

Why acquire P300/MMN?

P300 and Mismatched Negativity responses may be used to diagnose certain auditory conditions. This type of testing may provide the physician with very useful information about neurodegenerative and neuropathological changes, especially in the language and information processing areas of the brain. These techniques are especially helpful to test patients with aphasia, dyslexia, Parkinson's disease, Alzheimer's disease and other attention problems in order to determine the nature of the ailment.

What are P300 and MMN?

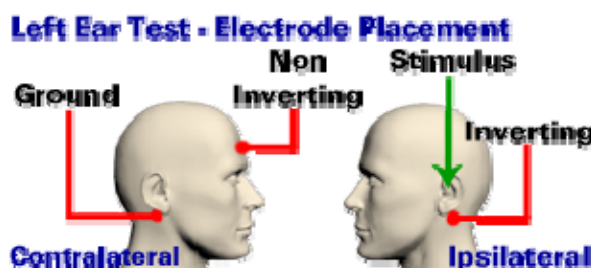
P300 and Mismatched Negativity Responses are potential differences generated when a patient is stimulated with a stimulus train containing frequently occurring stimuli and infrequent deviant stimuli. The potential difference originates in the auditory cortex and can be recorded by averaging the acquired signal over a specified period of time. The MMN response is commonly found between 100 and 200 milliseconds from the time of stimulation. The P300 response is commonly found around 300 milliseconds from the time of stimulation. An ideal MMN recording will contain a difference between the response to standard stimulus and the response to the deviant stimulus, which can be observed in the 100 to 200 millisecond region. An ideal P300 recording will contain one large peak at around 300 milliseconds from stimulation; where the amplitude of the peak is inversely related to the level of expectation for the odd stimulus and the latency is related to the ratio of standard to deviant stimuli.

Patient Preparation

The patient must be placed in a comfortable and quiet environment, preferably a sound booth where the patient lies down on a comfortable bed. The patient must be instructed to remain alert during testing. The

patient must also be instructed to count the deviant stimulus and to report that number at the end of the test when performing P300 testing; this is not needed for performing MMN testing. Clean and Prepare electrode placing sites to reduce impedance. Surface electrodes may be placed in the following configuration:

- Inverting (-) : Ipsilateral (Testing) Mastoid
- Non-Inverting (+) : High Forehead
- Ground: Contralateral Mastoid



When testing both ears, in a dual channel system, place the corresponding inverting electrodes on the mastoids, place the ground electrode on the lower forehead and place the two non-inverting leads, using a Y-adaptor, above the ground electrode. Consult the SmartEP manual for additional electrode placement details.

Setting up SmartEP

The system may be setup with a few clicks of the mouse. Complete the following steps in the order outlined, use the test setting that best fit your requirements or use the recommended settings shown on the next section:

- Under **Stimulus > Modality** in the main menu, click the appropriate option under *Auditory P300/MMN*.
- Set the stimulus, Click on **Stim** from the control panel and set the stimulus transducer.
- Click on the **Setup P300** button on the control panel and set the intensity and

percent of presentation for the standard and deviant stimuli for either test. Load the stimulus files to be used by clicking on the “File” for each of the buffers being used.

- Click on the **EEG and Amplifier** button on the control panel and set the filters, notch filter, artifact rejection ratio and region and desired amplification for each channel.
- On the control panel, set rate, polarity, intensity and the number of sweeps.
- Press the **Acquire** button to start. Repeat acquisition 2 to 4 times.

Make sure to carefully select your filter settings in the EEG and Amplifier dialog box. An unfiltered recording can always be filtered digitally to obtain a smoother waveform; however, hardware filtering cannot be undone. You may create your own stimulus files by using the Stimulus Conversion Utility. Refer to the Stimulus Conversion Smart Note for a detailed description of the stimulus conversion and calibration procedure.

Recommended Test Settings

This table shows the recommended settings for P300 and MMN acquisition:

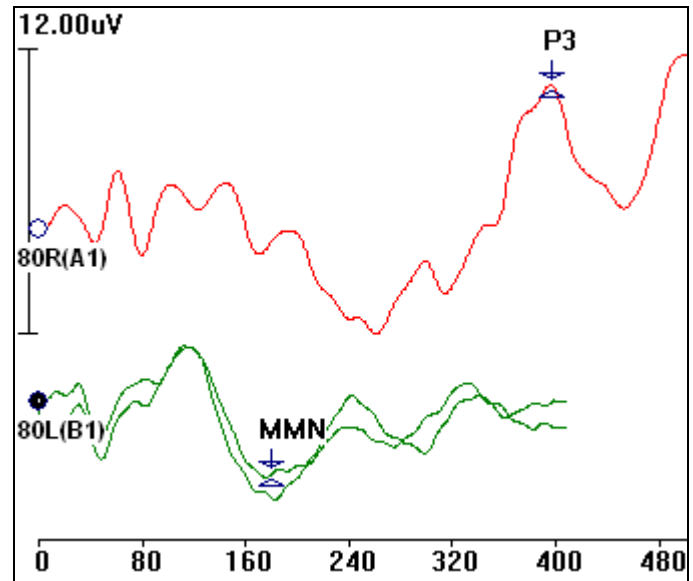
Stimulus:	for P300: 1000Hz in Buffer0 (frequent tone) and 2000Hz in Buffer1 (deviant tone) Use speech files for MMN
% Presentation	80% Buffer 0 (frequent) 20% Buffer 1 (deviant)
Intensity	70-90dB, You may also present an intensity disparity between the frequent and deviant stimuli.
Rate:	1.1/sec. (0.3/sec for longer ISI)
Polarity:	Alternating
Transducers:	Insert Earphones
Filters:	1 – 30 Hz
Notch Filter:	OFF. ON if there is excessive electrical line noise present.
Amplification:	50x
Analysis Time	500 milliseconds for both MMN and P300
Window:	
Sweeps:	About 100
Montage:	Ipsilateral Array

Marking Peaks

To accurately diagnose a condition, you must first place the applicable labels on the recently acquired recording. Peak P300 (also known as peak P3) or MMN may be marked when recognizable follow these steps for each of the labels:

- Right click at the point of the recording where the label is to be placed.
- Select “Mark Other Peak” and from the menu window select the peak to be marked (P3, N3, MMN).
- Once placed, drag the top and bottom markers to the right position.

The graph shows suggested label placing for acquired P300 and MMN signals. Recordings labeled X0 are for the common buffer and X1 for the deviant buffer, where X is the channel.



Analysis

Select Print Pages or Print Page from the SmartEP main Menu to print a report of the currently displayed signals. Refer to the SmartEP manual for other report generation options.

Since label placement is subjective, all results must be evaluated by an audiologist or medical professional trained in P300/MMN techniques.