A Polysomnogram Mystery: Sleep Sleuths
Student Activity Page 3F

Activity Introduction:
As an expert in polysomnogram analysis, your job is to help the local Sleep Center. The details of their problem follow.

The Sleep Center of a local hospital has a major problem on their hands. The clerk who was filing polysomnogram records dropped the whole stack and all of the records were jumbled. Fortunately, they have originals in their file by patient name. Your job is to match the polysomnograms. Because of patient confidentiality, all of the known polysomnograms are identified by number only. The dropped, unknown polysomnograms have letters as their labels.

Activity Background:
In labs across the world, mysteries are solved by comparing “known” samples to “unknown” samples to make a positive identification. For example, scientists can take DNA they know to have come from a certain person (the known sample) and compare it to samples taken at a crime scene with unknown sources (these samples are the unknown samples). A match made during these comparisons may provide an important piece of information about the identity of the criminal. This process can be used in many other situations as well. In this activity, prepare to apply your sleuthing skills and your knowledge of polysomnograms to solve the sleep mystery.

Activity Materials: For each group of 2 - 4 students:
- Visual Polysomnogram Page from Activity 3E, Poly Want a Somnogram?
- Plate 1 Known Polysomnograms (provided in Students Activity Pages)
- Plate 2 Unknown Polysomnograms (provided in Students Activity Pages)
- Student Answer Sheet (for every student)
- Scissors (for every student)

Activity Instructions: Read each step and check off each step as it is completed.

☐ 1. Carefully observe the different lines on the polysomnogram and compare them to the lines in your Visual Polysomnogram to see what body process is being measured in each line.

☐ 2. Cut the polysomnograms along dotted lines (Plate 1 and Plate 2) into individual polysomnograms to make matching easier. Divide the task equally among all group members.

☐ 3. Observe the lines of each polysomnogram to begin matching the Known Polysomnograms (I through XII) with the Unknown Polysomnograms (A through L).

☐ 4. Write the letter of the Unknown Polysomnogram in the space next to its matching Known Polysomnogram in the table on your Student Answer Page.
5. In the last column of this table, be sure to explain what part of the polysomnogram most helped you make the match.

6. You may refer to *Table 1, Polysomnogram Information* below in addition to your *Visual Polysomnogram* from the previous activity to help you describe the parts of these polysomnograms.

### Table 1 Polysomnogram Information

<table>
<thead>
<tr>
<th>#</th>
<th>What this part of the Polysomnogram Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Left eye movements (EOG electrode)</td>
</tr>
<tr>
<td>2</td>
<td>Right eye movements (EOG electrode)</td>
</tr>
<tr>
<td>3</td>
<td>Jaw movements &amp; teeth grinding (Chin strap)</td>
</tr>
<tr>
<td>4</td>
<td>Brain wave activity (EEG electrodes)</td>
</tr>
<tr>
<td>5</td>
<td>Brain wave activity (EEG electrodes)</td>
</tr>
<tr>
<td>6</td>
<td>Brain wave activity (EEG electrodes)</td>
</tr>
<tr>
<td>7</td>
<td>Brain wave activity (EEG electrodes)</td>
</tr>
<tr>
<td>8</td>
<td>Left leg movement (EMG electrode)</td>
</tr>
<tr>
<td>9</td>
<td>Right leg movement (EMG electrode)</td>
</tr>
<tr>
<td>10</td>
<td>Heart rhythm (EKG electrodes)</td>
</tr>
<tr>
<td>11</td>
<td>Heart rhythm (EKG electrodes)</td>
</tr>
<tr>
<td>12</td>
<td>Snoring/Talking (Sound monitoring)</td>
</tr>
<tr>
<td>* 13</td>
<td>Breathing (Oral Air Flow)</td>
</tr>
<tr>
<td>* 14</td>
<td>Breathing - Chest expansion and contraction (Thoracic Belt)</td>
</tr>
<tr>
<td>15</td>
<td>Breathing - Stomach cavity expansion and contraction (Abdominal Belt)</td>
</tr>
<tr>
<td>16</td>
<td>Backup belt (sometimes one and sometimes two are used)</td>
</tr>
<tr>
<td>17</td>
<td>Oxygen saturation of blood (Pulse Oximeter)</td>
</tr>
</tbody>
</table>

* Measured using CPAP (Continuous Positive Airway Pressure) device for people with sleep apnea
Plate 1
“Known” Polysomnogram

I
Drowsy and approaching Stage 1 Sleep

II
Stage 1 Sleep

III
Stage 3 Sleep

IV
Stage 4 Sleep
Plate 1 continued
“Known” Polysomnogram

V
REM Sleep

VI
Spindle pattern in Stage 2 Sleep

VII
K-complex wave patterns in Stage 2 Sleep

VIII
Sawtooth patterns in REM Sleep
Plate 1 continued
“Known” Polysomnogram

IX
Snoring

X
Leg Motion

XI
Awakening

XII
Possible Sleep Apnea
Plate 2 continued
“Unknown” Polysomnogram
A Polysomnogram Mystery: Sleep Sleuths

Students Answer Page 3F

Write the letter of the unknown in the column titled *Matching Unknown Polysomnograms* in the space matching the number of the *Known Polysomnogram*. In the last column, be sure to explain which part or parts of the polysomnogram most helped you make the match.

### Matches of Known Polysomnograms to Unknown Polysomnograms

<table>
<thead>
<tr>
<th>“Known” Polysomnogram</th>
<th>Matching “Unknown” Polysomnogram</th>
<th>Parts of the Polysomnogram that helped make the match</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
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<td>IV</td>
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<tr>
<td>VIII</td>
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<td>XI</td>
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<tr>
<td>XII</td>
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</tbody>
</table>
Check your understanding:

Before completing the following questions, arrange the polysomnograms in order from I – XII.

1. Specifically, what changes do you see in the polysomnogram patterns as patients go from being drowsy to entering stage 1 sleep?
   
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

2. What changes do you see as patients go from stage 1 sleep to stage 4 sleep?
   
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

3. What do the shapes of the waves in Polysomnogram XI tell you about the energy needed to produce the waves?
   
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

   Why would this be consistent with a person who is waking up?
   
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

4. In which part of the polysomnograms do you find spindle patterns, k-complexes and sawtooth patterns?
   
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

5. Give a possible explanation for what the k-complex might mean, considering the part of the polysomnogram in which it is found.
   
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

6. In what other types of situations might you use a matching of known and unknown samples of information like you did in this activity?
   
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

7. Look at the polysomnograms and list the body systems that are working together as you sleep.
   
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________