresponds to left and after (or forward) corresponds to right. There are other mnemonics that do not depend on directionality. Children can be taught to visualise key words (e.g., dog/ball) to help

them identify "d" and "b" in other words, or they can be taught to use a fist mnemonic wherein the "b" and "d" in the word "bed" is formed with the left fist (thumb extended, knuckles toward the body) forming the "b" and the right fist (thumb extended, knuckles toward the body) forming the "d". The extended thumbs represent bed posts. Rather than using mnemonics to help discriminate mirror image letters, some children guess; here success depends on their ability to predict the appropriate word according to their expectation of a word complementary to the meaning of the text. Without such psycholinguistic ("top down") reading skills to give adequate appreciation of the meaning of the text, guessing gives only a 50/50 chance of being correct. Incorrect guesses lead to confusion that can severely impair subsequent comprehension levels. For this reason, beginning readers are sometimes encouraged to use mnemonic devices to avoid confusion that occurs with incorrect guesses.

However, depending on mnemonics is obviously inefficient compared with being able to reliably and confidently identify "b" and "d" because the "d" faces left and the "b" faces right. Mnemonics cause delay and so consume a proportion of cognitive resources available for decoding. The child who has to "work out" words slowly and painstakingly cannot adequately pay attention to meaning because his cognitive capacity is fully preoccupied with decoding.⁶

The first level of learning a skill is the acquisition stage for which accurate demonstration of the skill should be evident.⁷ Mnemonics can help achieve accuracy of skill execution, but at the expense of speed and confidence. Dependence on mnemonic reasoning may restrict progress toward proficiency and fluency and so may inhibit the further progress toward the maintenance, generalisation and adaptation stages of skill development.

Concepts of left/right discrimination show a linear development with age. Awareness of the left and right parts of one's body is generally established by 6 to 7 years of age.¹ However, left/right discrimination for extra personal space (directionality) is not established until 9 to 12 years of age due to the more complex conceptual requirements of the task.¹

Consequently, children come to the

task of mirror image letter discrimination before they can be expected to have acquired adequate left/right body awareness. Discriminations involving reversals are learned only as children learn to read.⁸ The prevalence of reversal problems in reading^{9,10,11} appears to be a consequence of a lack of confident left/right body awareness in children without adequate linguistic or mnemonic compensatory mechanisms. Children are expected to grow out of their spatial confusion² but the evidence used to support such expectation is flawed. In testing left/right body awareness in normal adults between 16 and 64 years of age it was concluded that left/right confusion was very rare.¹² However, it was also reported that some adults lacked an intuitive sense of the difference between the left and right sides of the body and hence experienced difficulty in making rapid discrimination. They were found to deliberate about the distinction and apparently rely on visual cues (e.g., watch, ring or scar on a particular hand) or incipient movements (e.g., a writing gesture) to make an identification. Consequently, their responses on a left/right discrimination test may be slow and hesitant. Since the tests reported by Benton et al.¹² were untimed, the score did not reflect any slowness in response that was associated with the hesitation that was observed. On average the testing of Benton et al. allowed 15 seconds for responses to demands like "show me your left hand." Fifteen seconds is ample time to employ a mnemonic reasoning process to work out which side is right and left. Thus the form of testing used did not distinguish between confident, rapid, internal left/right body awareness and the use of mnemonic reasoning to work out left and right. As a consequence, the level of spatial confusion in adults was underestimated.

This interpretation was confirmed with a self-administered survey of 200 adults, which found that when speed and confidence were considered, spatial confusion was found to be prevalent. When asked, "How confident and quick are you in knowing your right and left hand sides?" 9% reported that they were often wrong, and 29% reported that they were sometimes wrong. These adults, more than 50% of whom were university graduates, were not selected on the basis of any known ability or deficiency in reading.¹³

An examination of 3rd grade children revealed that some good readers show above age normal frequency of reversals. Apparently these children possess compensatory mechanisms that permit good reading at 8 years of age despite high frequency reversals. Conversely there were some children who were poor readers without having significant reversal problems. However, apart from these exceptions, this study revealed a significant correlation between reversal frequency and reading difficulties.¹⁴ The correlation between reading difficulty and reversal frequency has been reported previously.^{9,10,11}

I thus hypothesised that the elimination of left/right confusion in poor readers with reversal problems will help them to discriminate between mirror image letters. I further propose that reversals may be reduced by preschool and kindergarten teaching of left/right body awareness so that children have a better chance of discriminating between mirror image letters before they start to read. In addition, confident LRBA could be expected to help children acquire reliability in consistently working left to right on a page so that written reversals could be reduced.

The introduction of special early intervention teaching techniques is also supported by the prospect of reducing left/right confusion in day-to-day situations throughout life, a problem that has previously been underestimated and/or ignored.

TEACHING LEFT/RIGHT BODY AWARENESS TO PRESCHOOLERS

The goal of functional orientation programming for preschoolers is to shape behaviour toward the achievement of appropriate skills that will lead the child to higher levels of independence. The longitudinal orientation to programming for preschoolers stresses acquisition of those skills that will have utility for the child after leaving the preschool classroom.¹⁵ The methods described below for teaching LRBA to preschoolers satisfy both of these requirements. An active learner progresses faster than a passive one so that activities should include moving, touching, manipulation, feeling.¹⁶ Young children give every appearance of enjoying nursery rhymes and jingles which in-

volve rhymes, and they seem to remember them well. Their attention is captured by simple games and routines in which rhyming words play a great part.¹⁷ It is not possible to teach left/right body awareness by saying, "Use your right hand" or "Show me your left hand." Left/right body awareness can only be learned through experiencing left and right areas of the physical body.¹⁸ This view is supported by a study¹⁹ that demonstrated improvement of verbal memory through motor enactment. In that study, children were found to more successfully remember sentences they were learning verbally when the learning experience involved some type of motor manipulation (acting out the sentences). Apart from motor encoding, this method of learning may be more successful because it is active rather than passive. The necessary ingredients for teaching preschoolers left/right body awareness appear to be simple rhyme, rhythm, a simple picture story to maintain interest, responses in the form of simple actions and verbal responses, repetition and parental/teacher guidance so that children are supported according to need. To meet these requirements, I have written a picture book²⁰ that can be read to the preschooler, who is helped to make the required verbal and hand responses. Each page shows a pair of pictures that proceed left to right to help establish appropriate page sequencing (see Figure 1). The young or hesitant child's wrists are held so that assistance can be given to match left and right open palms to those on the page as the words left and right are read. Experience shows that most children can begin to make independent motor and verbal responses after being read the book one or two times.

Children with special needs will benefit from having additional exposure to the book at home. The extra experience will help them to participate successfully when group activities are conducted in the preschool class. For group activities, each child can be given an individual copy of a response page or LRBA card (see Figure 2).

As the teacher reads the book to the group, responses in unison (verbal and motor) allow for children who are having difficulty to be identified. The worth of confident LRBA may be demonstrated to preschoolers using the identification of left and right shoes, games of Simon Says, and other games involving left and right.

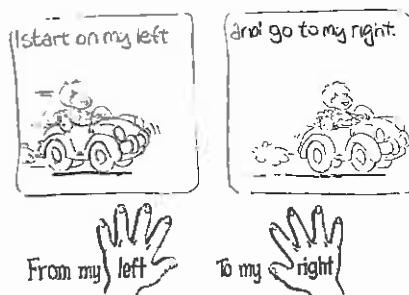


Figure 1. Sample page of book to teach preschoolers left/right body awareness.

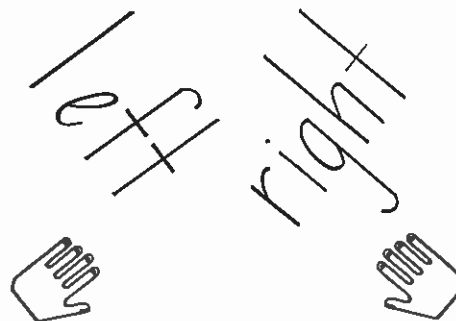


Figure 2. Left/right body awareness card.

For the older preschooler, an introduction to mirror image letter discrimination ("d" faces left, "b" faces right, etc.) can be made.

TEACHING LEFT/RIGHT BODY AWARENESS IN KINDERGARTEN AND PRIMARY CLASSES

Children entering kindergarten possess wide ranging levels of left/right body awareness (confident, dependent on a mnemonic, or confused). Some children in kindergarten will benefit from an opportunity to learn LRBA using the picture book written for preschoolers. In addition, I have written a separate manual of exercises, games and activities for teaching LRBA to allow for different entry levels and different rates of progress.²¹ The manual has been found to be appropriate up to 6th grade and has also been used for remedial management of LRBA and reversal problems. All of the exercises/activities in the manual use the LRBA card (see Figure 2). This card is intended as a permanent fixture on the wall where therapy is occurring and can be referred to according to need at any time, but especially during the activities and games in the manual. The manual includes sugges-

tions regarding the removal of the card for certain children who are progressing more quickly or at particular times when LRBA is being evaluated. The LRBA card is not intended to indicate the left and right sides of the room, but, rather, to indicate to the observer his or her left and right sides. When the card is viewed from the observer's left side, a slightly tilted/rotated head and body position allows the word "left" to be read in its normal orientation. At the same time, the word "right" is less readable because it is perpendicular to the natural direction of reading. From whichever direction viewed, directly in front, to the sides, or from behind, either "left" or "right" is more easily read depending on the rotation of the observer's body. Although teachers usually prefer to have one LRBA card on each wall, in multidirectional classrooms the same information is received from each card from any position.

In focusing on behavioral difficulties and seeking to make changes without reference to basic causal factors, the instructional strategies used in the manual can be classified as a direct skill (behavioral or task analysis) approach. That is to say, the techniques derive primarily from learning theories that stress how behavior tends to be learned through the effects of reinforcement and the pairing of responses and certain environmental stimuli. As described by Bowd,²² other features of direct skill approaches built into the various techniques include careful observation and analysis of the teaching/learning process to determine the conditions responsible for success or failure, precise structuring of learning into small units, and direct and immediate opportunities for individual assessment and reinforcement. Group activities with children responding in unison, for example, provide the opportunity for children to receive immediate correction when mistakes are made or when lack of confidence is indicated by hesitant responses.

In addition, the techniques have been sequenced according to the general principles of learning so that children can be guided through acquisition (accuracy), proficiency (fluency), maintenance (retention), generalisation (expansion) and adaptation (extension) stages.⁷ The main criteria for assessing performance are accuracy and speed (confidence).

To ensure that LRBA skill is trans-

ferred to the discrimination of mirror image letters, one of the techniques at the generalization stage provides a basis for children to specifically learn to employ their LRBA to recognize the directional characteristics of letter pairs that are often confused. As in the case of the approach used for preschoolers, the procedures used for school-age children make use of rhyme, rhythm, verbal and motor responses, repetition and reinforcement.

REMEDIAL APPROACHES TO TEACHING LRBA AND ELIMINATING REVERSALS

When children exhibit above age normal reading reversal errors in association with reading retardation, there is the indication for remedial intervention to teach LRBA as a basis for improving discrimination of mirror image letters. It is not yet known if there is an upper age limit (limit of a plastic period) beyond which remedial LRBA intervention will not be successful. Remedial LRBA programs^{23,24} have been associated with successful outcomes but they have not been subjected to scientific scrutiny. However, there is a solid theoretical basis for remedial LRBA approaches and sufficient clinical success to warrant formal evaluation of them. The manual, "A Practical Guide for Remedial Approaches to Left/Right Confusion and Reversals,"²⁴ has been written as an aid to parents, teachers, optometrists and others who help children with delayed acquisition of LRBA, especially when above age normal reversal problems are detected. The 18 remedial procedures follow a developmental sequence starting with body awareness in regard to self, which is used as a basis for acquiring an ability to project that internal awareness into space (directionality). The aim is to provide variety in activities that will establish an internal/automatic/reflex/somatesthetic awareness of left and right that does not depend on external cues such as identifying the writing hand, watch-wearing hand, ring- or bangle-wearing hand, etc. Specific activities are used to help children overcome difficulty with left to right reading and writing page directionality. To consolidate progress, other systems of directionality (e.g., compass points) are integrated with left/right discrimination in some of the exercises.

Strengths and confidence in one system of directionality are used to overcome weaknesses in another. The series culminates in activities that help children to apply LRBA to the specific task of avoiding MIL reversals. The manual grew out of a series of loose leaf instruction sheets given to parents to help them with home training. Bound in a single volume and with introductory sections on the nature of LRBA confusion and how the manual can be applied to the problem, it can be used as the basis for, or in support of, any remedial approach for these problems.

CONCLUSIONS

It cannot be assumed that children will always grow out of their spatial confusion without help. Evidence of spatial confusion in adults suggests a need to modify methods used to teach LRBA. For example, it is hypothesized that early intervention using active behavioral analysis teaching methods can be used to accelerate the preschool and kindergarten class acquisition of LRBA. The suggested approaches to teaching LRBA are intended to prevent problems in classroom activities that require left/right discrimination (starting work on the left side of the page, determining the correct orientation of letters in reading and writing, especially MILs, appreciating mathematical concepts that involve left and right, etc.). In addition, methods that improve LRBA have the potential to help prevent spatial confusion problems that can arise in a variety of day-to-day circumstances throughout life.

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