

READING DIFFICULTIES

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Reading difficulties are becoming increasingly important. During the past eighteen months, methods such as flash cards, sentence building, Frostig, Initial Teaching Alphabet and programmes initiated by Science Research Associates, are coming under discussion when orthoptically examining and teaching children.

The aim of the education system is to train children to read at as early an age as possible. However, this is not without some effects on the physical components of children's reading mechanisms.

Reading is a long time development progressing over many years. Physical handicaps present during the basic and formative stages will generally cause low grades and slow progress, because of lack of initial understanding. A physical handicap occurring later in the learning process may hinder further progress and lead to frustration which can be aggravated by pressure to succeed from parent and school. As orthoptists we see patients after the frustration has become manifest and caused worried parents to seek medical assistance.

In this paper, four questions relating to reading difficulties are investigated.

- A. Is the age at which a child can read decreasing?
- B. Are we finding the need to treat children with latent eye defects which become decompensated and produce symptoms, at a younger age?
- C. What is the frequency of occurrence of various symptoms?
- D. What is the probability that any child who is attending the clinic is attending for treatment of a latent deviation.

The data used in this investigation was analysed statistically, using the chi-squared method for comparative tests. This method tests the probability that for every one hundred trials examined similar results will occur. If we can expect similar results in 95 of these trials then we are 95% confident that our results are true. To be significant the results must have a confidence level of 90% or over.

A. With regard to the first question, there is for every orthoptist a mental equating of age, class and reading ability. This provides some guide as to when a child can transfer from doing the vision test with the illiterate "E" chart, to the more accurate Snellen letter chart. Thus the age at which the transfer occurs has been used in this study as a criterion of reading ability.

In 1949 the 12th International Conference of Public Education put out a publication which stated that "formal reading from simple books begins at just over 6 years in N.S.W. (Class 1)."

In an orthoptic clinic approximately eight years ago, it was observed that children in second class were the youngest who could cope with the Snellen letter

chart. In 1971, children in kindergarten were able to do this test. However, to investigate this development, a further survey of children referred to the orthoptic clinic in each of the three years, 1967, 69 and 71 was carried out.

All the above mentioned children were included in the survey regardless of the nature of their eye defect. Their ages varied between 4 and 8 years. The age of 4 years was chosen so that those children who were reading prior to formal education could be included. All patients had been referred by an ophthalmologist and so had been examined and given suitable glasses where needed.

Although the results only cover a span of four years, they show that a significant decrease in the age at which 50% or more of the children are reading, has occurred.

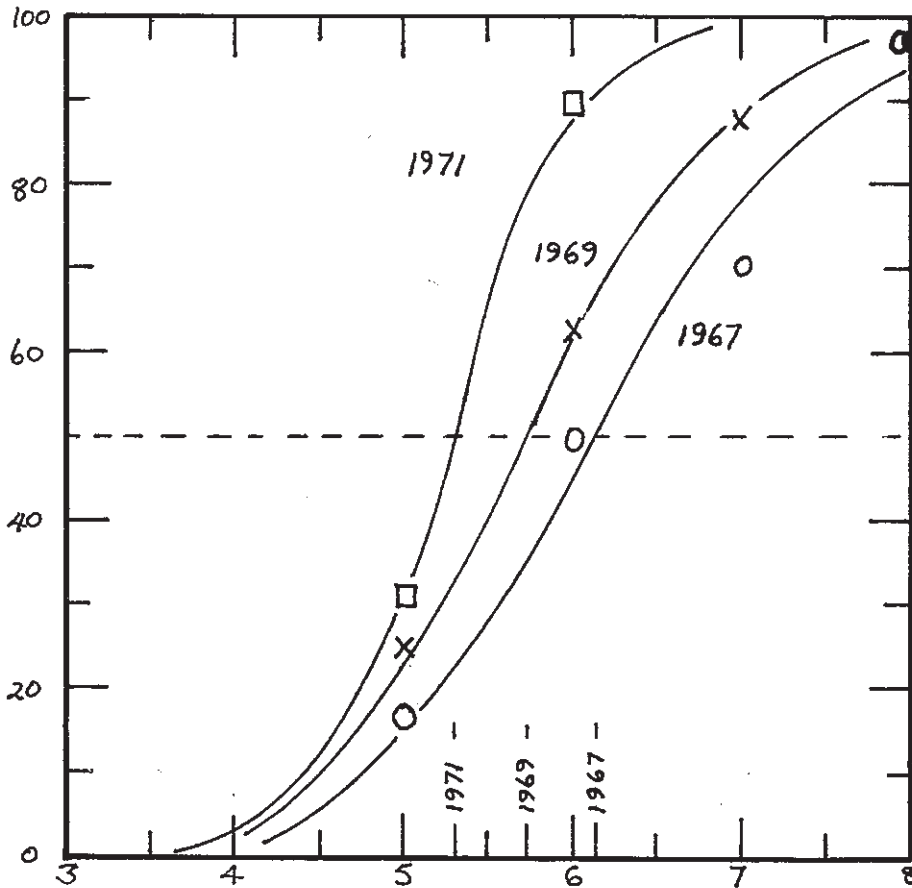
The results are shown in Table 1 and graphed in Figure 1.

PROBABILITY OF READING

TABLE 1

AGE	1967		1969		1971	
	NUMBER	PROBABILITY	NUMBER	PROBABILITY	NUMBER	PROBABILITY
3	1	0	4	0	5	0
4	14	0	20	0	21	0
5	18	17%	30	23%	30	33%
6	33	52%	24	62%	20	90%
7	12	67%	16	88%	16	100%
8	13	100%	21	100%		

FIGURE I
% READING AT GIVEN AGE



Referring to the table it can be seen that between 1967 and 69 there was an increase in the probability that a child of a given age would be reading. However, these differences when tested statistically are not significant. During the interval 1969 to 71 there was a further increase in the probability that a child of a given age would be reading. This increase from 1967 to 1971 for 6 year old children was highly significant (99% level of confidence) a finding which supports our hypothesis that the average age at which a child learns to read at Sydney suburban schools is decreasing. The increase over the same period for 5 year old children is significant (at the 95% level).

It is interesting to note that in the three years under study the average age per class has remained constant.

B. With regard to the second question, age and symptomatic heterophorias, an additional survey was carried out.

The age range in this instance was 4 to 12 years. Twelve years was chosen as the cut off point since above this age children have, in general, completed primary education and are undergoing a more strenuous close work programme.

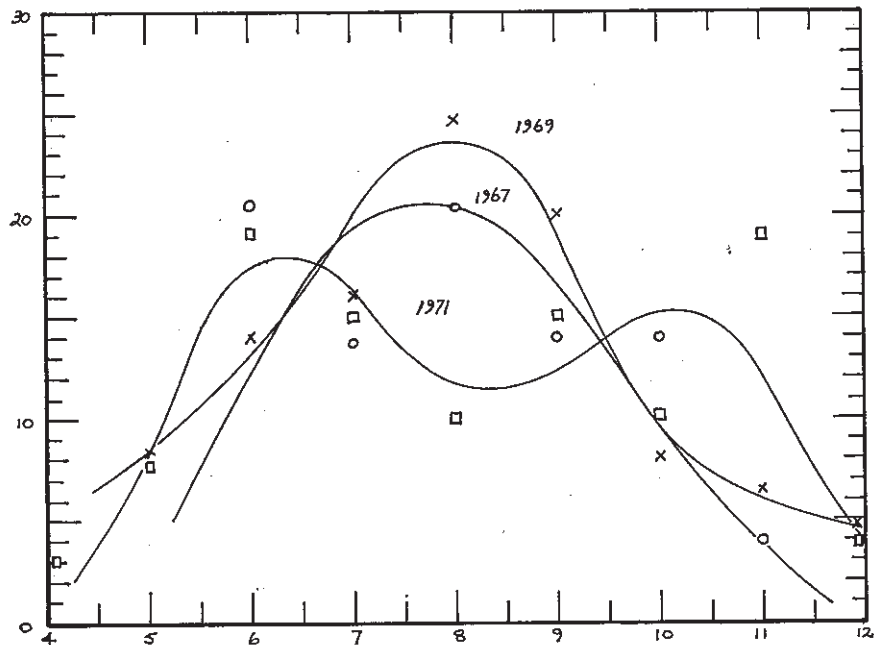
The distribution by age of the patients with latent deviation was investigated. The results can be seen in Table II and are plotted in Figure 2.

AGES AT WHICH LATENT DEVIATIONS ARE DISTRIBUTED

TABLE II

YEAR AGE	1967		1969		1971	
	NUMBER	PROBABILITY	NUMBER	PROBABILITY	NUMBER	PROBABILITY
4	-	-	-	-	2	3%
5	-	-	4	8%	5	7%
6	6	21%	7	14%	13	19%
7	4	14%	8	16%	10	15%
8	6	21%	13	25%	7	10%
9	4	14%	10	20%	10	15%
10	4	14%	4	8%	7	10%
11	4	14%	3	6%	13	19%
12	1	3%	2	4%	2	3%
TOTAL	29		51		69	

FIGURE 2



Points of interest are:-

1. the proportion of 8 year olds in the 4-12 years age group of heterophoric patients has decreased, from 1969 to 1971. This decrease is significant at 98% confidence level. (Highly significant)
2. the proportion of 11 year olds in the 4-12 years age group of heterophoric

patients has increased, from 1969 to 1971. This increase is significant at 98%. (Highly significant)

3. the proportion of 6 year olds has increased from 1969 to 1971. The increase in both groups is significant at only an 80% level of confidence.
4. in the curve for 1971 there are two maxima. The first is at 6 years of age, the second at 11 years of age.

When considering the two maxima in 1971 it was thought possible that if the group of patients under study were extended to include patients older than 12 years, then both the 1967 and 1969 curves would exhibit a second maxima similar to that of the 1971 curve. The presence of two maxima would alter the curve shape.

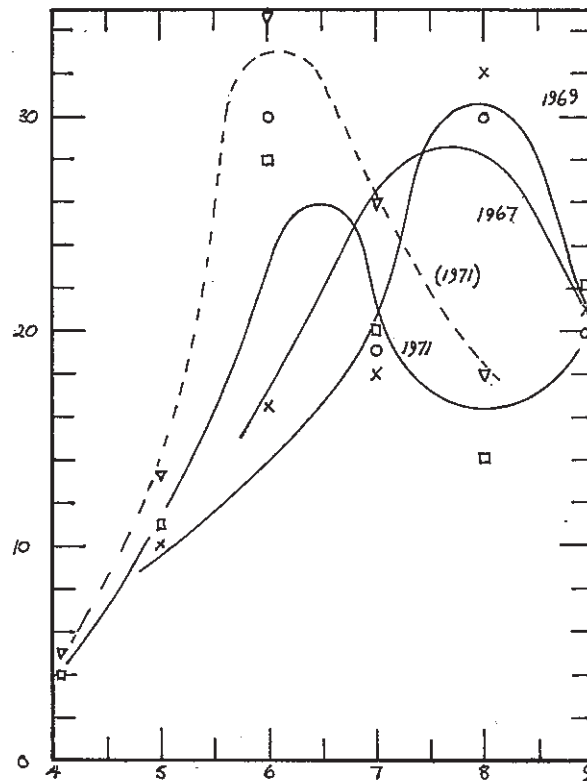
It was then decided to move the cut-off age to 9 years, that is to restrict the study to include those patients aged 4 to 9 years. This removes the levelling effect on the 1971 curve of the second maxima, and results in a more realistic comparison, since the original 1967 and 1969 curves did not show this second peak. The curves of the reduced data (Figure 3) all show a single maximum. The curve for 1971 data, recalculated with an even lower cut-off age (8 years) is also plotted in Figure 3 (broken line). The change in peak positions over the period 1967 to 1969 is not significant, however, the change from 1969 to 1971 is highly significant, and appears to support the theory that, in 1971, children with symptomatic heterophorias are appearing for treatment at a younger age than in previous years.

AGE DISTRIBUTION OF LATENT DEVIATION

TABLE III (Restricted Study: patients 4 yrs. to 9 yrs.)

YEAR AGE	1967		1969		1971	
	NUMBER	PERCENTAGE	NUMBER	PERCENTAGE	NUMBER	PERCENTAGE
4	-	-	-	-	2	4.3%
5	-	-	4	9.5%	5	10.7%
6	6	30%	7	16.7%	13	27.7%
7	4	20%	8	19%	10	21.2%
8	6	30%	13	31%	7	14.99%
9	4	20%	10	23.8%	10	21.2%
TOTAL	20		42		47	

FIGURE 3



C. Of the patients with latent deviation, some complained of a single symptom, others of multiple symptoms. The frequency of various symptoms is summarised in Table IV.

PERCENTAGE FREQUENCY OF OCCURRENCE OF SYMPTOMS

YEAR SYMPTOMS	1967	1969	1971
Poor reading	17%	8%	26%
Diplopia	59%	57%	39%
Headaches	24%	39%	43%
Sore Eyes	41%	45%	40%
Observed Problems	21%	27%	32%
Total Patients	29	51	69

The following points are to be noted from the table:

1. Headaches - there has been a steady significant increase in the occurrence of headaches reported over the period of study. The increase 1967 to 1969 is significant at a 90% level of confidence, whilst the increase over the past four years is significant at a 96% level.
2. Poor readers - those referred because reading was noted to be below standard. Problems included losing place and apparent wave-like motion of print.

Over the past two years the increase in the number of patients with this difficulty is highly significant (99%). However, the level in 1969 had shown a decrease from 1967, so that the overall increase from 1967 to 1971 is significant only at an 80% confidence level.

3. Observed problems - that is difficulties reported by the parents and not noticed by the patient.

The frequency of this sign has increased steadily over the past years. The difference between 1967 and 1971 figures is significant at the 85% level of confidence.

- D. The study of the probability that a child is attending for treatment of a latent deviation.

Points of particular interest are that

1. there is an overall increase in the percentage frequency of referral of latent deviations between 1967 and 1969. This increase is significant at a 99% confidence level. (highly significant)
2. there is an overall increase in the percentage frequency of referral of latent deviations between 1969 and 1971. This increase is significant at a 99% confidence level. (highly significant)
3. for 5 year old patients there is an increase from 1967 to '69 in the probability that a child will be undergoing treatment for a latent deviation. This increase is significant at level greater than 99%. (very highly significant)
4. for 6 year old patients there is an increase from 1969 to '71 in the probability that the child will be undergoing treatment for latent deviation. This increase is significant at level greater than 99%. (very highly significant)
5. for 7 year old patients there is an increase from 1967 to '69 in the probability that a child will be undergoing treatment for latent deviation. The increase is significant at only 80 to 85%.
6. for 7 year old patients, between 1969 and '71 there was an increase significant only at a 77% level of confidence.
7. for 7 year old patients between 1967 and '71 there is an increase significant at 98%. (highly significant)
8. for 8 year old patients, between 1967 and '69 there is an increase in the probability that the child will be undergoing treatment for latent deviation. This increase is significant at 90%.
9. in 1967 the age of the youngest child attending for treatment was 6 years in 1969 it was 5 years, and 1971, 4 years. Statistically these figures are only significant at the 80% level of confidence. Hence little importance can be attached to this observed decrease in age but it does indicate a trend for children to require treatment at an earlier age.

**PROPORTION OF PATIENTS REFERRED AT A GIVEN AGE WHO SHOW
A LATENT DEVIATION**

TABLE V

YEAR AGE	1967			1969			1971		
	Total Number	Patients with latent defect	Proportion	Total Number	Patients with latent defect	Proportion	Total Number	Patients with latent defect	Proportion
3	1	—	—	4	—	—	5	—	—
4	14	—	—	20	—	—	21	2	10%
5	18	—	—	30	4	13%	30	5	16%
6	33	6	18%	28	7	25%	20	13	65%
7	12	4	33%	16	8	50%	16	10	63%
8	13	6	46%	21	13	62%	14	7	50%
9	6	4	67%	13	10	77%	12	10	83%
10	4	4	100%	5	4	80%	8	7	88%
11	5	4	80%	3	3	100%	13	13	100%
12	1	1	100%	2	2	100%	2	2	100%
Total	107	29	19%	142	51	35%	141	69	49%

CONCLUSION

The conclusions that can be drawn from this investigation seem to answer the four questions initially raised.

A There is significant evidence that children are reading at a younger age.

B There seems to be a trend for children to be attending for treatment of latent deviations at a younger age.

C Amongst the children referred for clinical treatment of latent deviation, symptoms of headache and poor reading have increased in frequency.

D Of all the children referred to the clinic, the percentage who are suffering from latent deviations has increased.

Although it has not been proved, these factors may well be inter-related. It is interesting to consider why there is a trend for a decrease in age in occurrence of a latent deviation causing symptoms. Points to consider are:

- i. increased awareness from the authorities, such as the Education Department through the School Medical Service and literature distributed by the optometrists.
- ii. the change in pattern of the referral of patients.
- iii. increased pressure from the school at an earlier age causing physical disabilities to become manifest. Knowledge of the aims and methods of the various reading techniques could be of great help in connection with this point.