THE DETECTION of diffuse and minor brain damage remains one of the
major diagnostic problems in neurology and psychiatry. The lack of
appropriate indices of impaired cerebral functioning was especially
noticeable in the study of patients suffering from head injuries. The majority
of late post-traumatic conditions are characterized by a scarcity of neuro-
logical signs and the clinical picture is, in addition, often complicated by
psychogenic superstructure. In the search for objective methods which would
substantiate the presence of brain damage in these cases, attention was called
to a number of visual functions which were shown to be sensitive indicators
of changes in brain physiology. In view of these reports it seemed of interest
to inquire into the value of visual functions as indicators of structural brain
damage. Thus dark adaptation, onset of negative after images, apperception
and comprehension following tachistoscopic exposure and reaction time
were investigated in 57 patients with head injuries.

The diagnostic value of gross alterations of the visual fields following
cranio(cerebral) injuries is well established. The influence of psychological
factors in the testing of visual fields is stressed by Gelb and Goldstein. These
authors attribute the occurrence of ring scotomata and concentric
restricted fields to fatigue following brain injury. Halstead reported on the
dynamic visual field, that is, that portion of the peripheral retinal field that
can be made to yield the threshold visual impression at the same instant
that a form discrimination is being made in the region of the fovea. He found
that campimetric and dynamic fields coincide in lesions of the occipital or
parietal lobes, but that in frontal lesions the dynamic fields are restricted
when compared to the campimetric fields. Investigation of the fields was
not confined to examination with white and colored test objects only.
Phillips called attention to the use of the flicker phenomenon in neuro-
logical diagnostic and Riddell demonstrated its value for the estimation of
the density of scotomata. Werner and Thuma applied the same method in
the investigation of two groups of mentally deficient children. The critical
flicker frequency was lower for the brain injured group at each brightness

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conducted at the Langley Porter Clinic, San Francisco.
level than it was for another group of mentally deficient children without signs of brain injury.

Another group of studies was concerned with deficient perception of motion and with apperception after tachistoscopic exposures. Werner and Thuma\textsuperscript{24} showed that children with brain injuries are defective in perception of apparent motion, though they are able to perceive real motion. Pötzl and Redlich\textsuperscript{19} described a case of occipital injury with inability to perceive real or stroboscopic movements. A case of occipital and cerebellar injury in which slow and stroboscopic movements could not be perceived at all was reported by Goldstein and Gelb.\textsuperscript{7} Ruesch\textsuperscript{16} examined acute head injuries with regard to the phi-phenomenon and apperception after tachistoscopic exposure. He found that only a small percentage of cases showed significant impairment. Goldstein,\textsuperscript{8} on the other hand, tends to stress the general value of the tachistoscope in the study of head injuries and Altenburger\textsuperscript{1} used the same method for the detection of visual field defects.

A third group of studies dealt with visual functions as indicators of altered brain physiology while the subjects were exposed to gas mixtures of low oxygen content.\textsuperscript{2} Evans and McFarland\textsuperscript{2} studied the effects of oxygen deprivation on the central visual field. They found that while the central visual acuity remains unaffected, the angioscotoma widens progressively with increasing oxygen deprivation until it obliterates almost the entire field. McFarland and Evans\textsuperscript{10} demonstrated increased thresholds of light sensitivity after dark adaptation. McFarland and Halperin\textsuperscript{11} showed decrease of foveal visual acuity especially at low illuminations. Gellhorn and Spiesman\textsuperscript{5} pointed out that there is a lengthening period for the appearance of negative after images under influence of O\textsubscript{2} lack, CO\textsubscript{2} excess and reduction in CO\textsubscript{2} tension of the blood due to hyperpnea. They conclude that these conditions produce a lowered excitability of fundamental nervous mechanisms involved in vision.

The above-mentioned findings clearly demonstrate that the majority of visual functions are dependent on intact anatomical structure of the brain, normal cerebral circulation, and blood chemistry. However, psychological factors such as “attention” determine to a considerable extent the outcome of visual testing. Goldstein,\textsuperscript{6} Halstead,\textsuperscript{8} Ruesch\textsuperscript{16,17,19}, and others have shown that the degree of awareness is lowered in patients suffering from brain disease or injury. Impairment of awareness, however, may also occur in distractable, self-preoccupied, or fatigued persons.\textsuperscript{3,21}

In the application of visual tests to head-injured patients, these different etiological factors must be considered. In late post-traumatic syndromes the frequent combination of residual signs of brain injury with personality disorders of the neurotic type made it necessary to correlative visual functions with intelligence and personality tests, and with information concerning the severity of the injury. I.Q. and presence of neurological signs are indices of brain damage, whereas the Minnesota Multiphasic Personality Inventory gives a measure of abnormal personality trends.\textsuperscript{18} A visuo-motor reaction