ABR Examiner Hearlab v EP25 Results

Systems compared: HEARLab and Interacoustics EP25.

Examiners: KGB, MW, PM, AG (FM results excluded due incompletion)

# Overall analysis

The percentage of waveforms marked as “Response Present” is shown in the table below. This is grouped by stimulus frequency and sensation level, and shown individually for each examiner.

Overall, 56% of responses were marked as present for both Hearlab and EP25, showing the close similarity of the outputs of the two systems.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **KGB** | **PM** | **AG** | **MW** |  | **Mean** |
| Percentage of responses detected |  |  |  |  |  |  |
| **- Hearlab (all)** | **68%** | **38%** | **52%** | **68%** |  | **56%** |
| **- EP25 (all)** | **63%** | **41%** | **55%** | **63%** |  | **56%** |
|  |  |  |  |  |  |  |
| Grouped by stimulus frequency |  |  |  |  |  |  |
| - Hearlab (Click) | 59% | 39% | 39% | 61% |  | 50% |
| - Hearlab (4k) | 76% | 57% | 68% | 80% |  | 70% |
| - Hearlab (2k) | 70% | 36% | 64% | 76% |  | 61% |
| - Hearlab (1k) | 68% | 30% | 52% | 58% |  | 52% |
| - Hearlab (500) | 74% | 23% | 41% | 68% |  | 52% |
| - EP25 (Click) | 55% | 41% | 43% | 54% |  | 48% |
| - EP25 (4k) | 65% | 57% | 63% | 80% |  | 66% |
| - EP25 (2k) | 76% | 43% | 61% | 69% |  | 62% |
| - EP25 (1k) | 68% | 36% | 68% | 58% |  | 57% |
| - EP25 (500) | 56% | 23% | 52% | 63% |  | 48% |
|  |  |  |  |  |  |  |
| Grouped by sensation level |  |  |  |  |  |  |
| - Hearlab (40) | 86% | 43% | 100% | 71% |  | 75% |
| - Hearlab (30) | 77% | 53% | 63% | 75% |  | 67% |
| - Hearlab (20) | 81% | 48% | 61% | 80% |  | 67% |
| - Hearlab (10) | 65% | 34% | 49% | 68% |  | 54% |
| - Hearlab (0) | 43% | 14% | 29% | 43% |  | 32% |
| - EP25 (40) | 100% | 33% | 86% | 86% |  | 76% |
| - EP25 (30) | 71% | 56% | 66% | 79% |  | 68% |
| - EP25 (20) | 73% | 53% | 70% | 73% |  | 67% |
| - EP25 (10) | 62% | 33% | 53% | 62% |  | 53% |
| - EP25 (0) | 39% | 21% | 24% | 35% |  | 30% |
|  |  |  |  |  |  |  |
| Difference (Hearlab-EP25) |  |  |  |  |  |  |
| - (all) | 5% | -3% | -4% | 4% |  | 1% |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| - (Click) | 5% | -2% | -4% | 8% |  | 1% |
| - (4k) | 11% | 0% | 5% | 0% |  | 4% |
| - (2k) | -5% | -7% | 3% | 7% |  | -1% |
| - (1k) | 0% | -7% | -15% | 0% |  | -6% |
| - (500) | 18% | 0% | -11% | 5% |  | 3% |
|  |  |  |  |  |  |  |
| - (40) | -14% | 10% | 14% | -14% |  | -1% |
| - (30) | 7% | -3% | -2% | -4% |  | -1% |
| - (20) | 8% | -5% | -10% | 7% |  | 0% |
| - (10) | 2% | 1% | -5% | 6% |  | 1% |
| - (0) | 4% | -8% | 4% | 7% |  | 2% |

# Latency comparison

ABR Wave V latency was compared between the two systems.

Only waveforms which had response marked as present with at least 90%confidence in both Hearlab as well as EP25 by an examiner for a particular stimulus frequency and intensity level were included in the measure. The analysis was also repeated using a confidence criterion of at least 80%. The high confidence levels were chosen to ensure waveforms where wave V may have been less clear would not adversely affect the latency comparison.

Wave V latency differences are also grouped by stimulus frequency.

Negative values of latency difference indicates that the Wave V peak in the Hearlab averaged waveform occur with lower latency than the Wave V peak in the EP25 averaged response.

With the exception of the 500 Hz response, which can be very difficult to interpret, the average latency differences between the two systems are well below 0.1ms.

Note: the Hearlab responses already include the trigger delay correction as follows

% 500 Hz -0.509

% 1000 Hz -0.254

% 2000 Hz -0.15

% 4000 Hz -0.064

% Click Hz +0.011

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **KGB** | **PM** | **AG** | **MW** |  | **Mean** |
| Latency difference (EP25-Hearlab) |  |  |  |  |  |  |
| Number of waveforms with response present **>90%** confidence in both systems |  |  |  |  |  |  |
| **- Total** | **41** | **41** | **63** | **198** |  | **86** |
| - (Click) | 10 | 6 | 11 | 56 |  | 21 |
| - (4k) | 13 | 20 | 21 | 48 |  | 26 |
| - (2k) | 6 | 9 | 14 | 40 |  | 17 |
| - (1k) | 11 | 6 | 14 | 29 |  | 15 |
| - (500) | 1 | 0 | 3 | 25 |  | 7 |
|  |  |  |  |  |  |  |
| **Average Latency Difference (ms)** |  |  |  |  |  |  |
| **- Total** | **-0.093** | **0.000** | **-0.067** | **-0.049** |  | **-0.052** |
| - (Click) | -0.200 | -0.017 | 0.036 | 0.011 |  | -0.042 |
| - (4k) | 0.015 | 0.030 | 0.005 | -0.013 |  | 0.009 |
| - (2k) | -0.150 | -0.044 | -0.071 | -0.080 |  | -0.086 |
| - (1k) | -0.082 | -0.017 | -0.207 | 0.179 |  | -0.032 |
| - (500) | -0.200 |  | -0.267 | -0.468 |  | -0.312 |
|  |  |  |  |  |  |  |
| **Std Deviation of latency difference (ms)** |  |  |  |  |  |  |
| - Total | 0.289 | 0.140 | 0.231 | 0.679 |  | 0.335 |
| - (Click) | 0.508 | 0.147 | 0.143 | 0.484 |  | 0.321 |
| - (4k) | 0.146 | 0.130 | 0.177 | 0.276 |  | 0.182 |
| - (2k) | 0.164 | 0.142 | 0.209 | 0.322 |  | 0.209 |
| - (1k) | 0.183 | 0.172 | 0.308 | 1.292 |  | 0.489 |
| - (500) |  |  | 0.153 | 0.850 |  | 0.502 |
|  |  |  |  |  |  |  |
| Number of waveforms with response present **>80%** confidence in both systems |  |  |  |  |  |  |
| **- Total** | **107** | **55** | **81** | **203** |  | **112** |
| - (Click) | 29 | 10 | 16 | 57 |  | 28 |
| - (4k) | 29 | 23 | 25 | 48 |  | 31 |
| - (2k) | 15 | 12 | 16 | 40 |  | 21 |
| - (1k) | 23 | 9 | 18 | 30 |  | 20 |
| - (500) | 11 | 1 | 6 | 28 |  | 12 |
|  |  |  |  |  |  |  |
| **Average Latency Difference (ms)** |  |  |  |  |  |  |
| **- Total** | **-0.110** | **0.002** | **-0.052** | **-0.050** |  | **-0.053** |
| - (Click) | -0.110 | -0.030 | -0.019 | 0.009 |  | -0.038 |
| - (4k) | -0.031 | 0.017 | 0.004 | -0.013 |  | -0.006 |
| - (2k) | 0.093 | 0.008 | -0.062 | -0.080 |  | -0.010 |
| - (1k) | -0.235 | 0.000 | -0.211 | 0.183 |  | -0.066 |
| - (500) | -0.336 | -0.100 | 0.133 | -0.443 |  | -0.186 |
|  |  |  |  |  |  |  |
| **Std Deviation of latency difference (ms)** |  |  |  |  |  |  |
| - Total | 0.409 | 0.157 | 0.341 | 0.673 |  | 0.395 |
| - (Click) | 0.331 | 0.211 | 0.286 | 0.480 |  | 0.327 |
| - (4k) | 0.280 | 0.134 | 0.165 | 0.276 |  | 0.214 |
| - (2k) | 0.625 | 0.156 | 0.196 | 0.322 |  | 0.325 |
| - (1k) | 0.430 | 0.173 | 0.283 | 1.269 |  | 0.539 |
| - (500) | 0.344 |  | 0.973 | 0.820 |  | 0.712 |