Applying Expert Criteria for Automated Detection of Polysomnographic Patterns: Rapid Eye Movements in Children

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1. MOTIVATION

Development of an automatic Rapid Eye Movements (REMs) detection system based on modeling expert criteria. Advantages:

• Reduce time consuming-effort by the experts
• Reduce variability in the sleep analysis

2. SUBJECTS AND RECORDINGS

Database of 30 all-night polysomnographic recordings of healthy 10-years old children

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Total Records</th>
<th>Duration</th>
<th>Total REMs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>20</td>
<td>166 hours</td>
<td>15540</td>
</tr>
<tr>
<td>Test</td>
<td>10</td>
<td>74 hours</td>
<td>8091</td>
</tr>
</tbody>
</table>

3. METHODOLOGY

II. Highest REMs Detection (REMs35)

In the previous defined zones we search for strong REMs, defined as with an amplitude of at least 35µV (REMs35).

3.3. REMs15-Zone Definition

REMs15 zones defined for each REMs35.

3.4. REMs15 Detection

In the previous defined zones we search for REMs with an amplitude of at least 15µV (REMs15), with more stringent criteria at the zones limits.

4. RESULTS

We have developed a powerful tool to identify REMs that:

• allows to discern REMs from noise and artifacts
• identifies zones which are compatible with REMs presence
• applies different criteria extracted from expert knowledge
• allows to standardize criteria among evaluators
• reduces processing time in sleep analysis

<table>
<thead>
<tr>
<th>Data Set</th>
<th>REMs Events</th>
<th>Expert System Agreement (TP)</th>
<th>Marked but not detected (FP)</th>
<th>Detected but not marked (FN)</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
</table>
| Test     | 8091        | 7871                         | 7306                        | 785                        | 1475           | 90.3           | 83.2
| Training | 15540       | 16452                        | 14001                       | 1539                       | 2451           | 90.1           | 85.1

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