Reading Disability: Evoked Potentials in
CLINICAL PEARL

Assessment of the visual evoked potential (VEP) response can provide valuable information about the functional integrity of the visual system. The VEP response is measured by presenting a series of visual stimuli to the patient and recording the electrical response in the brain. The response is analyzed to determine the integrity of the visual pathways and the function of the visual system.

The VEP response is typically recorded from electrodes placed on the scalp, and the response is measured in microvolts (µV). The response is typically measured in the occipital lobe, which is responsible for visual processing.

The VEP response can be used to assess a variety of conditions, including visual impairments, brain tumors, and multiple sclerosis. The VEP response can also be used to assess the effectiveness of treatment for visual impairments.

The VEP response is a useful tool for assessing the functional integrity of the visual system. It can provide valuable information about the condition of the visual system and the effectiveness of treatment. However, it is important to note that the VEP response is not a substitute for a comprehensive neurological examination.
Characteristics of Parallel Pathways

<table>
<thead>
<tr>
<th>M Pathway</th>
<th>P Pathway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low frequency, high contrast, low spatial sensitivity</td>
<td>High frequency, low contrast, high spatial sensitivity</td>
</tr>
<tr>
<td>Vision system is dominated by contributions from the M-pathway due to the contrast of the signal difference in contrast and spatial frequency</td>
<td>Vision system is dominated by contributions from the P-Pathway due to the contrast of the signal difference in contrast and spatial frequency</td>
</tr>
</tbody>
</table>

The M and P pathways interact at the stage of contrast sensitivities, where they complement each other in the processing of visual information. This interaction is critical in maintaining visual clarity and perception under various lighting conditions.
Electrophysiological assessment of the M and P pathways

are generally considered with those of psychophysical studies.

The results of these electrophysiological studies show that the P and M pathways are involved in the processing of visual information, with the P pathway playing a more critical role in the perception of movement and the M pathway being more sensitive to local changes in the retinal image.

The figure illustrates the difference between the P and M pathways. The P pathway is characterized by a high sensitivity to local changes, while the M pathway is more sensitive to global changes.

The figure also shows the relationship between the P and M pathways and the visual field of view. The M pathway is more sensitive to stimuli in the periphery, while the P pathway is more sensitive to stimuli in the central field of view.

The figure further illustrates the role of the P and M pathways in the perception of motion. The P pathway is more sensitive to changes in the direction of motion, while the M pathway is more sensitive to changes in the speed of motion.

Overall, the electrophysiological assessment of the M and P pathways provides valuable insights into the mechanisms underlying vision and contributes to our understanding of visual perception.
Visual Evoked Potentials in Reading Disability

Electrophysiological techniques offer many advantages over psychiatric and psychological assessments of reading delay. Tactile-electrophysiological techniques, such as those used in the study of children with reading disabilities, have demonstrated the importance of the visual processing system in the development of reading skills. The use of these techniques, in conjunction with traditional psychological assessments, can provide valuable insights into the underlying mechanisms of reading disability.

**Clinical Pearl:**

- **High-temporal frequency VEPs at high-temporal frequencies:**
  - VEPs (visual evoked potentials) recorded at high-temporal frequencies do not show the typical biphasic response, which is typically observed in VEPs recorded at low-temporal frequencies. This suggests that high-temporal frequency VEPs may provide information about the processing of visual stimuli at high-temporal frequencies.
  - A biphasic response is observed in VEPs recorded at low-temporal frequencies, indicating that the processing of visual stimuli at low-temporal frequencies is more complex and involves multiple brain regions.

**Figure 10.1:**

A comparison of steady state and transient VEPs.

**Note:**

- **Steady-state VEPs:** These VEPs are characterized by a continuous response to a steady-state stimulus, such as a flickering light or a periodic visual pattern. They are often used to study the effects of sensory stimuli on the brain, and can provide information about the processing of visual information over extended periods of time.

- **Transient VEPs:** These VEPs are characterized by a transient response to a transient stimulus, such as a brief flash or a rapid change in the visual environment. They are often used to study the effects of rapid changes in the visual environment on the brain, and can provide information about the processing of visual information over short periods of time.
In contrast, the effects of spatial frequency on reading performance are not as pronounced. Kemp et al. (1987) and Sperling et al. (1987) demonstrated that spatial frequency plays a significant role in reading performance, with higher spatial frequencies leading to better performance. However, the effects of spatial frequency on reading performance are not as pronounced as those of orthographic frequency and structural complexity.

Spatial frequency refers to the number of times a pattern repeats within a given area. In reading, spatial frequency can affect the visual processing of text. Higher spatial frequencies, such as those found in uppercase letters, are easier to perceive and process than lower spatial frequencies, such as those found in lowercase letters. This is because the visual system is more sensitive to higher spatial frequencies, which allows for faster and more accurate reading.

Orthographic frequency refers to the frequency of a letter or group of letters in the written language. In English, for example, the letter "e" is more frequent than the letter "z". This affects reading performance, as words and phrases that are more common are easier to read and process.

Structural complexity refers to the complexity of the text, such as the number of syllables per word. More complex texts require more cognitive resources and can slow down reading speed.

The effects of these factors on reading performance are not independent of each other. For example, orthographic frequency and spatial frequency can interact to affect reading performance. Words with higher orthographic frequency and higher spatial frequency are easier to read than words with lower orthographic frequency and lower spatial frequency.

Overall, the effects of these factors on reading performance are complex and interrelated. Future research should continue to explore these relationships to better understand the factors that influence reading performance.
Effects Obtained in Reading Displaced Observers

TABLE 10-2

<table>
<thead>
<tr>
<th>VEP Difference</th>
<th>Low SF</th>
<th>High SF</th>
<th>Low FT</th>
<th>High FT</th>
<th>Can</th>
<th>Cannot</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPP</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steady</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 10-2.

Difference between the VEP of normal and displaced readers.
References

Based on the recent psychological studies of reading disability, the normal temporal flow of information during reading, dyslexic children have a delayed or reversed reading sequence. Although different subtypes of reading disorders exist, one of the key factors contributing to dyslexia is a delayed or reversed reading sequence. The effect of flicker masking with a corresponding spatial frequency has been shown to improve reading performance in dyslexic children.