COMPARISON OF ACCOMMODATIVE AND NONACCOMMODATIVE TARGETS FOR THE ASSESSMENT OF OCULAR DEVIATIONS

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A study of 85 strabismic patients was undertaken to evaluate the variability in their measurements of horizontal deviation using both accommodative and nonaccommodative targets. Significant differences in their measurements were demonstrated by 39% of the esodeviation group and 56% of the exodeviation group, depending on the type of fixation target used. The study demonstrates the importance of using an accommodative target to elicit the basic deviation.

A point of disagreement among clinicians has been whether or not it is diagnostically significant to employ a nonaccommodation control target rather than an accommodation control target in the prism cover test.[1,2] Some feel that failure to control accommodation yields an inaccurate measurement of the horizontal deviation.[3] We felt it would be useful to determine if there were a significant difference between measurements obtained with accommodation controlled as opposed to those obtained with accommodation uncontrolled.

SUBJECTS AND METHODS

Eighty-five men and women were randomly selected from outpatients who had been referred to the University of Iowa Strabismus Clinic. Their ages ranged from 5 to 26. Of the sample, 58% were less than 10 years of age. All patients were measured for horizontal deviation, first at 35.56 cm and 6.096 meters controlling accommodation with 20/30 letters, and then using a fixation light for a controlling nonaccommodative target. Patients were wearing their full cycloplegic correction throughout the testing. The AC/A ratio was figured by the standard gradient and heterophoric methods.[4]

To determine if the comparison between men and women would prove to be an important variable, individuals were divided into four subclasses for analysis. These subclasses are: esodeviation women (22), esodeviation men (27), exodeviation women (15), and exodeviation men (21). The classification of deviations was based on the findings of the distance measurement using an accommodative target.

RESULTS

The mean levels for distance deviation with accommodation control (A-C) and nonaccommodation control (NA-C) targets are shown in Table 1. For all four subclasses the difference in magnitude is less than half a diopter. The mean levels of the near measurements are shown in Table 2. It should be noted that measurement error is considered to be within the range of ±15%, or at least 3 D.

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TABLE 1
MEAN LEVELS OF DEVIATIONS MEASURED AT DISTANCE WITH ACCOMMODATION CONTROL AND NONACCOMMODATION CONTROL TARGETS

SUBCLASS	NO. OF PATIENTS	A-C TARGET	NA-C TARGET	DIFFERENCE
Esodeviation women	22	8.4	8.0	0.4
Esodeviation men	27	13.0	12.6	0.4
Exodeviation women	15	16.1	16.2	-0.1
Exodeviation men	21	14.3	14.7	-0.4

TABLE 2
MEAN LEVELS OF DEVIATIONS MEASURED AT NEAR WITH ACCOMMODATION CONTROL AND NONACCOMMODATION CONTROL TARGETS

SUBCLASS	NO. OF PATIENTS	A-C TARGET	NA-C TARGET	DIFFERENCE
Esodeviation women	22	16.2	14.9	1.3
Esodeviation men	27	16.4	18.2	-1.8
Exodeviation women	15	11.1	13.5	-2.4
Exodeviation men	21	16.1	15.3	0.8

Thus, measurements that differ no more than 3 D, or a difference that represents less than 15% of the measurements obtained with an A-C target, are considered not to be significantly different. The maximum difference between means for near measurements was found to be 2.4 prism diopters in the exodeviation women. Only in the case of the near measurements of exodeviation women does the difference between the means for these measurements exceed the 15% range, even though the difference is less than 3 D. The criterion for measurement differences, ±15%, produced less meaningful distributions in view of the large number of relatively small deviations. Mean levels, of course, obscure the individual variability in the differences in deviation.

Figure 1 shows the frequency distribution of the difference between the distance deviations elicited by the two types of targets. Using the formula $(A\text{-}C^{\Delta})-(NA\text{-}C^{\Delta})$ = difference for the esodeviation group, a positive difference indicates that the A-C target yielded a larger deviation. For the exodeviation group, a positive difference indicates that the NA-C target yielded a larger deviation. Keep in mind that exodeviations are referred to in minus numbers, ie (-10 -[-15] = +5). Since a difference of +3 Δ (represented in brackets) is considered to be within the range of measurement error, 65% of the esodeviation groups and 75% of the exodeviation groups displayed no differences for the two targets. The number of individuals beyond these limits is fairly equal for both groups: eight vs nine for the esodeviation group and four vs five for the exodeviation group.

Figure 2 shows the frequency distribution of the difference between the near deviations assessed by the two types of targets. Again, the same formula is used. At near, 61% of the esodeviation group and 44% of the exodeviation group responded in a comparable manner with both targets. The sexes do not appear to present dissimilar distribution for these differences.

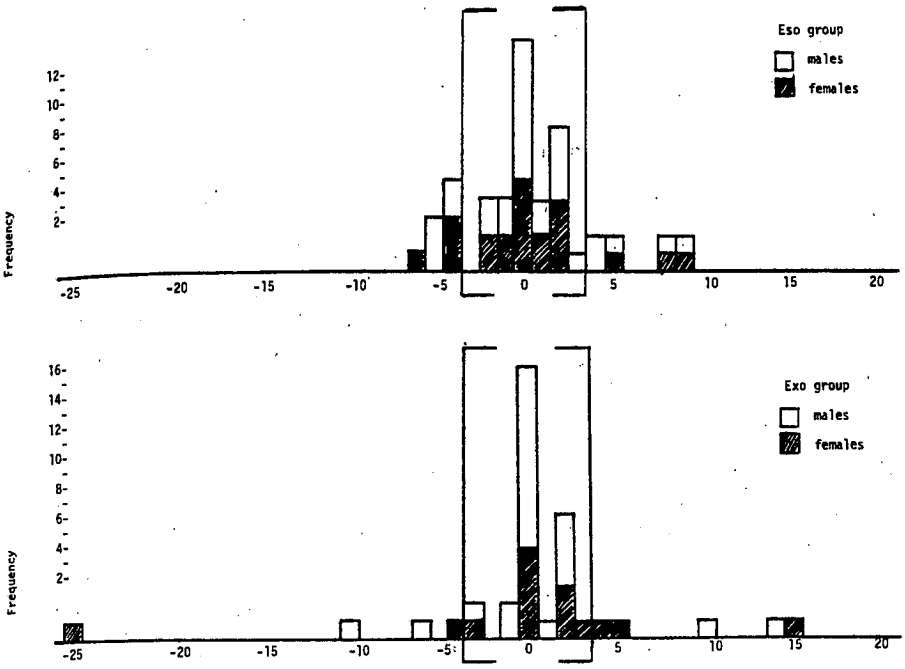

FIG 1—Frequency distributions of difference between distance deviations ([A-C$^{\Delta}$] - [NA-C$^{\Delta}$] = difference).

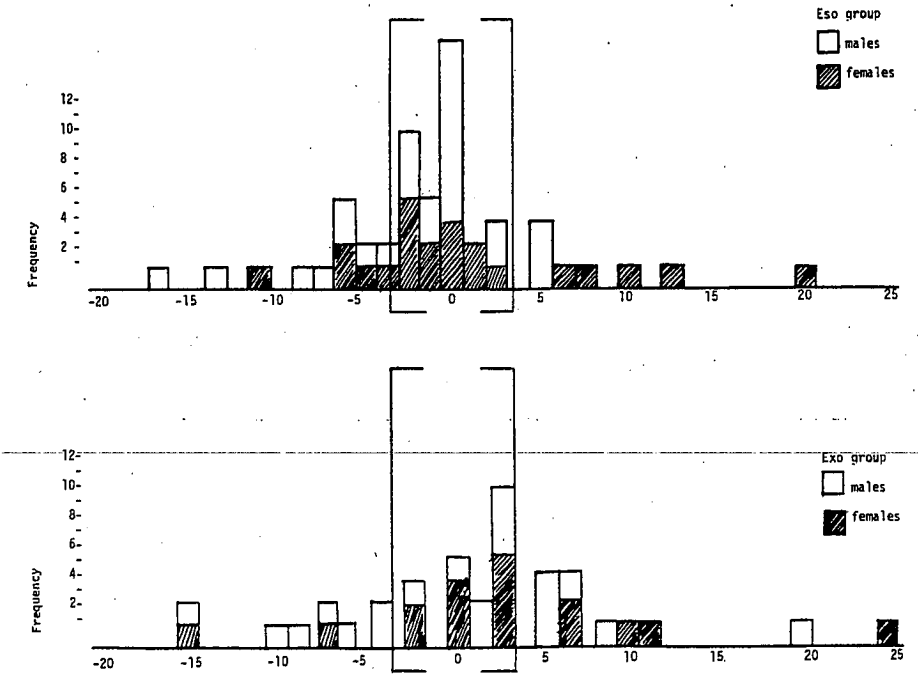

FIG 2—Frequency distributions of difference between near deviations ([A-C$^{\Delta}$] - [NA-C$^{\Delta}$] = difference).

The AC/A ratios were calculated from the accommodation controlled deviation measurements. The AC/A ratio means measured by the heterophoric method were consistently larger than the AC/A ratio means, calculated by the gradient method, by a range of 1.6 to 3.7 D. The difference between these two indices of the AC/A relationship seems to be unrelated to the amount of accommodative convergence. Rather, it is attributable primarily to the amount of proximal and tonic convergence, which is held constant with the gradient method but is not considered in the heterophoric method.

DISCUSSION

There is a reasonably high degree of correspondence between the measurements obtained by the two types of targets. However, there remains a relatively significant percentage of patients (39% of the esodeviation group and 56% of the exodeviation group) who display a difference in measurements depending on the type of target used. As one would expect, the near measurements of both groups and the measurements of the exodeviation group in general show a lower degree of correspondence. This is most likely accounted for by the varying amount of accommodation used at near, depending upon the patient's needs, and the familiar variable control of an exodeviation by the patient's use of his accommodation. These findings demonstrate the need for using a reliable system in the evaluation of a strabismus problem in order to elicit the basic deviation with confidence and reproducibility. It is important to challenge each patient with his best visual acuity in order to be certain that the patient is not sacrificing vision in an attempt to control his deviation by varying his accommodation. The use of an accommodative target also allows for reproducible control of the AC/A ratio, be it normal or abnormal, and for control of the patient's attention.

Since it is the basic deviation that one is attempting to elicit in the strabismus examination, the results of this study clearly show the importance of using an accommodative controlled target to reduce one of a number of variables present in the patient's examination.

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Key Words: Accommodation controlled targets; nonaccommodation controlled targets; heterophoric AC/A; gradient AC/A.

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