An Apparatus for the Detailed Analysis of Short-Term Taste Tests in Rats

LAURA S. WILSON, JAMES C. SMITH, ROSS HENDERSON, JEFFREY SHAUGHNESSY, MOHSEN S. NEJAD, AND LLOYD M. BEIDLER

Department of Psychology
The Florida State University
Tallahassee, Florida 32306

A moment-by-moment analyses of feeding and drinking patterns in rats over 24-hour periods yield valuable information pertaining to taste quality and concentration discrimination that is not available from mere analysis of amounts consumed. The aims of the research reported here was to determine if such a detailed analysis of lick patterns would be equally revealing for short-term tests, where postgestational licks were minimized.

An apparatus was developed to test rats in single-bottle taste tests for up to 45 min. Licks are measured by tongue contact on the metal sipper tube. The number of licks per 500-msec period and a 1.0-msec inter-lick interval (ILI) histogram are stored for a microcomputer. Analysis programs allow for plotting a strip-chart of lick patterns over time. Using a selected criterion, the number of licks can be determined, allowing for analyses of burst number, burst length, and interburst intervals. In addition, the ILI histogram is plotted and mean and standard deviation values are determined. To evaluate the usefulness of detailed analysis of short-term taste tests, examples involving different solution concentrations and quality differences were conducted.

Table 1. Mean Values for the Dependent Variables Indicated

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Water</th>
<th>0.25 M</th>
<th>0.5 M</th>
<th>1.0 M</th>
<th>F Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount consumed (ml)</td>
<td>4.3</td>
<td>10.9</td>
<td>9.3</td>
<td>11.6</td>
<td>3.35</td>
</tr>
<tr>
<td>Number of bursts</td>
<td>1396</td>
<td>1200</td>
<td>1070</td>
<td>1803</td>
<td>3.24*</td>
</tr>
<tr>
<td>Burst length (sec)</td>
<td>22.00</td>
<td>71.70</td>
<td>17.30</td>
<td>6.39*</td>
<td></td>
</tr>
<tr>
<td>Total drinking time</td>
<td>25.30</td>
<td>17.30</td>
<td>6.39*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Note: These are matched t-tests with five degrees of freedom.

** Significant beyond the 0.05 level.

*** Significant beyond the 0.01 level.

**EXAMPLE 1**

Six rats were tested on water and three concentrations of sucrose (0.25 molar, 0.50 molar, and 1.0 molar) with 10-minute single-bottle tests. In Table 1 it can be seen that although the amount consumed and total number of licks for the sugars are similar, they are consumed in different ways. For example, the concentration increases, the bursts simultaneously decrease in number and increase in length. The decrease in the ILI histogram standard deviation indicates that there is less variability and fewer pauses in the licking as the concentration increases.

**EXAMPLE 2**

A comparison was made of licking patterns on qualitatively different solutions. Single-bottle daily 30-minute tests with 0.2% sodium saccharin were followed by similar testing with 32% sucrose (see Table 2). Again the amounts of the solutions consumed are similar, while the detailed analysis shows significant differences in the drinking patterns. The saccharin was ingested in many short bursts throughout the session, compared to the few long sucrose bursts concentrated in the first half of the session.

**EXAMPLE 3**

An analysis was made of sucrose ingestion before and after bilateral sections were made of the greater superficial petrosal nerves. Following surgery, number of bursts decreased and the interburst interval increased. In all three examples, this type of...
detailed analysis of short-term licking patterns allowed inferences about taste qualities and intensities not available from intake levels alone. It will also be useful in making inferences about taste perceptions of the rat following various surgical manipulations.

REFERENCE