Literature research for innovations in binocular balance testing

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LITERATURE RESEARCH FOR

INNOVATIONS IN

BINOCULAR BALANCE TESTING

by Norman Butler

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LITERATURE RESEARCH FOR INNOVATIONS IN BINOCULAR BALANCE TESTING

A number of near-point balancing techniques have been proposed and utilized to some extent in the history of optometry. No less an authority than A. E. Turville was among those who first advocated a near-point binocular balance. His work was followed by many who thought along the same lines, these proponents have offered a variety of techniques.

Turville argued that there was a need to balance the eyes subjectively at the near point with the eyes in a binocular mode. He utilized a septum which allowed each eye to see a portion of a chart, this arrangement in turn afforded a means of testing each eye separately without conscious knowledge of the subject that both eyes were not viewing the chart. This arrangement also disclosed hyperphoria and cyclophoria. He recommended low illumination for the most sensitive testing. A variety of type sizes were used on the chart as well as a row of dots which was for the purpose of testing hyperphoria and cyclophoria. A row of squares was to give an estimation of equality or difference in image size for the two eyes. A 40 cm distance was recommended for the test. When a different equalization at near must use lenses that when projected to infinity cannot be tolerated by the subject he said consideration must be given for the use of the infinity lenses and a different balance at near in the form of a bifocal or reading glasses. Cylinders may likewise have to be adjusted for the near viewing distance.

In an article by Amigo he describes a modified Turville
near balance technique which uses an angled bi-surface mirror which divides the field into right and left halves. The major difference in this arrangement and the Turville infinity balance is the elimination of the septum. One area of the retina is stimulated by the target reflected in one mirror and another adjacent area is stimulated by a second image. This minimizes retinal rivalry and cortical suppression.

Cowan utilized a modified binocular technique in which two halves of each red and green area of a target are polarized. While it is realized that this involves rapid alternation between monofoveal images the test is highly sensitive for balancing the accommodative response of the two eyes.

Freeman developed a bichromatic polarized method of near point balance of accommodation. A system with polarized red-green targets and glasses permits the examiner to determine when the subject's eyes are balanced at the near-point by questioning the subject's observation of the appearance of two adjacent targets. The test is said to allow the best near-point balance even if the eyes do not accommodate equally, as well as eliminating the need for fine discrimination by the patient.

Goodlaw developed a technique for near-point binocular balance which he claims not only gives binocular balance at near but also provides further information related to near point stress, such as suppression or other means of using monocular vision. Goodlaw says that the amplitude of
accommodation may be grossly overestimated by means of negative relative accommodation and positive relative accommodation tests since the patient may become monocular when visual stress becomes too great. Goodlaw used a polaroid system with small targets adjacent to each other which were viewed alternately by each eye.

Samuel and McAtee describe a technique developed by a Bavarian optometrist, Hans Bachmaier. This technique uses a red-green target and filter system which the inventor claims completely excludes accommodation as an unknown quantity.

Anderson and Jensen offer a near balancing procedure based on alterocular phoria measurements. The authors used a cross-grid target with lines running at 45°-135° at a distance of 40 cm. The dioptric value that placed the midpoint of the range on the retina was placed in the phoropter. Prism was used to vertically separate the images to each eye. A 20/20 vertical row of letters replaced the cross-grid and the subject was "flashed" at various horizontal prism settings until the targets were aligned. The phoria was compared to the AC/A and if they were different by less than a significant amount the stimulus to accommodation was assumed to be balanced.

What is wrong with all these methods and how will your method improve on near balance? Why do you think yours will be better?
DESCRIPTION OF EXPERIMENTAL METHODOLOGY:

Subjects will be routine clinic patients and testing will be conducted at the conclusion of the 21-point examination. In order to reduce variables as much as possible subjects are to be adults and should show no indications of strabismus or amblyopia and should normally use binocular vision.

The starting point will be the 7a finding from the 21-point examination. The target used will be the reading material card generally used for the number 19 minus to blur test. Occluders will prevent a portion of the target from being seen by both eyes. Approximately the left 5/8 of the card will be seen by the right eye and likewise the right 5/8 of the card will be seen by the left eye. Both eyes will observe 1/4 of the card in the central section. The card will be placed at .4 meters for presbyopes and near presbyopes, for younger adults the card will be situated at .25 meters to more fully utilize the subject's accommodation and convergence. The occluders will be placed at an appropriate distance dependent on the subject's interpupillary distance. In this arrangement the subject can compare left eye target, right eye target and that seen by both eyes in one sweep of a line of type. This system will maintain convergence and thus utilize any accommodation due to convergence the patient normally has.

Minus lenses will be used to fog the subject, this will place him in a position of using his full accommodative ability. By limiting this study to adults the problem of extremely high amounts of accommodation found in children will be avoided.
If enough presbyopic subjects are available a section devoted to them will be included. The writer contends that a difference in the near-point balance compared to the infinity balance could come from either of two things: 1. A greater amount of sensitivity at the reading distance or; 2. An actual difference in accommodation between the two eyes.

A difference of .25 diopter will be considered significant.

Drawing of apparatus appears on following page.
DIAGRAMS OF APPARATUS

LEFT EYE
TARGET

RIGHT EYE
TARGET

READING
CARD

OCCLUDERS

PHOROPTER

EYES

READING
CARD

OCCLUDERS

PHOROPTER
REFERENCES


