

# Using Eye-tracking to measure L2 vocabulary acquisition from reading

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## L2 Vocabulary learning from reading

- Small amount of new words learned  
(e.g. Brown, Waring, & Donkaewbua, 2008; Pitts, White, & Krashen, 1989; Waring & Takaki, 2003)
- Focus on assessing **form** and **meaning**
- **Multiple components** of vocabulary knowledge.
  - Day and Swan (1998): *spelling ability*.
  - Pigada and Schmitt (2006): *spelling, meaning and grammatical characteristics*.
  - Pellicer-Sánchez and Schmitt (2010): *spelling recognition, recall of grammatical class, meaning recall, and meaning recognition*.
  - Webb (2007): *orthography, association, syntax, grammatical functions, and form-meaning*.

# L2 Vocabulary learning from reading

- Small amount of new words learned
- Focus on assessing **form** and **meaning**
- **Multiple components** of vocabulary knowledge.
- Frequency of exposure/N of repetitions
  - Saragi, Nation, and Meister (1978): 10 repetitions
  - Later studies (e.g. Pigada & Schmitt, 2006; Pellicer-Sánchez & Schmitt, 2010; Webb, 2007): 8-10 repetitions

# Aims of the study

- What happens when L2 learners encounter new words while reading? How are new words read?
- To examine multiple lexical components:
  - **Off-line measures**: form and meaning (declarative knowledge)
  - **On-line measures**: fluency of reading (procedural knowledge)
- Role of frequency of repetition: How many times do L2 learners need to read a new word before showing a more fluent and automatic reading?

# Methodology

## - Participants:

- 15 non-natives speakers of English
- 7 males, 8 females
- Ages: from 21 to 32 years old (M= 25.5)
- Variety of L1s: Portuguese, Spanish, Greek, Chinese, Hindi, Lithuania, Polish, Romanian.
- PG students
- Self-rated reading abilities  $\geq 8$  (10-point scale)

# Methodology

## - Structure:

Reading Activity + post-reading assessment

## - Materials:

- **Reading text:**

- Short story
- 2,298 words
- High-frequency vocabulary (3k from the BNC)

# Methodology

- Target vocabulary:

| <b>Nonword</b>   | <b>Meaning/ Word replaced</b> | <b>N Repetitions</b> |
|------------------|-------------------------------|----------------------|
| <b>1. holter</b> | house (1k); shelter (3k)      | 8                    |
| <b>2. berrow</b> | bowl (2k)                     | 8                    |
| <b>3. bancel</b> | criminal/ prisoner (2k)       | 8                    |
| <b>4. cambul</b> | ring (1k)                     | 8                    |
| <b>5. twoser</b> | noise (2k)                    | 8                    |
| <b>6. soters</b> | clothes (1k)                  | 8                    |

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# Methodology

- Control vocabulary:

| <b>Control word</b> | <b>Frequency (BNC)</b> | <b>N Repetitions</b> |
|---------------------|------------------------|----------------------|
| <b>1. garden</b>    | 1k                     | 8                    |
| <b>2. master</b>    | 1k                     | 8                    |
| <b>3. mother</b>    | 1k                     | 8                    |
| <b>4. dinner</b>    | 1k                     | 8                    |
| <b>5. worker</b>    | 1k                     | 8                    |
| <b>6. secret</b>    | 1k                     | 8                    |

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| <b>1. garden</b> | 1k              | 8             |
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| <b>3. mother</b> | 1k              | 8             |
| <b>4. dinner</b> | 1k              | 8             |
| <b>5. worker</b> | 1k              | 8             |
| <b>6. secret</b> | 1k              | 8             |

# Apparatus and Procedure

- **Instruments:**

- Eye tracker: Eyelink I
- Calibration (at the beginning and half way through the experiment)
- Practice session
- Experimental session (25 screens)
- Comprehension Questions
- Post-tests
- Less than 1 hour



This is the story of Hugo. His life started in a very small village in the south of Spain. It was a very small and poor village. There were only a few buildings in the village and one of them was a holter for poor kids who had no money and nowhere to live. It was run by a very angry master and an old woman. They took in little kids with the idea that each of them would be a free worker for years. This was not a secret in the community. Everybody knew about it.

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# Instruments- Off-line measures

## Part 1- Form recognition test:

Example:

|              |           |            |           |                       |                  |                |                     |
|--------------|-----------|------------|-----------|-----------------------|------------------|----------------|---------------------|
| a) ackol     | b) acklon | c) hacklon | d) hackol | 1                     | 2                | 3              | 4                   |
|              |           |            |           | <i>Very uncertain</i> | <i>Uncertain</i> | <i>Certain</i> | <i>Very certain</i> |
| <hr/>        |           |            |           |                       |                  |                |                     |
| 1. a) hotler | b) holter | c) houter  | d) houler | 1                     | 2                | 3              | 4                   |
| 2. a) twoser | b) twonse | c) twiser  | d) twines | 1                     | 2                | 3              | 4                   |
| ...          |           |            |           |                       |                  |                |                     |

# Instruments- Off-line measures

**Part 2**-Meaning Recall test: Interviews

**Part 3**-Meaning Recognition test:

1) holter

- a) basement
- b) workhouse
- c) prison
- d) food hall
- e) I don't know.

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

2) cambul

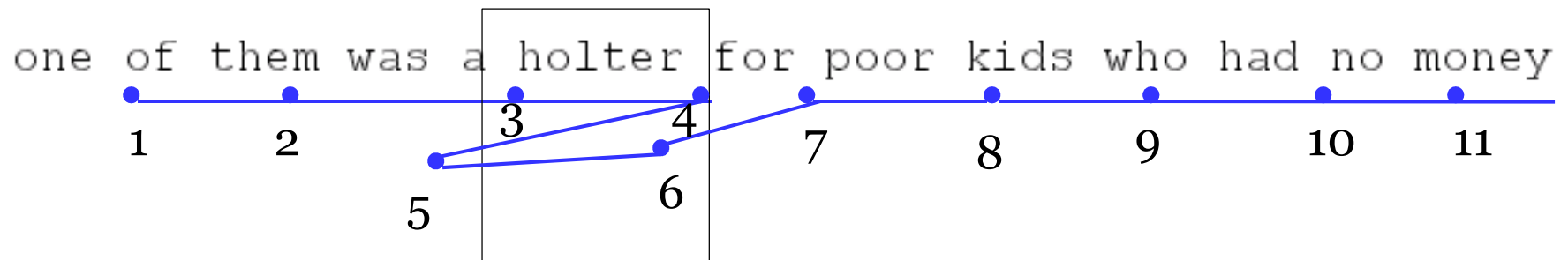
- a) picture
- b) plate
- c) window
- d) ring
- e) I don't know

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
|---|---|---|---|

**Part 4**-Reading strategies Interviews

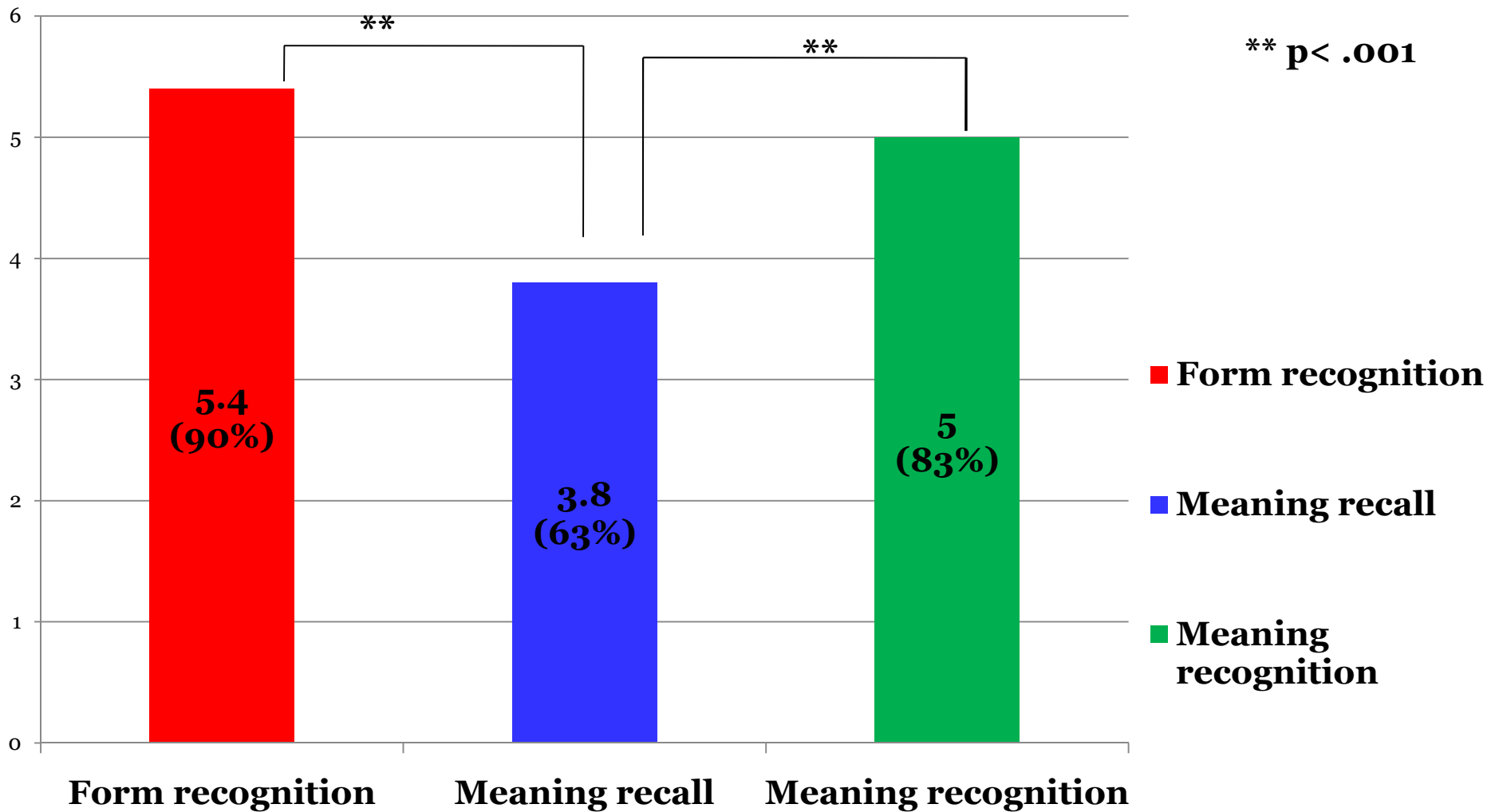
# Instruments- On-line measures

- 1) **First fixation duration = 3**
- 2) **First pass reading time = 3 + 4**
- 3) **Fixation count = 3 fixations**
- 4) **Total reading time = 3+4+6**

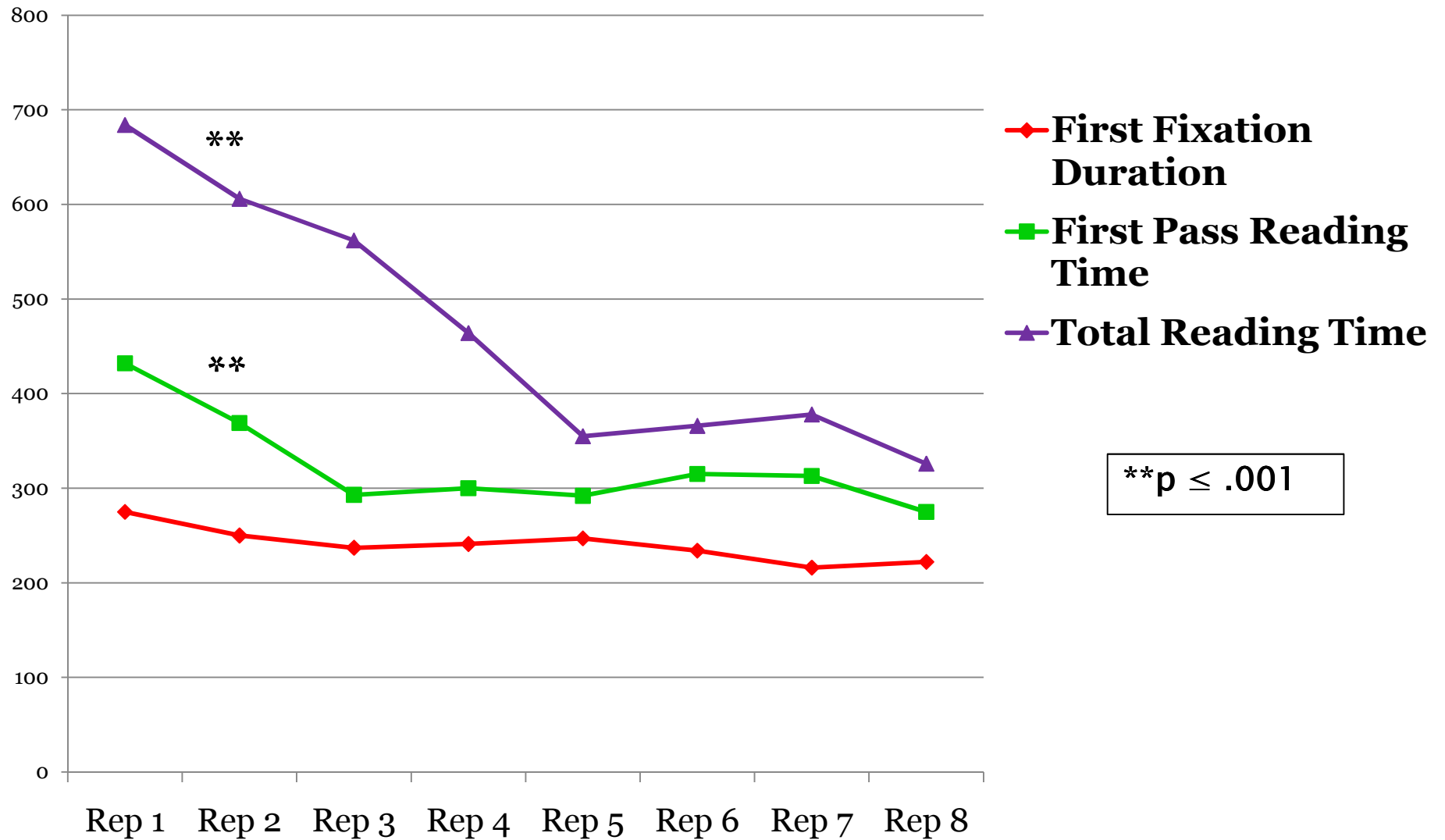




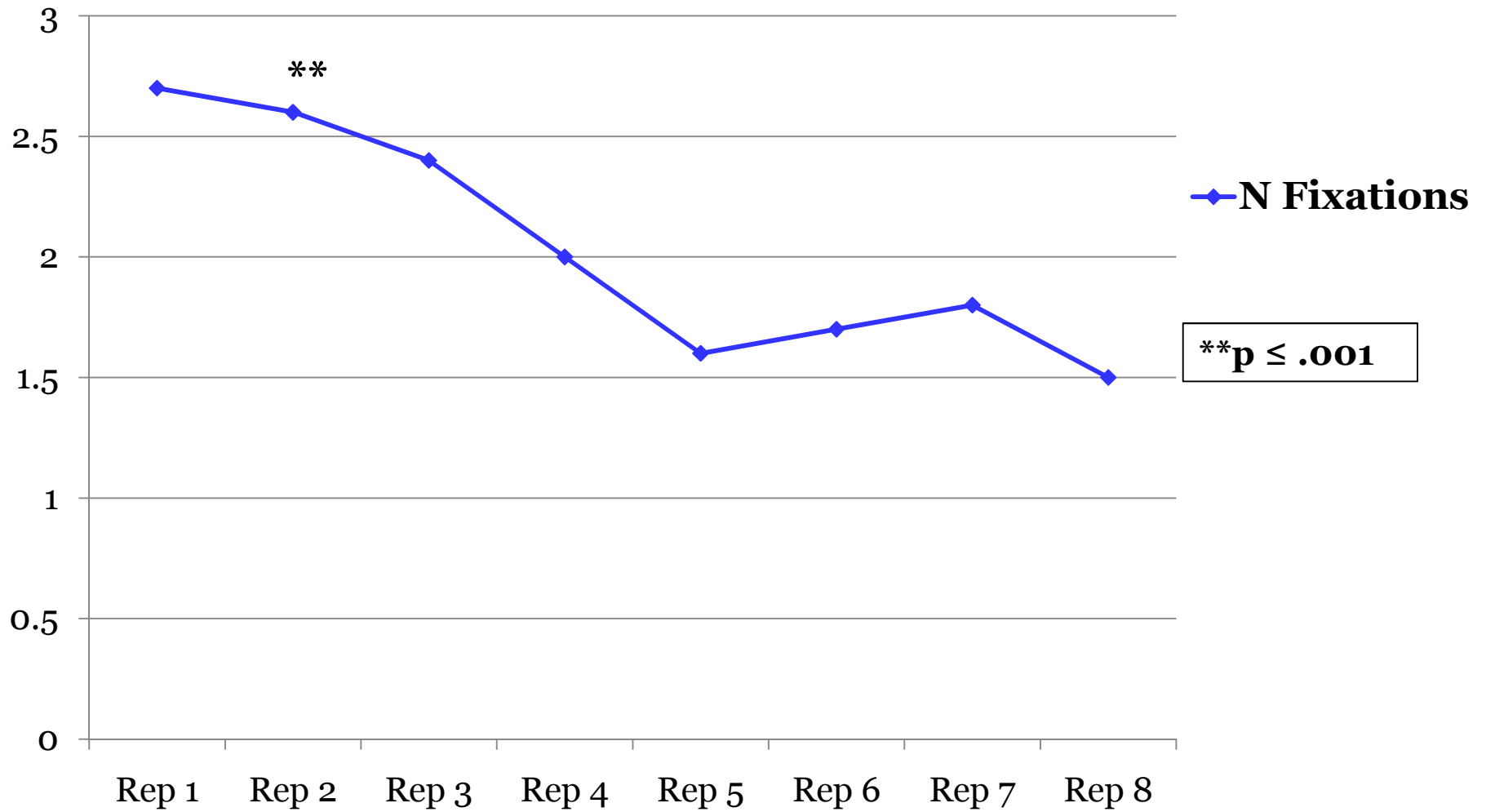
# Results- Declarative knowledge



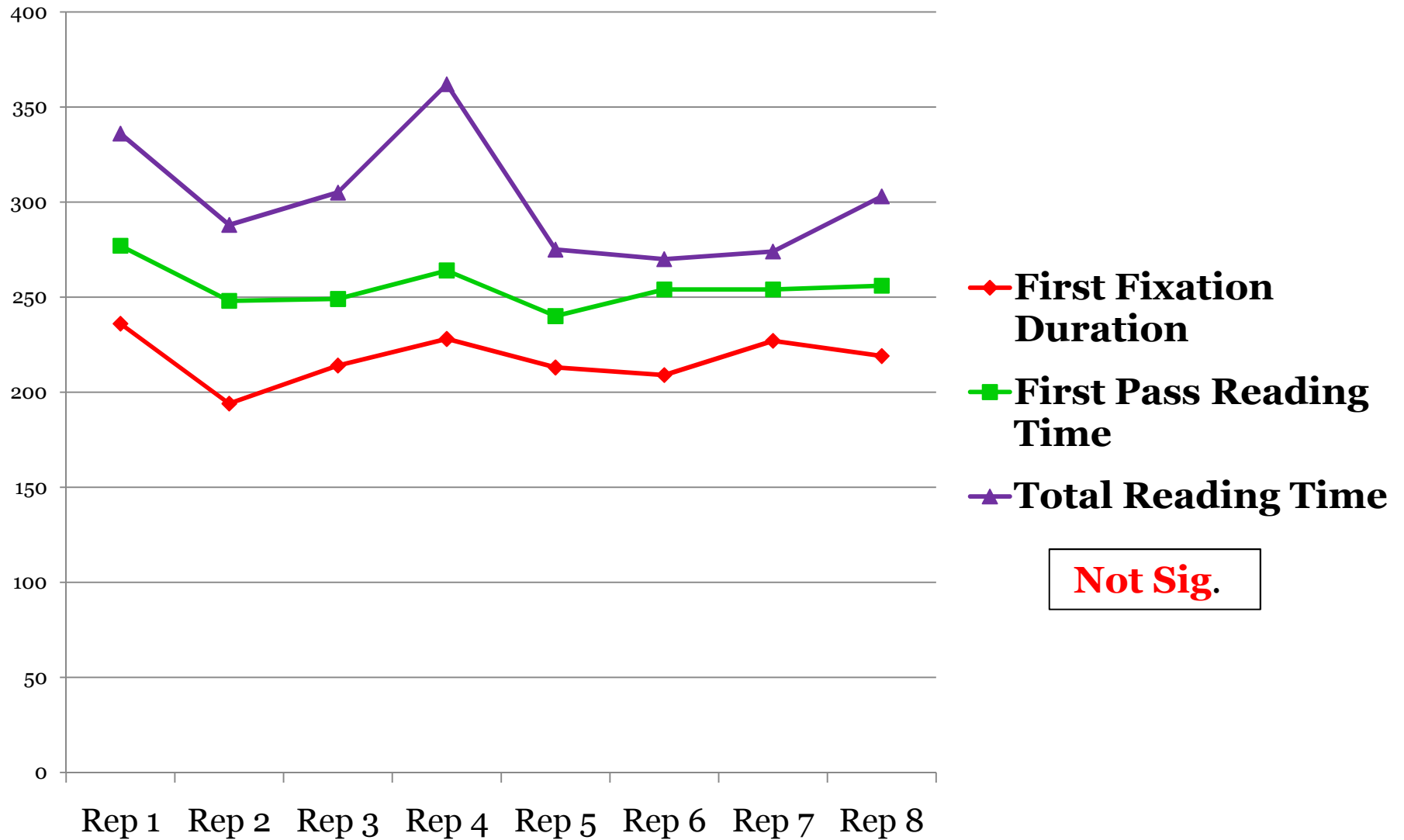
# Results- Procedural knowledge



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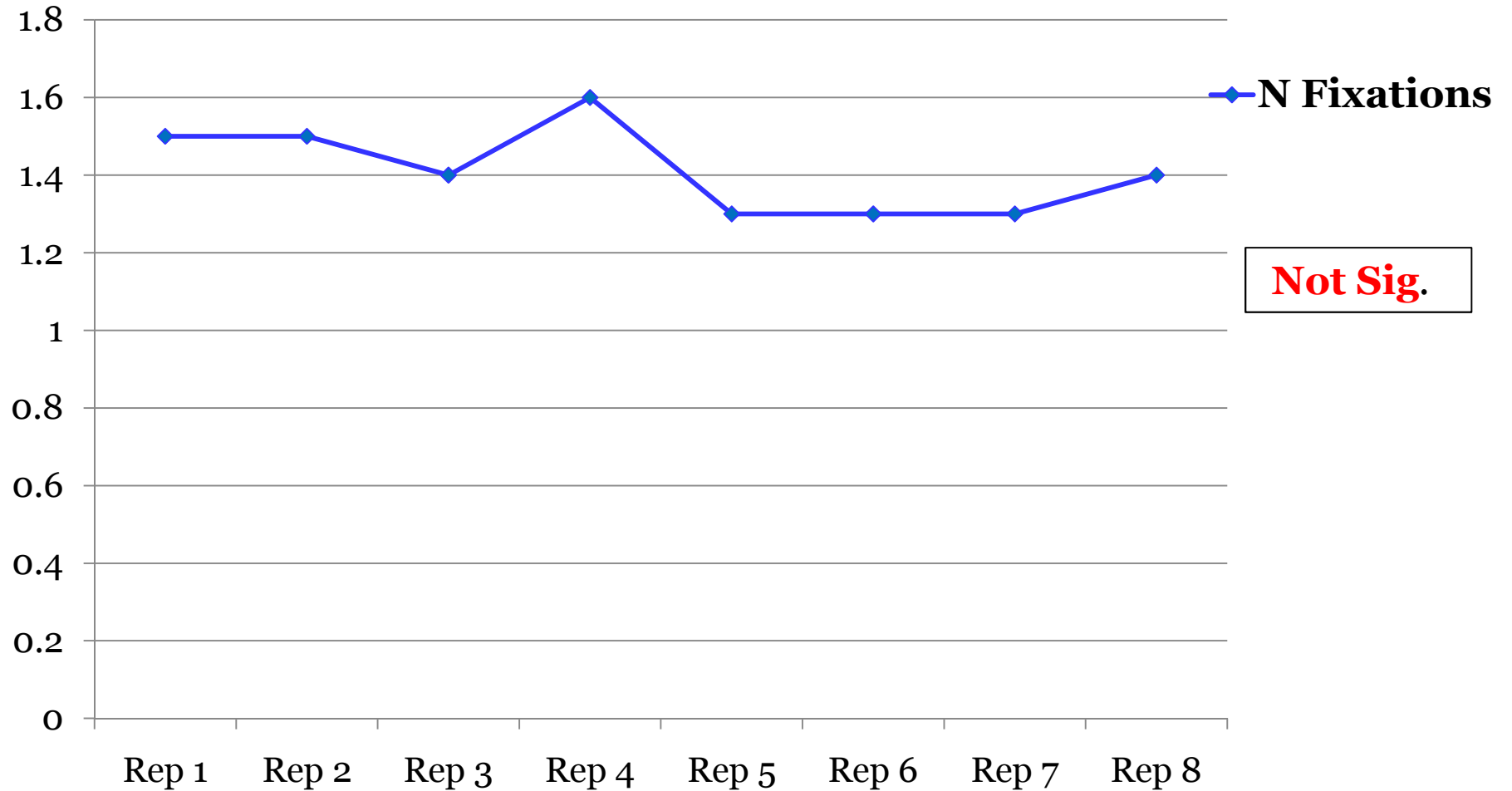


# Results- Procedural knowledge



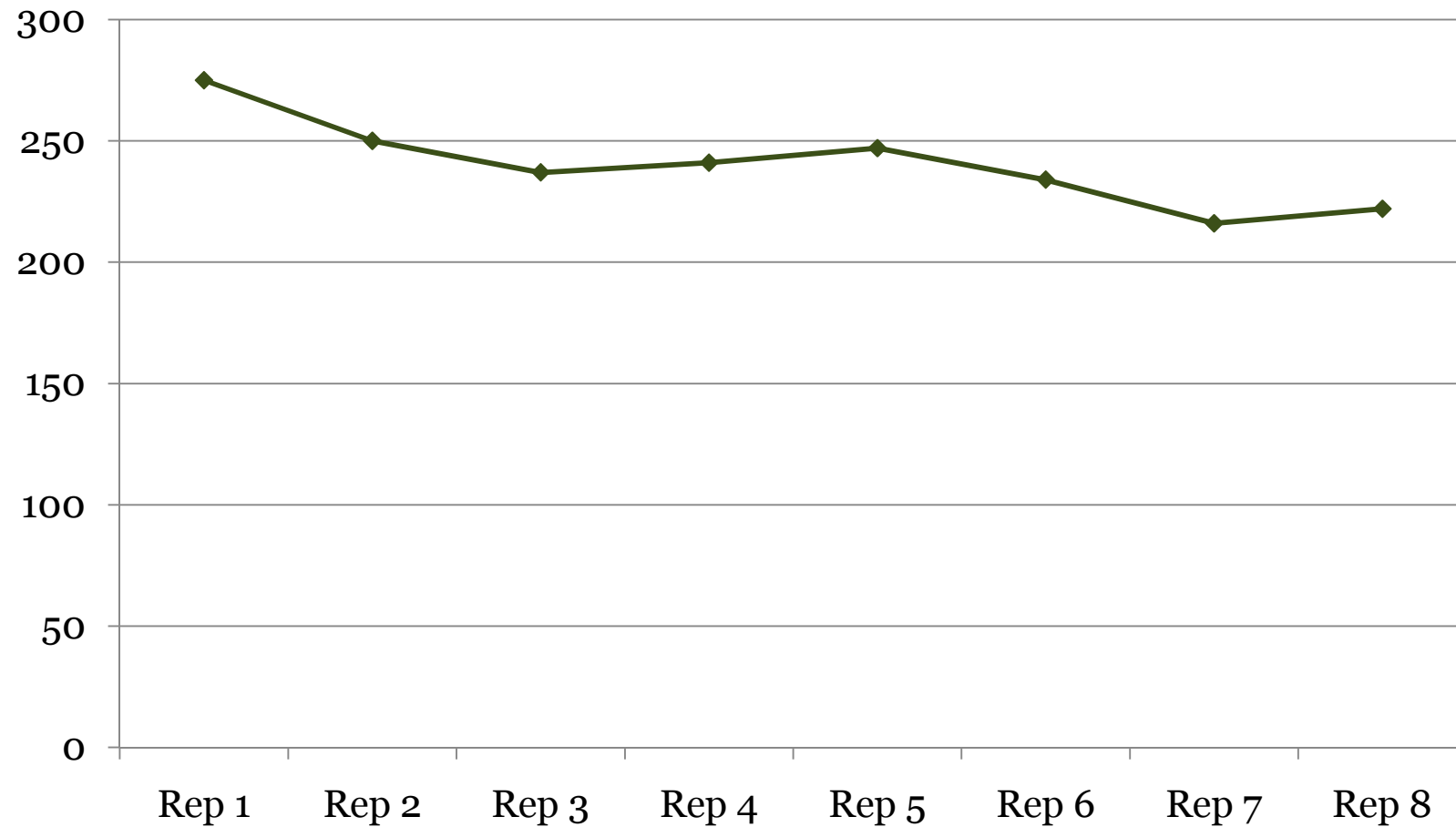
# Results- Procedural knowledge

**N Fixations**



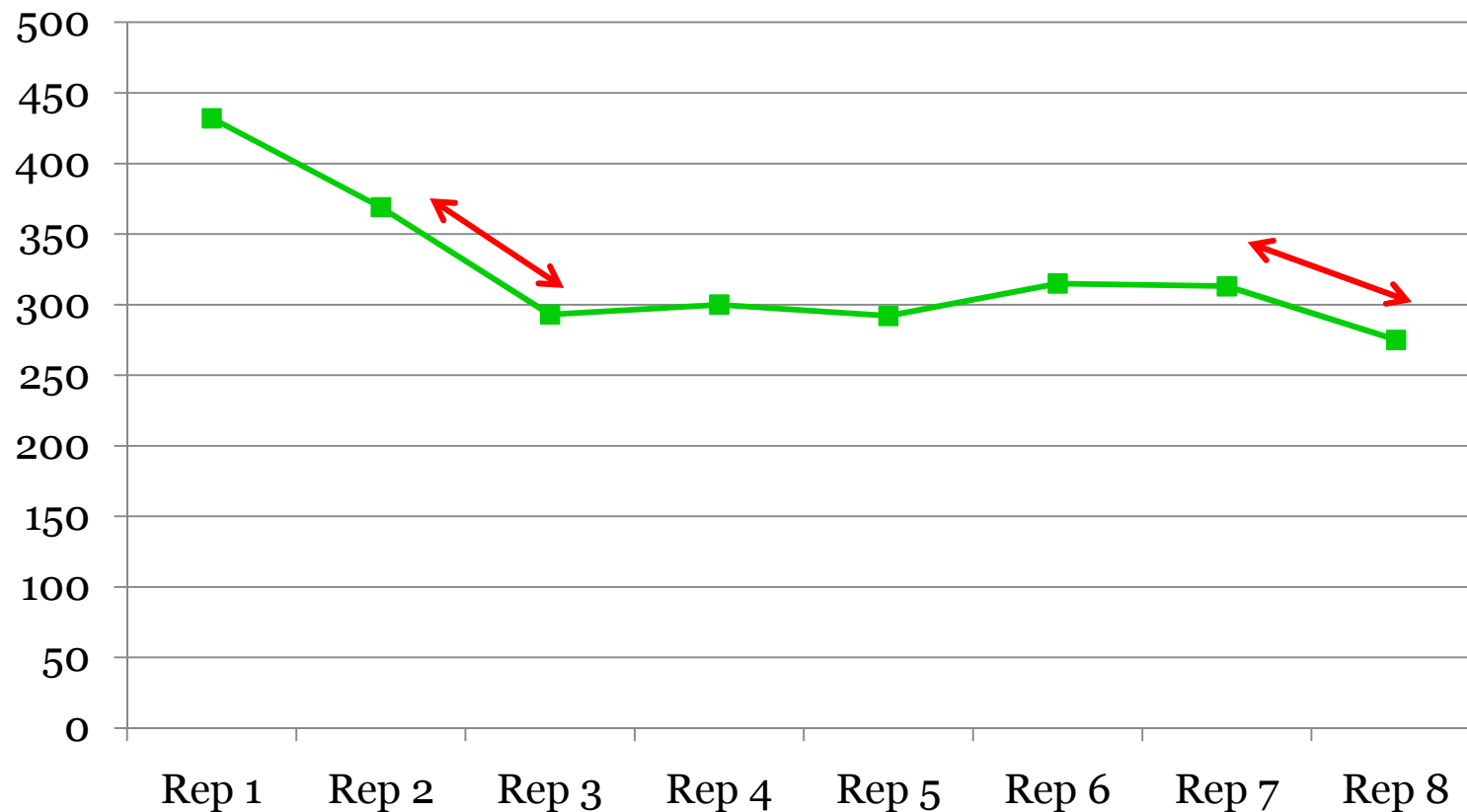
# Results- Procedural knowledge

**First Fixation Duration: Not sig.**



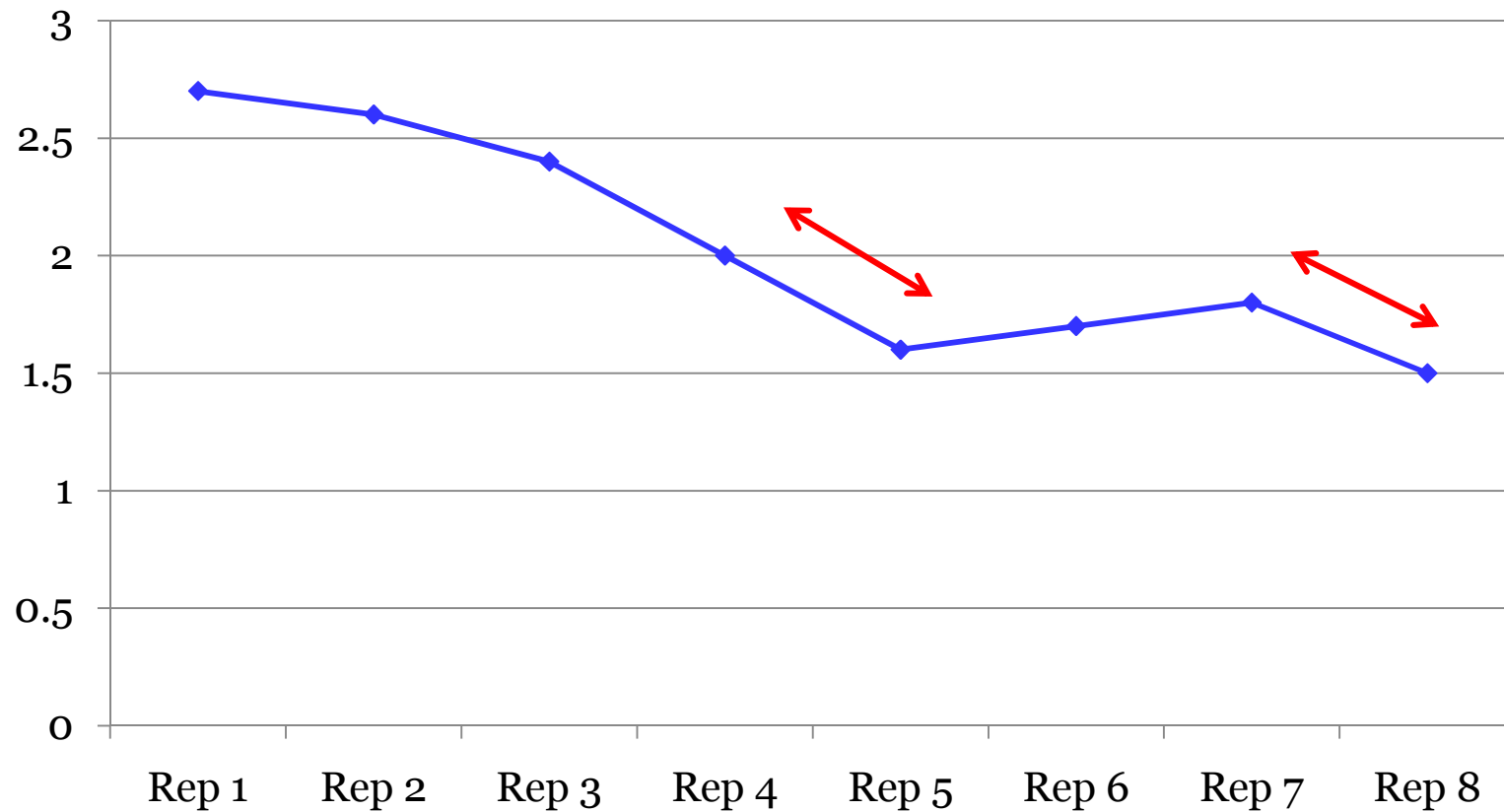
# Results- Procedural knowledge

First Pass Reading Time:  $1 = 2 > 3 = 4 = 5 = 6 = 7 > 8$



# Results- Procedural knowledge

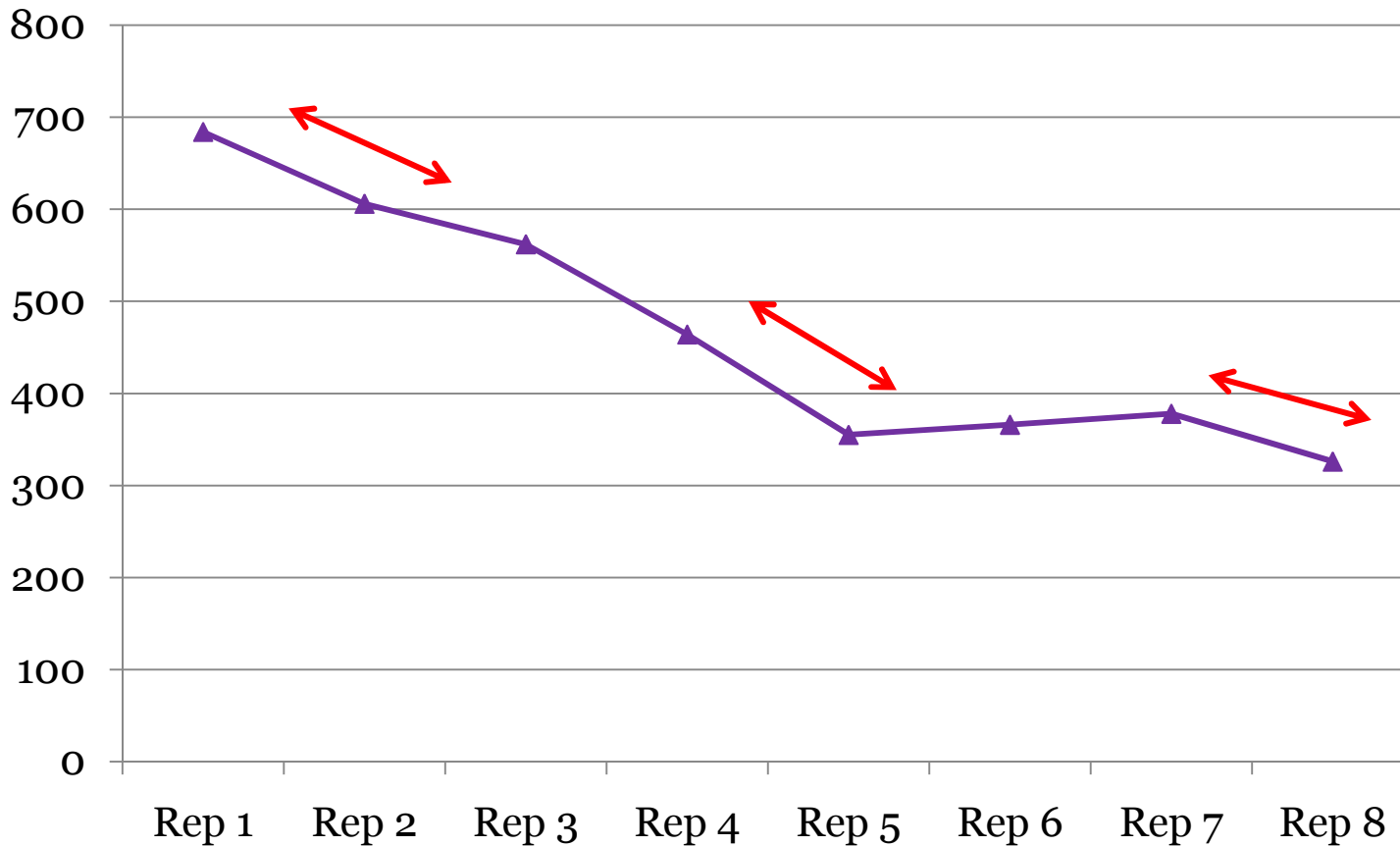
**N of Fixations: 1 = 2 = 3 = 4 > 5 = 6 = 7 > 8**





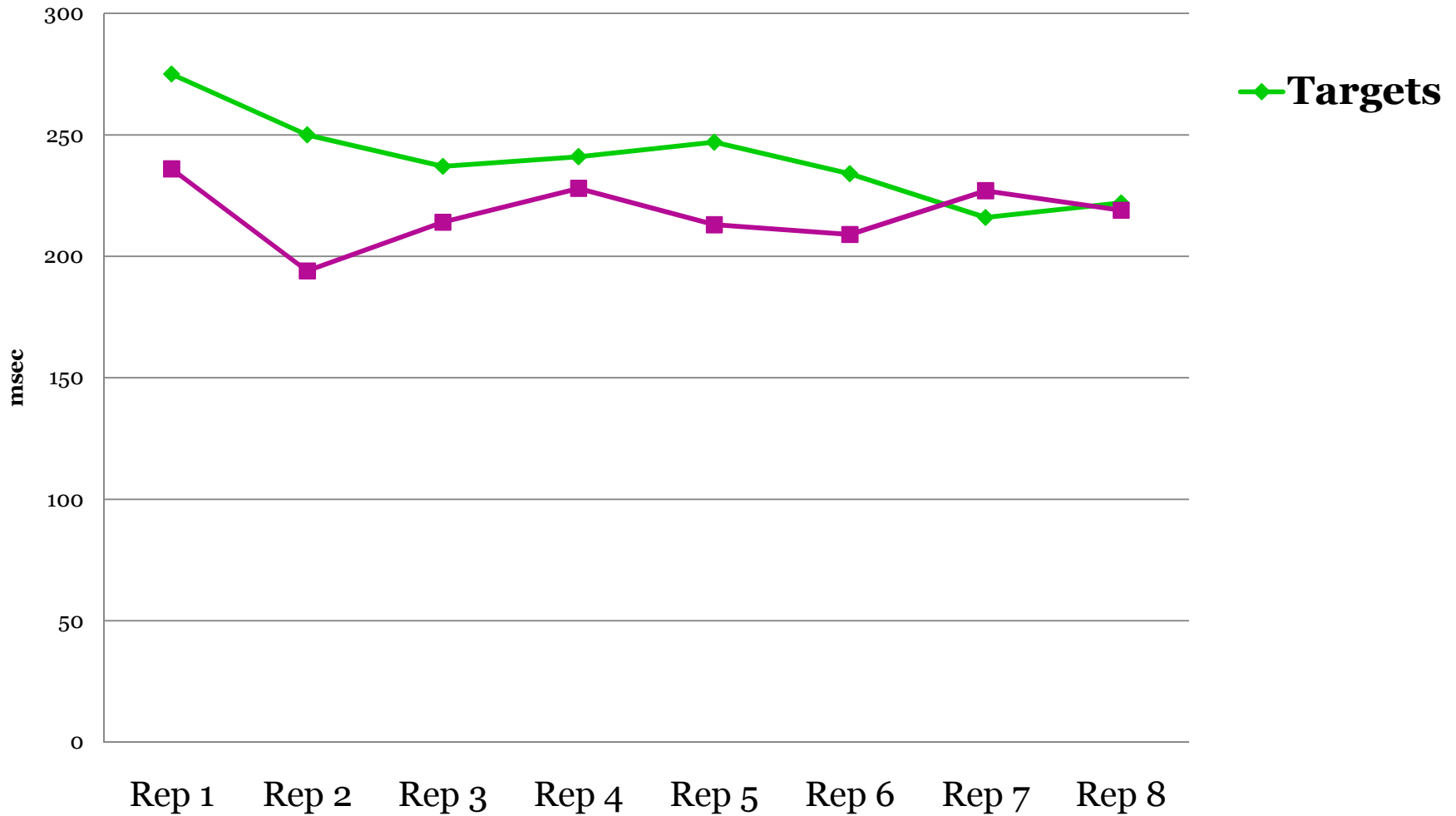
# Results- Procedural knowledge

**Total Reading Time: 1 > 2 = 3 = 4 > 5 = 6 = 7 > 8**



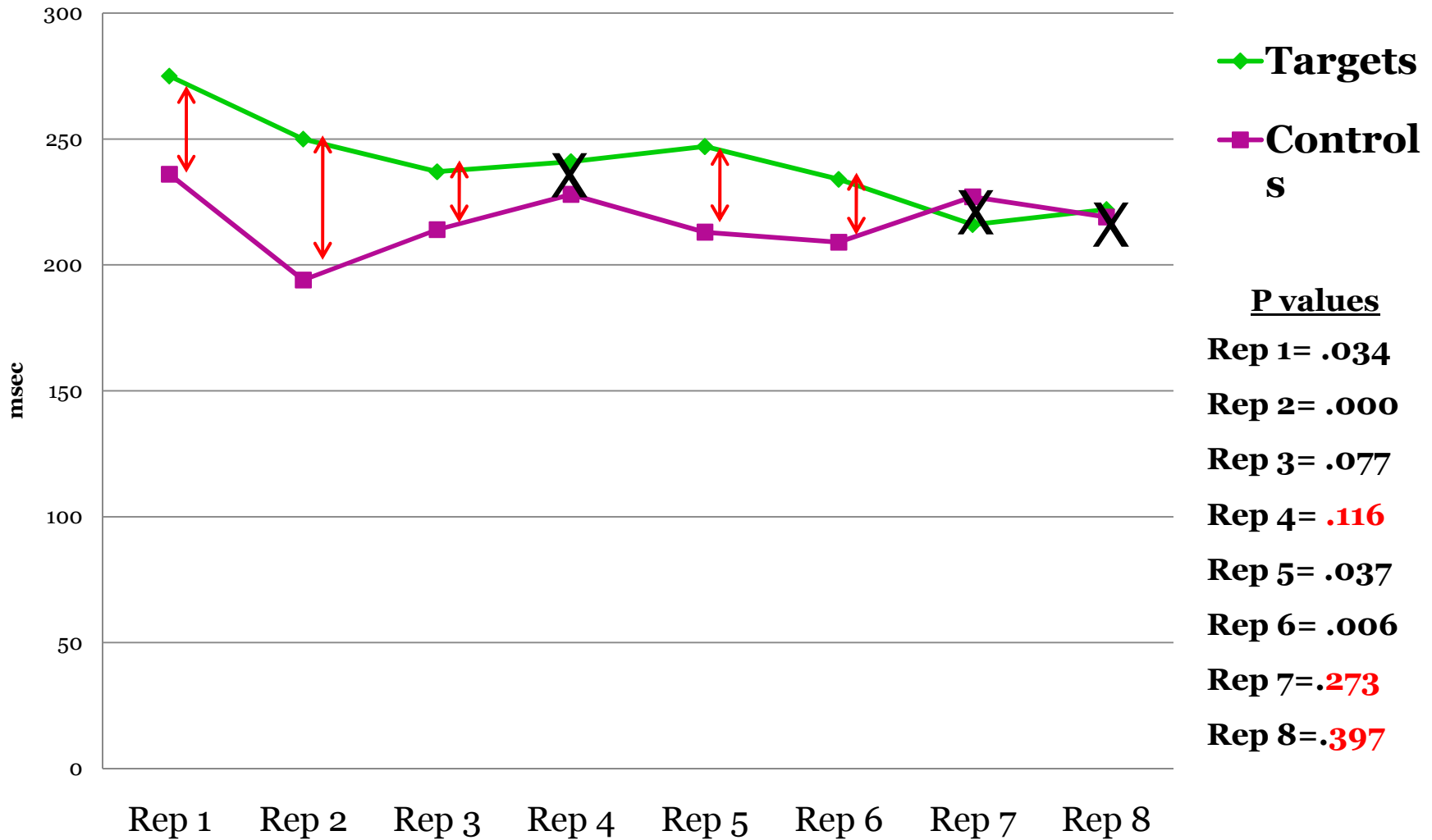
# Results- Procedural knowledge

## First Fixation Duration



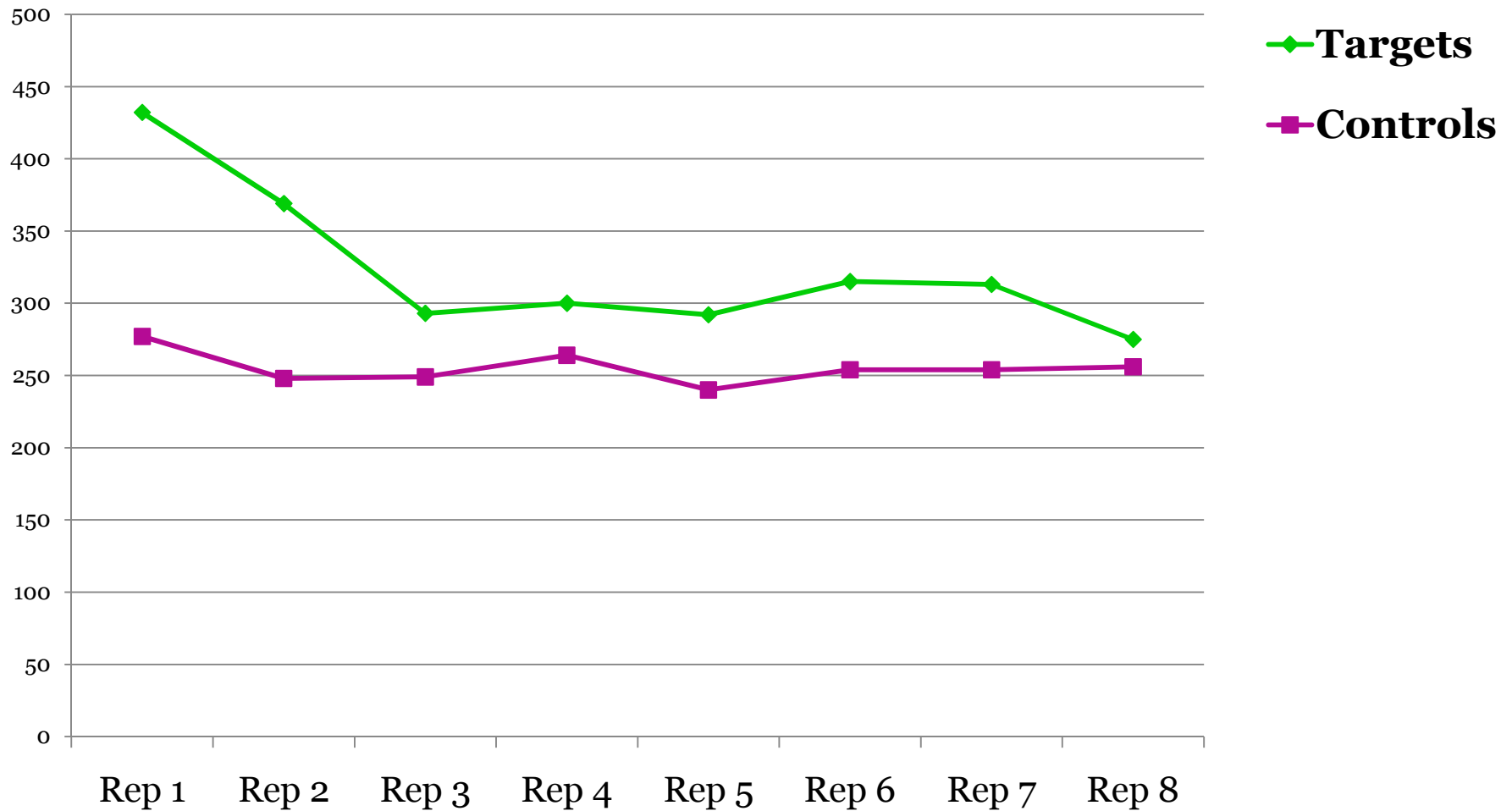
# Results- Procedural knowledge

## First Fixation Duration



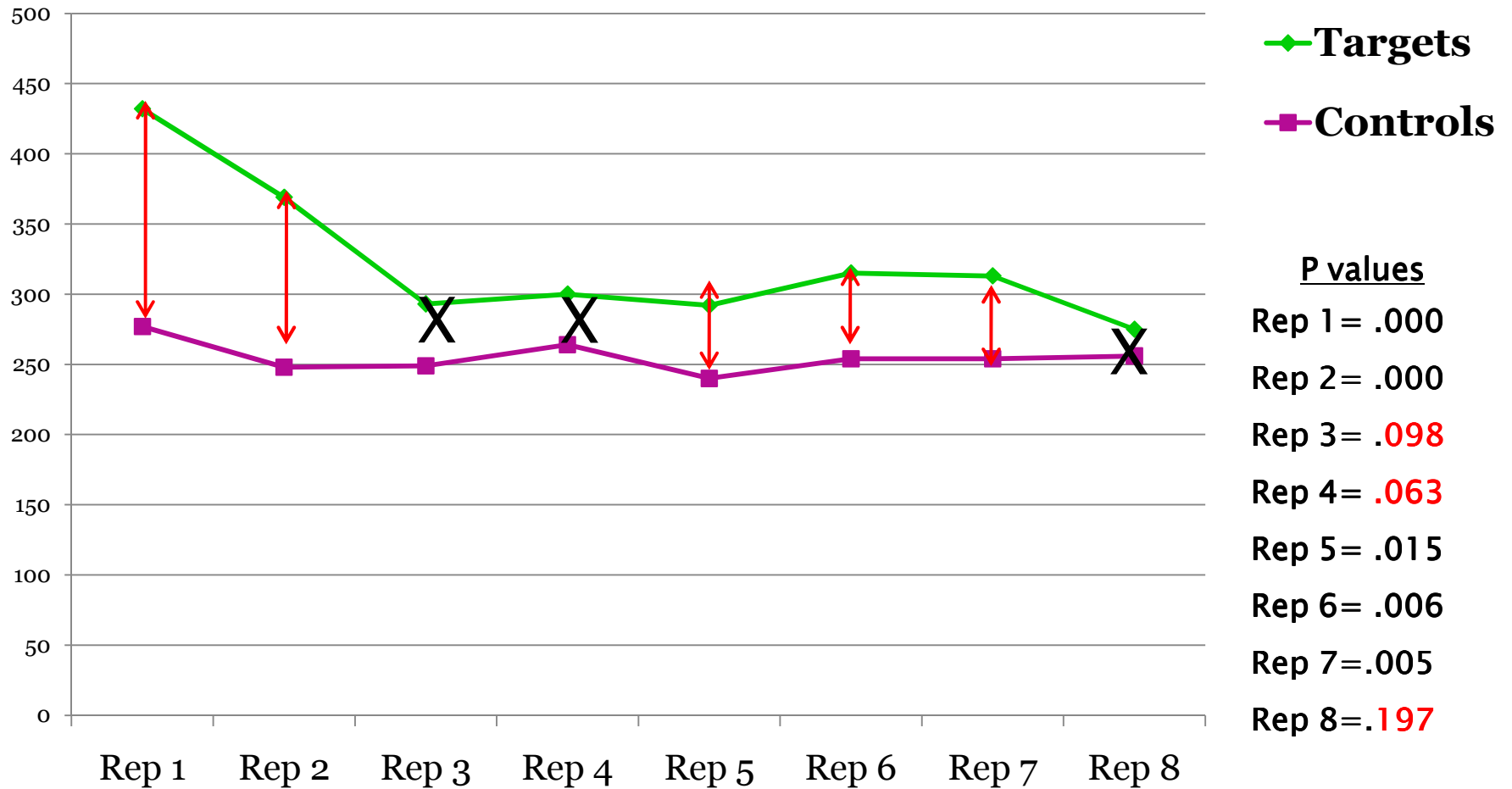
# Results- Procedural knowledge

## First Pass Reading Time



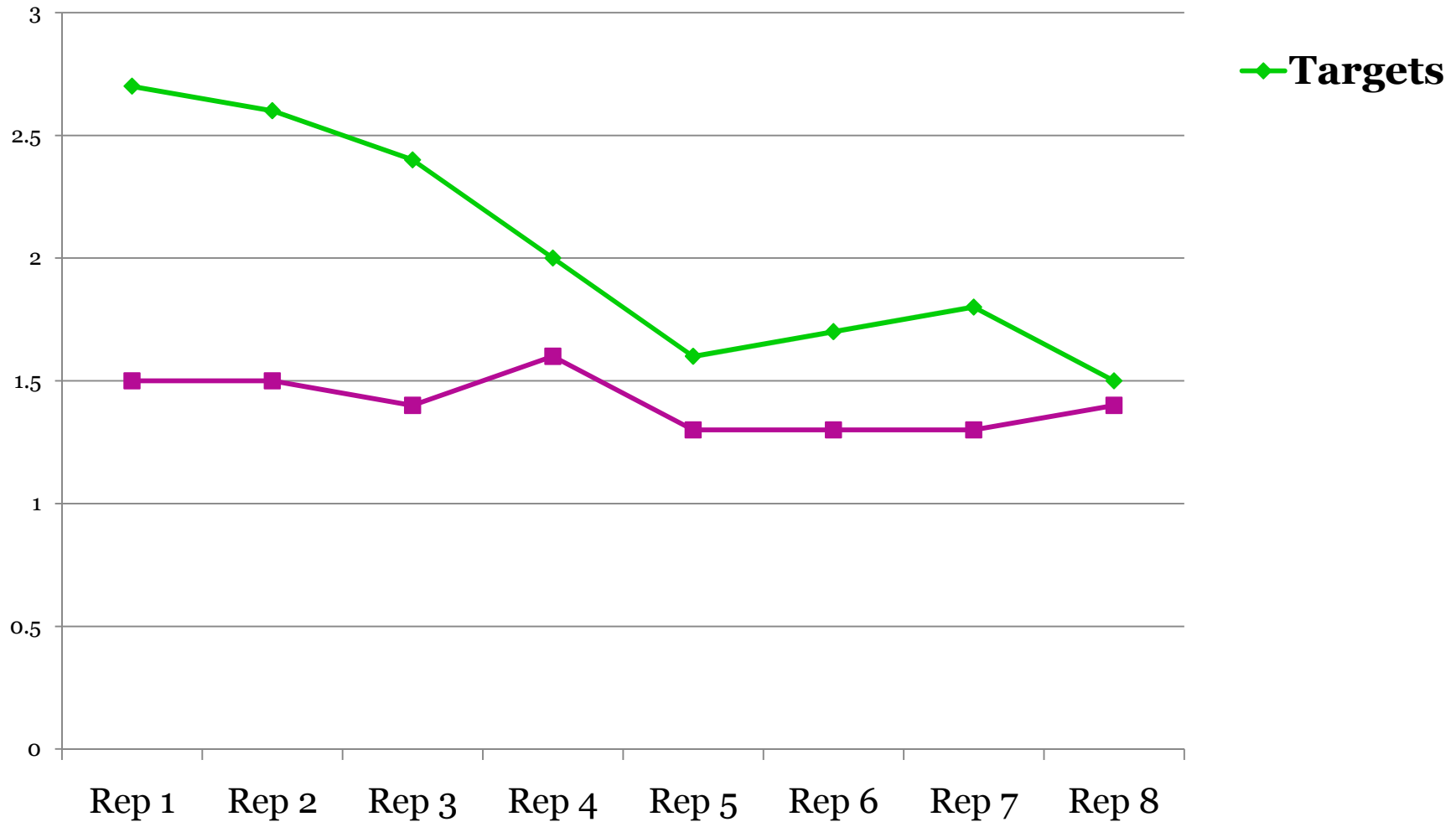
# Results- Procedural knowledge

## First Pass Reading Time



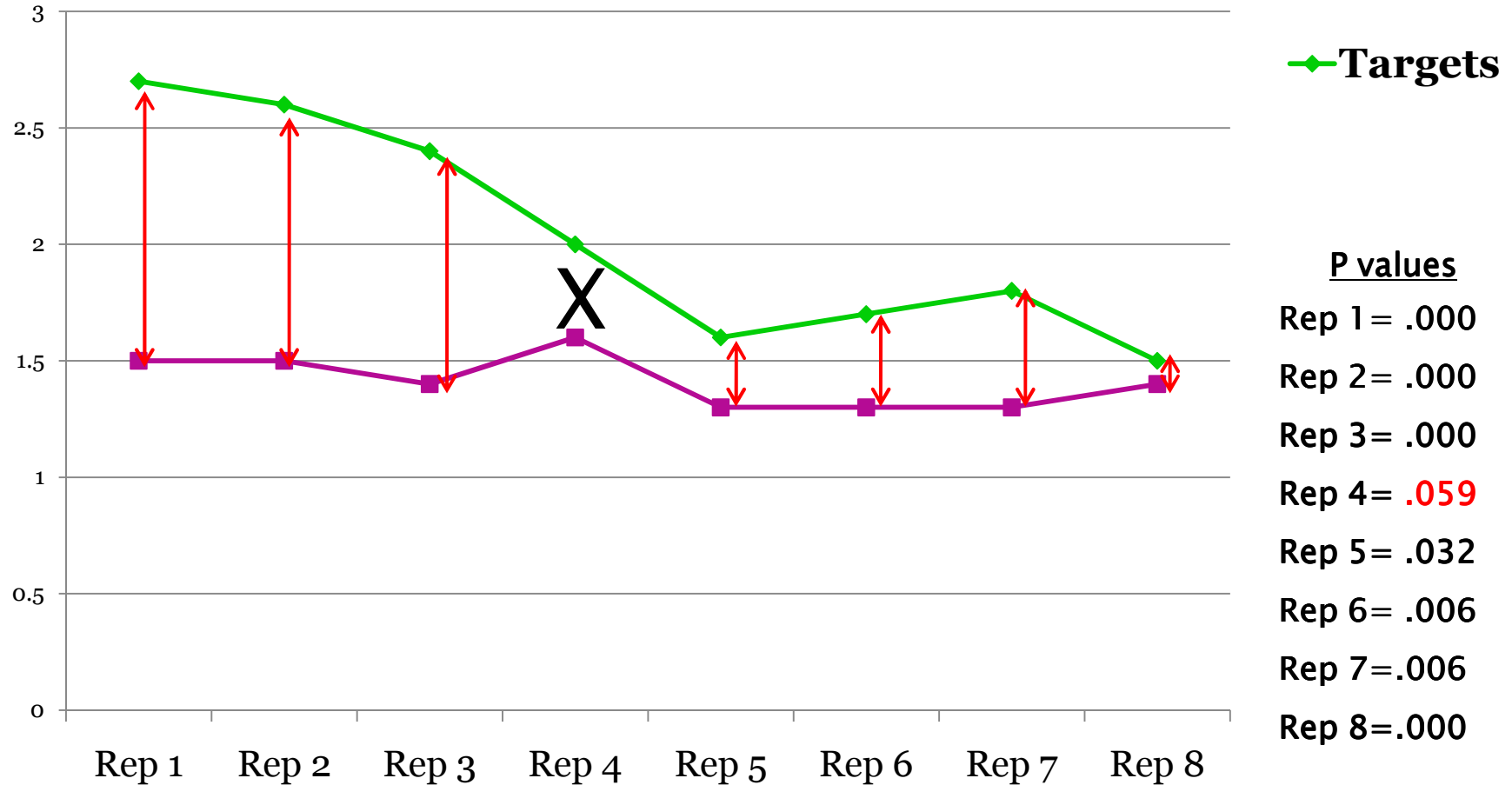
# Results- Procedural knowledge

**N of Fixations**



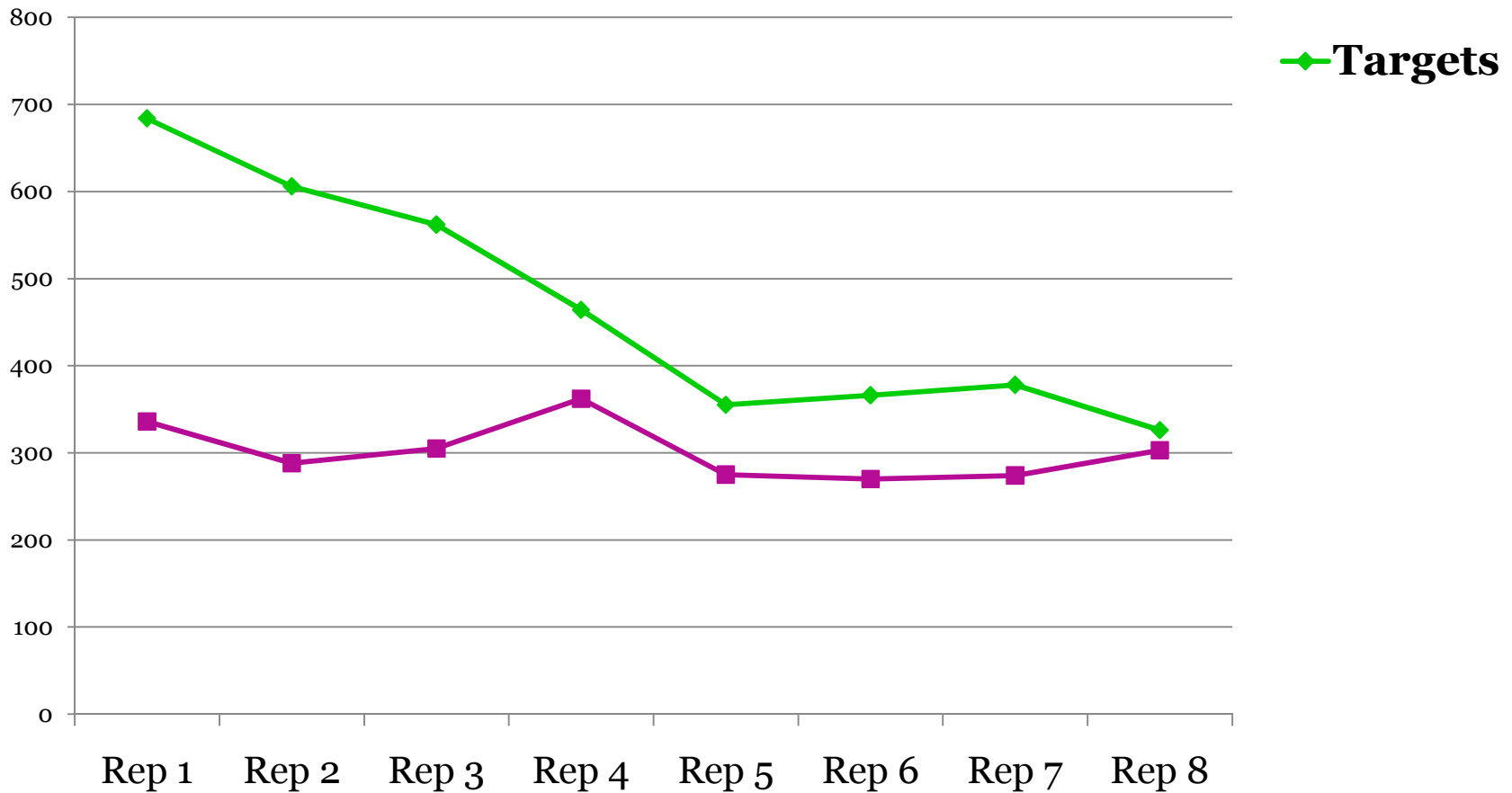
# Results- Procedural knowledge

N of Fixations



# Results- Procedural knowledge

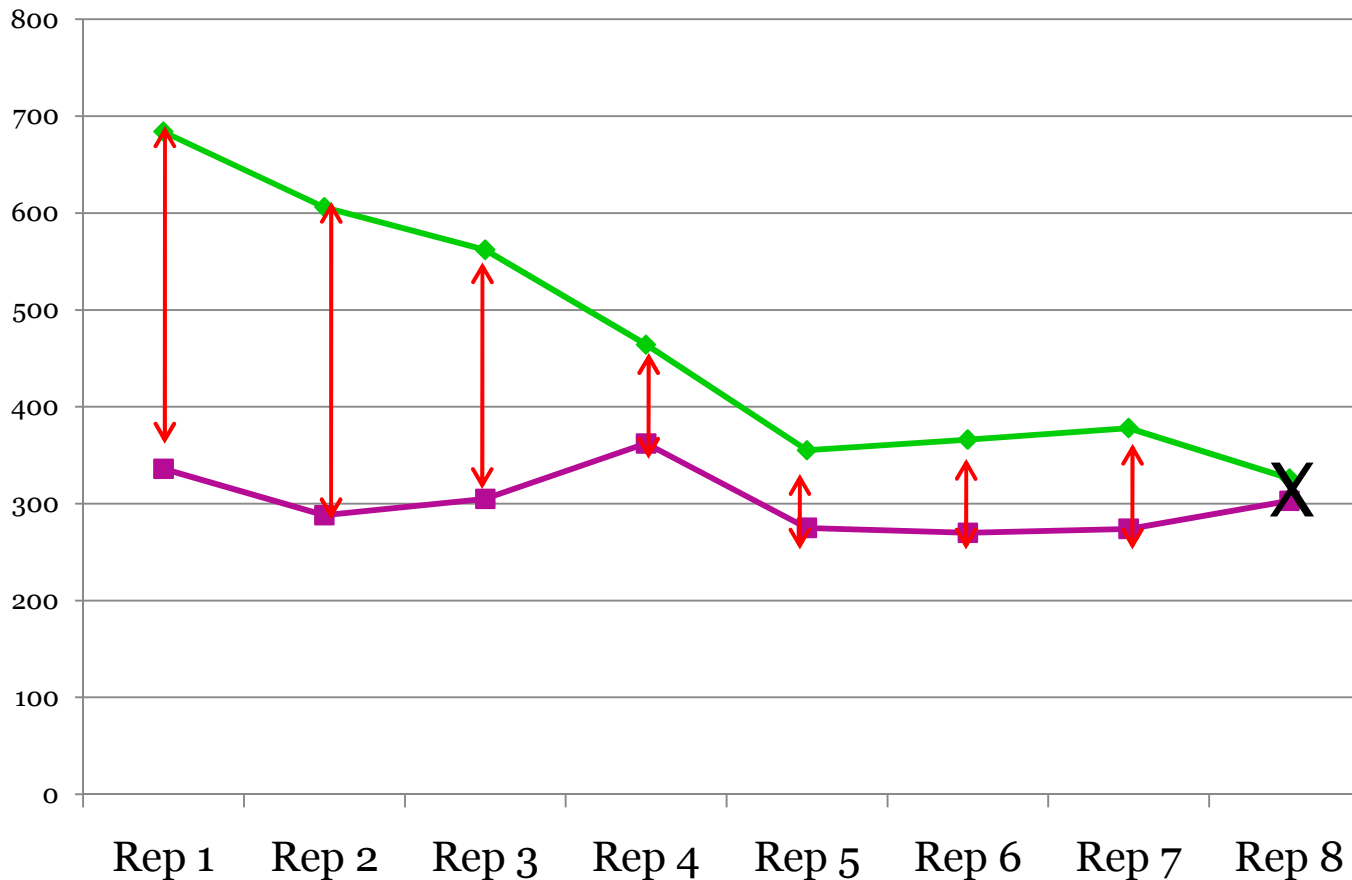
## Total Reading Time





# Results- Procedural knowledge

## Total Reading Time



◆ Targets

### P values

Rep 1 = .000

Rep 2 = .000

Rep 3 = .000

Rep 4 = .013

Rep 5 = .003

Rep 6 = .000

Rep 7 = .000

Rep 8 = .764

# Results- Reading Strategies

**1. Guessing**    **6.6 %** (1/15 participants)

**2. Skipping**    **13.3 %** (2/15 participants)

**3. Guessing + Skipping**    **66.6%** (10/15 participants)

**4. Skipping + Guessing**    **13.3 %** (2/15 participants)

# Summary & Conclusion

- Effectiveness of reading for incidental acquisition of multiple components of vocabulary knowledge.
- Declarative knowledge:
  - Form recognition  $\geq$  Meaning recognition > Meaning recall**
- Procedural knowledge:
  - Significant effect of the N of repetitions for new words (not for controls)  $\rightarrow$  **3-5 repetitions.**
  - Similarity to known words by **8 repetitions.**
- Reading strategies are related to participants' eye-movement behaviour.

## Further research

- Further examine the role of **frequency of exposure** by including different frequency groups.
- Explore the relationship between **degree of certainty** and eye-movements.
- Native speakers' data. Comparison of **L1 and L2 reading** processes.
- Explore different percentages of **lexical coverage**.
- etc.



**Thank you!!!**

**?????**

## References

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