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THE INFLUENCE OF ORTHOPTIC TREATMENT ON PROXIMAL CONVERGENCE

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Abstract
Proximal convergence in a subject with convergence insufficiency was measured before and after treatment by a method previously explained. It was demonstrated that this response improved after treatment. It is suggested that, since proximal convergence is a learned response, it may be more amenable to training than accommodative, fusional or tonic convergence.

Key Words
proximal convergence, convergence training, AC/A ratio, infra red photography

Introduction

Orthoptists spend a large proportion of their time altering a convergence response in patients with latent or intermittent deviations. The most common example of this is in cases of convergence insufficiency, which, as is well known, responds quickly to convergence training.

However, it is worthwhile to ask exactly what is improved by these exercises. Arnott and O'Callaghan[1] suggest that the tone of the medial rectus muscles is improved, and this, indeed, is the explanation frequently given to patients. However, if monocular adduction exercises were given instead of convergence exercises, the medial rectus would still be innervated, but it would be doubtful if convergence would be improved.

Although, in some cases, accommodation which appears 'sluggish' improves with treatment giving extra accommodative convergence, it is unlikely that the AC/A ratio is altered by this treatment.

The most favoured explanation, especially from orthoptic text books is that the patient's fusion range is improved. However, one must be specific in the use of the term fusion. Fusion, if not innate, is at least well established during infancy. True fusion is an involuntary function. The improved 'fusion' ranges demonstrated at the synoptophore or with prisms after training undoubtedly include voluntary convergence, as the patient consciously tries to keep the images joined. Fusion may be allowed to act more efficiently by the removal of barriers to its action such as suppression or a patient's aversion to convergence, but it is unlikely that an innate function could be so dramatically altered by a few exercises at home and in the clinic.

Proximal convergence is obviously a conditioned response which develops as we learn from our experience how far away from us objects are. Proximal convergence is perhaps also evident in voluntary convergence, as one imagines that an object is close to the eyes. Certainly, each of these types of convergence is based on learning, and could be more logically altered by simple training.

Although cases of convergence excess are generally attributed to a high AC/A ratio, von Noorden[2] demonstrated that, in a certain proportion of these cases, the AC/A ratio was normal. He suggested that there could be an altered response of tonic convergence for near. However, it is also possible that proximal convergence could be acting excessively. It has been observed during practice that some such cases do lose the excessive near convergence after simple relaxation exercises.

The previous paper has described a technique of evaluating proximal convergence by the use of infra red photography, so that fusional and accommodative clues are eliminated.

This technique was also used to evaluate the effect of orthoptic treatment on the proximal response of a subject with convergence insufficiency.

Method

Photographs were taken, both in the light and, (by the use of infra red photography) in the dark of a subject (RG) converging from 50cms to 10cms from the eyes. In the dark, the subject was told to hold the object and imagine that she was looking at it. The photographs were enlarged and the measurements taken of the interlimbal distance as previously described.

Her response is shown in Figure 1, compared with the average response in the dark found from sixteen symptom free subjects, with their upper and lower limits.

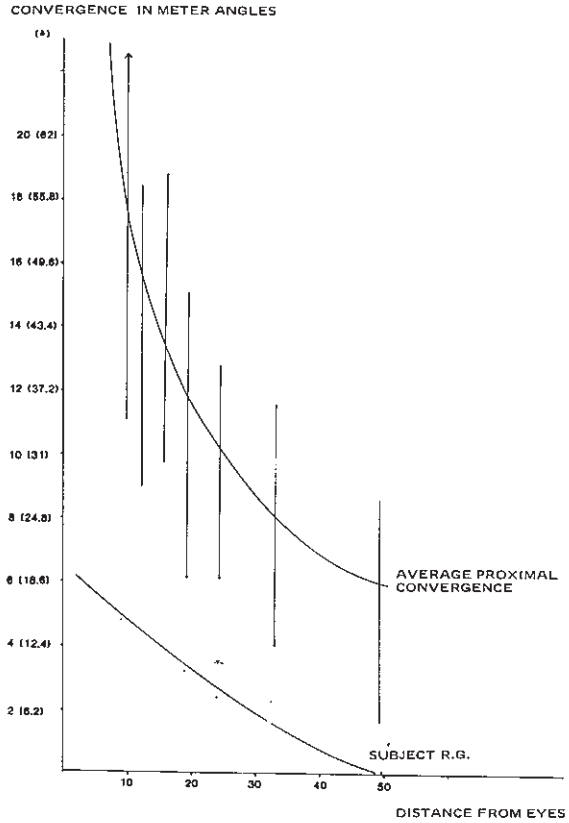

FIGURE 1 PROXIMAL CONVERGENCE BEFORE TREATMENT

It is clear that her response was well below even the lower limits of the symptom free group.

Her convergence near point was 14cms, with a reduced accommodation amplitude. Her range of convergence on the synoptophore was from -3° to $+8^\circ$.

Standard orthoptic treatment was given, consisting of simple convergence exercises as the target was brought closer to the eyes, followed by the development of voluntary convergence and relative fusion with stereograms.

After treatment her convergence near point was 7.5cms, accommodation was normal, and the synoptophore range of convergence was -4° to $+20^\circ$. Her standard was still below that normally aimed for, but, since she had been symptom free for several visits the course of treatment was stopped.

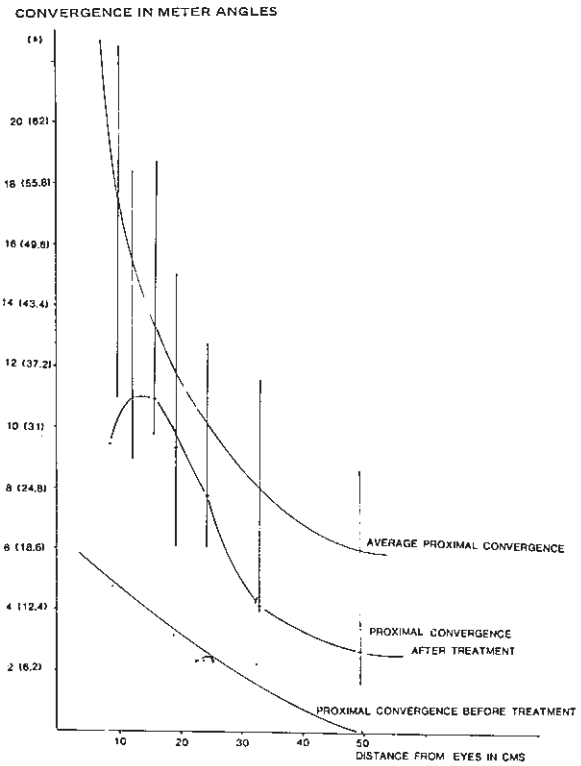

FIGURE 2 PROXIMAL CONVERGENCE BEFORE AND AFTER TREATMENT

Measurements of proximal convergence were repeated, and are shown in Figure 2. It is obvious that her proximal response has improved and is now within the lower limits of the normal population. The 'dropping off' effect at the nearer distances was not surprising as her convergence near point was still not well maintained.

Infra red photographs of her proximal convergence before and after treatment are shown in Figure 3.

Discussion

Orthoptic treatment has altered the proximal convergence response in this particular subject with convergence insufficiency.

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Figure 3.
Subject (R.G.) converging to 20 cms (1/5 m) in the light (top) and attempting to converge to the same distance before (centre) and after (bottom) treatment.

It is possible that this response may be altered on other types of latent or intermittent strabismus, most notably in those cases of convergence excess where a high AC/A ratio is not present.[1]

It is obvious that further cases should be studied to define more accurately the modification of this response from treatment.

REFERENCES

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