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Auditory P300 Late Positive Complex Peaking-Picking Procedure

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Abstract: Latency and amplitude figures for waveforms were picked at their point of maximal deflection as seen at their electrode site of maximal voltage distribution. The foregoing procedure for peak-picking was usually rather simple and straightforward for the early peaks. However for the Late Positive Complex (LPC) components due to their inherent but limited morphological identification had to be used in order not to confuse and admix together different LPC components from different subjects. Basically it is assumed that there are a maximum of three components in a person's LPC which we call P3a, P300 and P3b. P3a is the earliest and P3b the latest such component while P300 falls somewhere in the middle usually assumed as the waveform's center of gravity where a distinct peak cannot be ascertained. The range of LPC morphological variability which is seen in a general population including both healthy and sick people is then considered to represent a kind of gradient of LPC degeneration or deterioration and can be classified as such.

Key words: Auditory, evoked potential, event-related potential, late positive complex, P300

INTRODUCTION

Peak-picking of the early peaks (N1, P2, N2) was accomplished by means of moving an enhanced point cursor through the waveforms displayed on the computer screen while simultaneously paying attention to the resultant changes in the topographic maps. Latency and amplitude figures for waveforms were picked at their point of maximal deflection (whether positive or negative) as seen at their electrode site of maximal voltage distribution as follows:

- N1 was picked at the Fz electrode site
- P2 and N2 were picked at the Cz electrode site

The foregoing procedure for peak-picking was usually rather simple and straightforward for the early peaks. However for the Late Positive Complex (LPC) components due to their inherent but limited morphological identification had to be used in order not to confuse and admix together different LPC components from different subjects (Federico, 1984; Hood and Berlin, 1986; Spehlmann, 1985). Basically, this system is used at the Neuro-Behavioural Biology Center, Institute of Science and Technology for Research and Development, Mahidol University, Thailand which was mandated to be used in all studies as follows.

It is assumed that there are a maximum of three components in a person's LPC which we call P3a, P300 and P3b. P3a is the earliest and P3b the latest such component while P300 falls somewhere in the middle usually assumed as the waveform's center of gravity where a distinct peak cannot be ascertained (Morstyn *et al*., 1983; Spehlmann, 1985). The range of LPC morphological variability which is seen in a general population including both healthy and sick people is then considered to represent a kind of gradient of LPC degeneration or deterioration and can be classified as such (Buchsbaum *et al*., 1981; Chiappa, 1983; Owen and Davis, 1985; Spehlmann, 1985; Tyner *et al*., 1983). On an initial simplistic scale of 0-8 with 0 representing a total absence of response and 8 representing maximal good health or normality it would then appear as shown in Table 1.

In order to flesh-it-out to accommodate variations in component complexity, especially as regards the P3a/P3b amplitude balance as well as to accommodate equivocality of peaks it would appear as shown in Table 2. Since this system's instruction at the Neuro-Behavioural Biology Center, Institute of Science and Technology for Research and Development, Mahidol University, Thailand, several years ago this system has been able to prospectively use it to identify all LPC variants recorded and that it therefore adequately describes the full range of LPC variability so far encountered.

Although somewhat complicated to learn at first, it is rather quickly and easily mastered and has the great benefit of preventing the mixing-up of different components between subjects or patients, thereby facilitating interindividual comparisons (Goff, 1974; Jewett and Williston, 1971; Spehlmann, 1985; Tyner *et al*., 1983).

Table 1: Scales representing an absence and normality according to variations in component complexity

Scales	LPC component description
8.0	LPC evident, comprised of a simple, monophasic waveform (P300) with no identifiable P3a or P3b components visible
7.0	LPC evident, comprised of (equivocally) compound waveform with clear P300 (the wave's center of gravity) bracketed either side by equivocal P3a and P3b component estimates
7.1	Same as # 7.0 but with clear-cut P3a and equivocal P3b with the wave's center of gravity coincident with P3a where P300 is estimated. Fused P3a/P300>equivocal P3b in amplitude OR: with the wave's center of gravity in-between where P300 is estimated. P3a>equivocal P3b in amplitude
7.2	Same as # 7.0 but with equivocal P3a and clear-cut P3b with the wave's center of gravity coincident with P3b where P300 is estimated. Fused P300/P3b>equivocal P3a in amplitude OR: with the wave's center of gravity in-between where P300 is estimated. P3b>equivocal P3a in amplitude
6.0	LPC evident comprised of compound waveform with clear-cut P3a and P3b components with the wave's center of gravity in-between where P300 is estimated
6.1	Same as # 6.0, P3a>P3b in amplitude OR: Same as # 6.0 but with the wave's center of gravity coincident with P3a where P300 is estimated. Fused P3a/P300>P3b in amplitude
6.2	Same as # 6.0, P3b>P3a in amplitude OR: Same as # 6.0 but with the wave's center of gravity coincident with P3a where P300 is estimated. Fused P300/P3b>P3a in amplitude
5.0	LPC evident comprised of P3a and P3b components separated by a medium-sized notch where P300 is estimated
5.1	Same as # 5.0, P3a>P3b in amplitude
5.2	Same as # 5.0, P3b>P3a in amplitude
4.0	LPC evident comprised of P3a and P3b components separated by a deep notch where P300 is estimated
4.1	Same as # 4.0, P3a>P3b in amplitude
4.2	Same as # 4.0, P3b>P3a in amplitude
3.0	LPC evident, comprised of P3a and equivocal P3b components separated by a deep notch where P300 is estimated
2.0	LPC evident, comprised of P3a component only
1.0	Equivocal LPC may be present, perhaps comprised of P3a component only
0.0	No LPC evident although the patient/subject reported was able to adequately comply with the testing paradigm

Table 2: Scales representing an absence and normality

Scales	LPC component description
8	LPC evident comprised of a simplem monophasic waveform (P300) with no identifiable P3a or P3b components visible
6	LPC evident comprised of compound waveform with clear-cut P3a and P3b components with the wave's center of gravity in between where P300 is estimated
4	LPC evident comprised of P3a and P3b components separated by a deep notch where P300 is estimated
2	LPC evident comprised of P3a component only
0	No LPC evident, although the patient/subject reportedly was able to adequately comply with the testing paradigm

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