Using Eye Tracking to Evaluate Language Learning
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Introduction
• Traditional grammatical language intervention strategies for children with language impairment rely on implicit approaches in which children are expected to induce target forms through clinician models (Leonard et al., 2004).
• Evidence suggests an explicit approach (e.g., directly informing children of grammatical rules or patterns) may result in a language learning advantage (Finestack & Fey, 2009); however, little is known regarding the cognitive processes involved with each type of instruction.
• Researchers have been increasingly using eye-tracking measures to examine cognitive processes involved in language-learning tasks that use implicit or explicit instructional approaches.

Research Questions
In comparison to implicit instruction, when explicitly taught novel grammatical forms, do adults demonstrate:
1) Greater accuracy?
2) Greater pupil dilation?
3) Longer fixation?
4) More regressions between images?

Participants
• All participants passed hearing and vision screenings and a Cognitive Linguistic Quick Test (CLQT) assessing attention, memory, executive functions, language, and visual spatial skills.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Min - Max</th>
<th>Mean</th>
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<tbody>
<tr>
<td>Age (years)</td>
<td>18 - 40</td>
<td>23.1</td>
</tr>
<tr>
<td>Male : Female</td>
<td>20 : 20</td>
<td></td>
</tr>
<tr>
<td>White : Other</td>
<td>28 : 12</td>
<td></td>
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<tr>
<td>Native English : Other</td>
<td>37 : 3</td>
<td></td>
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<tr>
<td>Current College Student : Other</td>
<td>32 : 8</td>
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</tr>
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Method
• Participants completed two computer-based games, each of which targeted a different novel grammatical form.
• In each game, examiners prompted to try to learn to talk like a creature from outer space.
• Teaching completed using either explicit or implicit instruction.

Novel Grammatical Forms
Gender Rule: "When it is a boy, you have to add sh/f to the end. When it is a girl, you don’t add anything to the end."

Person Rule: "When the creature talks about herself or if you talk about yourself, you have to add sh/f to the end. When you or the creature talks about someone else, you don’t add anything to the end."

Eye Tracking Task
• To test learning, participants heard an audio recording of a sentence, viewed 2 images, and click the mouse to indicate the picture that best matched the recording.
• Eye tracking data was collected on 10 items that contained a marked form and 10 that contained an unmarked form.

Results
1) No significant difference in percent accuracy between explicit and implicit instruction (p = 0.87), but greater accuracy for person form with explicit instruction (p = 0.04).
2) No significant difference in pupil diameter between explicit and implicit instruction (p = 0.90).
3) No significant difference in fixation duration on target probes between implicit and explicit instruction (p = 0.94), but significantly longer fixation for person form with implicit instruction (p < 0.05).
4) No significant differences in number of regressions between implicit and explicit instruction (p = 0.96), but significantly more regression for gender form with explicit instruction (p = 0.02).

Conclusions
• Eye tracking measures were not sensitive to detecting learning differences between explicit and implicit instruction.
• Noteworthy trends were found in percent accuracy of probes, fixation duration on target images, and number of regressions.
• These results motivate further investigation into language learning trends that differ based on the type of grammatical form introduced and that include pediatric populations.