Nocturnal Scratch:
Ontology & Terminology

NOCTURNAL SCRATCH

Digital Measures Development

A project by the
www.dimesociety.org/tours-of-duty/digital-measures-nocturnal-scratch
Ontology of "Scratch"

**Class**

- **Scratch**
  - An action/behavior; of rhythmic and repetitive skin contact movement
  - As distinct from **itch**: Unpleasant cutaneous sensation that may provoke a desire to scratch

**Concepts**

- **Scratching episode, scratching bout**
  - A short period of scratching with defined minimum duration and minimum pause interval between bouts

- **Scratch area**
  - Region of skin being directly scratched, including adjacent skin of the scratch area

**Properties**

- Total scratch duration
- Start/end
- Minimum duration
- Minimum interval between bouts
- Scratching tool
- Intensity
- # of single scratch events
- Frequency of single scratch events
- Movement type
- Articulation
- Scratch area
- Scratch area eczema
- Scratch measurement modality
- Surveys
- Other metadata

**Values (or nested properties)**

- Time (hours, minutes, seconds), % of total measured time, # of bouts; average bout duration, average interval between bouts
- Initiation timestamp/termination timestamp*
  - Seconds
- Finger, palm, dorsum, elbow, knee, foot, other body part, non-body part
- Mild, moderate, severe*
- Int (# of single scratch events in the scratching bout)
  - Hz
- Rubbing, tapping, touching, pressing, etc.
- Fingers, wrist, elbow, arm, etc.
- Head, Face, & Neck (HFN)
- Right Upper Extremity (RUE)
- Left Upper Extremity (LUE)
- Torso–including Back (TB)
  - Right Lower Extremity (RLE)
  - Left Lower Extremity (LLE)
- Y/N

**Metadata**

- Accelerometry, videography, acoustic sensors, etc.
- Device model, evaluation method/algorithim, device placement

*Suggestion according to the literature
Measurement of Scratch

Defining the scratching bout
- Consistent with the literature, for each scratching episode (scratching bout), the following must be defined:
  - Minimum bout duration (e.g. 1s, 3s, 5s)
  - Minimum interval between bouts (e.g. >3s)
- Scratching bouts with intervals between that last less than the minimum interval between bouts are considered to be a single bout
- The initiation and termination timestamp (or frame) delimiting the scratching bout is required to be defined and determined by a suitable measurement modality (accelerometry, videography, acoustic sensors, etc.)

Total scratch duration is the main outcome measure of scratch, and is calculated as the sum of all scratch bouts during the measured period.

Defining other scratching properties
- If using intensity property, each intensity label and differences between labels should be defined
- Scratch measurement modality needs to be defined in the metadata

“Scratch intensity could be its own outcome measure, but in the ontology it makes sense to be a property of the scratching episode.”

-Nocturnal Scratch Project Team
Table 2. Outcome measures & properties for measurement of scratch

<table>
<thead>
<tr>
<th>Nocturnal scratch outcome measures</th>
<th>Property</th>
<th>Use of property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total scratch duration</td>
<td>(sum of all scratching bouts)</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td># of bouts</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td>Average bout duration</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td>Average interval between bouts</td>
<td>Optional</td>
</tr>
<tr>
<td>Scratching episode, scratching bout</td>
<td>Start/end</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>Minimum duration</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>Minimum interval between bouts</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>Scratching tool</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td>Intensity</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td># of single scratch events</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td>Frequency of single scratch events</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td>Movement type</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td>Articulation</td>
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<tr>
<td>Scratch area</td>
<td>Scratch area</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td>Scratch area eczema</td>
<td>Optional</td>
</tr>
<tr>
<td>Metadata</td>
<td>Scratch measurement modality</td>
<td>Required</td>
</tr>
<tr>
<td></td>
<td>(Device model, sensor &amp; evaluation method/algorithm as optional sub-properties)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Surveys</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td>Other metadata</td>
<td>Optional</td>
</tr>
</tbody>
</table>

Measuring scratch is meaningful both as a COA (how patients feel & function), but also as a disease biomarker of the disease itself. One measure can thus contain two aspects.”

“Nocturnal Scratch Project Team

Some aspects may be different depending on the COU: disease biomarker vs. clinical outcome assessment. For example, scratching intensity may be more relevant as a disease biomarker measuring response to therapy, while total scratch time may be more patient-relevant as a clinical outcome measure.”

“Nocturnal Scratch Project Team
**Summary**: Definition & outcome measures of nocturnal scratch

**Definition of nocturnal scratch**

*Scratching* is an action/behavior, of rhythmic and repetitive skin contact movement.

Performed during a delimited time period of **intended and actual sleep**; not restricted to any specific time of the day or night.

**Outcome measures of nocturnal scratch**

**Total scratch time** (sum of all scratch bouts) measured during a delimited measured period of intended and actual sleep within the **total sleep opportunity**

Total scratch time can be also represented as a percentage of the measured total sleep opportunity period.
Acknowledgements

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- Will Wang, Biomedical Engineering
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Additional Relevant Resources

Publication of the literature review will be available here

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