How does solution knowledge form when solving anagrams?

Jesse Murray; Adwik Rahematpura; Minjoon Kouh, Ph.D.
Neuroscience Program, Drew University

Introduction

Previous studies on anagram problem-solving have sought to determine whether solution knowledge suddenly appears in mind or forms gradually. By observing a gradual decrease in viewing times on a distractor letter prior to a solution, Ellis et al. confirmed the latter [1]. However, less is known specifically about *how* solution knowledge forms as the correct order of letters is deduced from the random scramble. We hypothesized that the sequence of letters people read when solving anagrams could reveal the partial solution knowledge that forms early in the problem-solving process. To test our hypothesis, we designed and conducted an experiment to examine the sequence of letters read when solving anagrams.

Problem: Ambiguous fixations

From pilot experiments, we found that participants tended to not look directly at the letters on the screen, which made the letter sequence data discontinuous and unreliable.
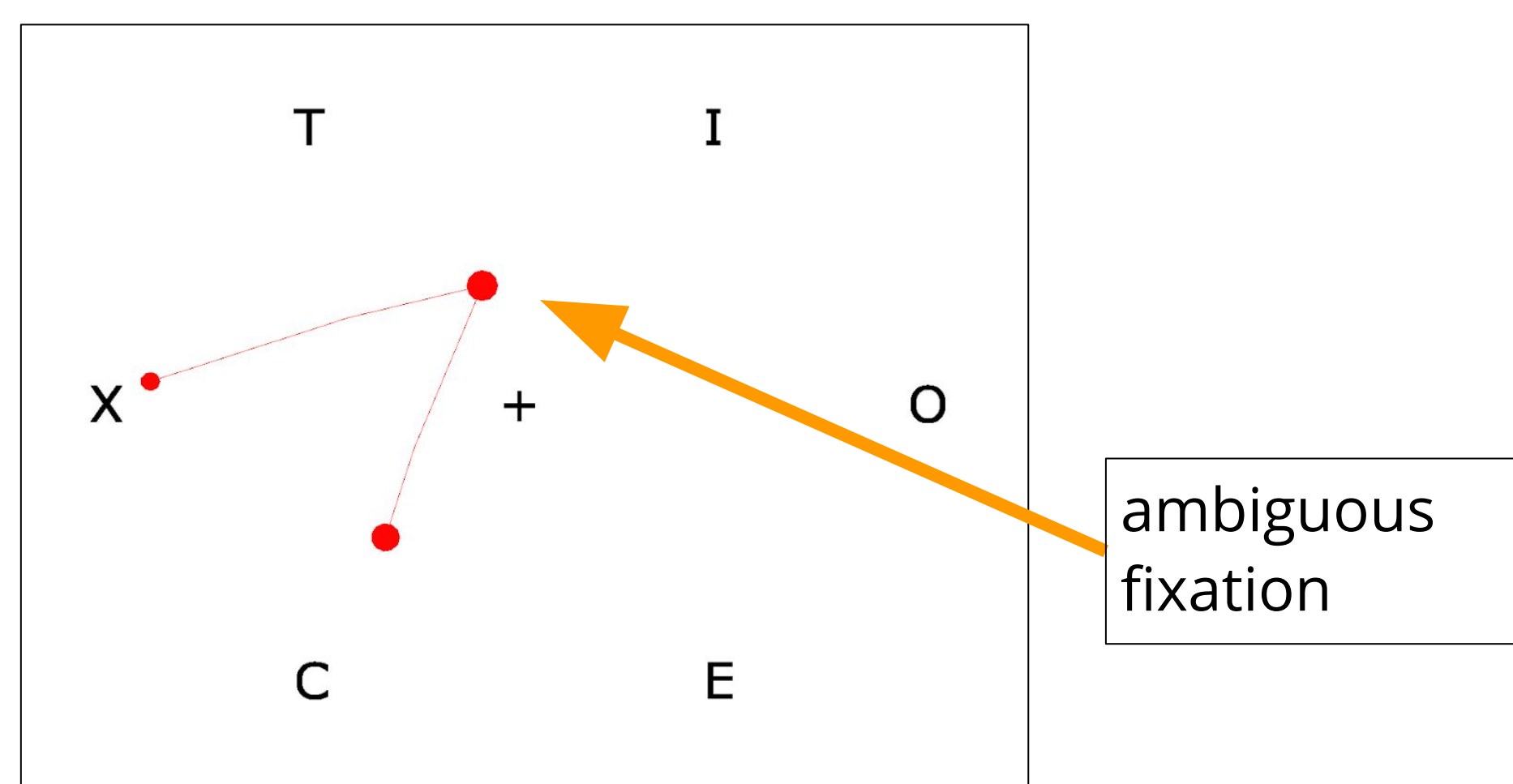
Solution: Make letters difficult to see

We were able to make the letters much more difficult to see with peripheral vision by highly altering their radii, contrast, size, and color. These changes led to a significant reduction in ambiguous fixations, presumably by nudging participants to look directly at the letters on the screen. It was then possible to collect letter sequence data.
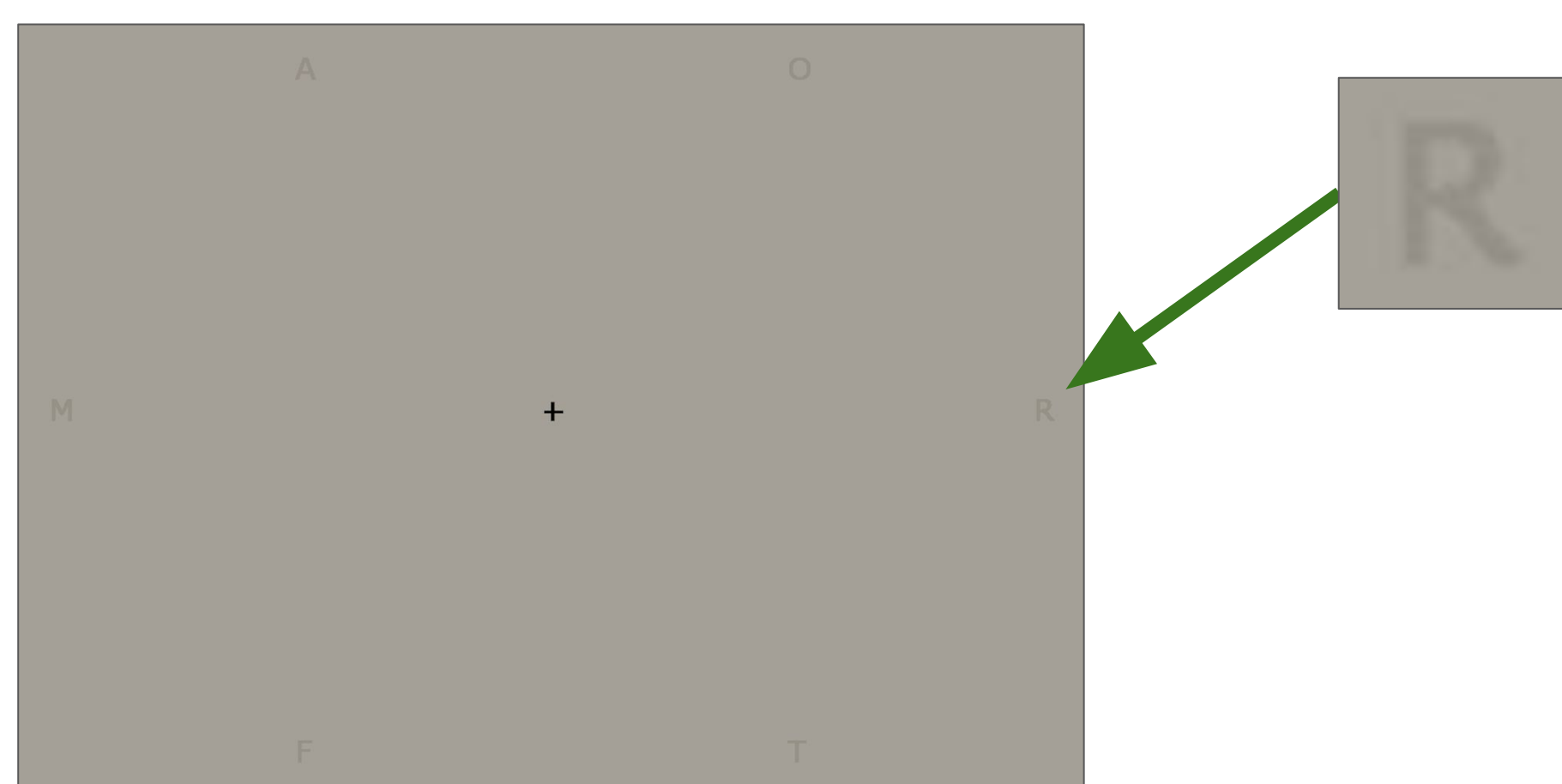
Methods

- 29 undergraduate participants
- Five and six-letter word anagrams in randomized letter positions
- Tobii T60 Eye Tracker and Tobii Studio software
- One piece of candy rewarded for every anagram correct
- Raw data cleaned and prepared with pandas

Results

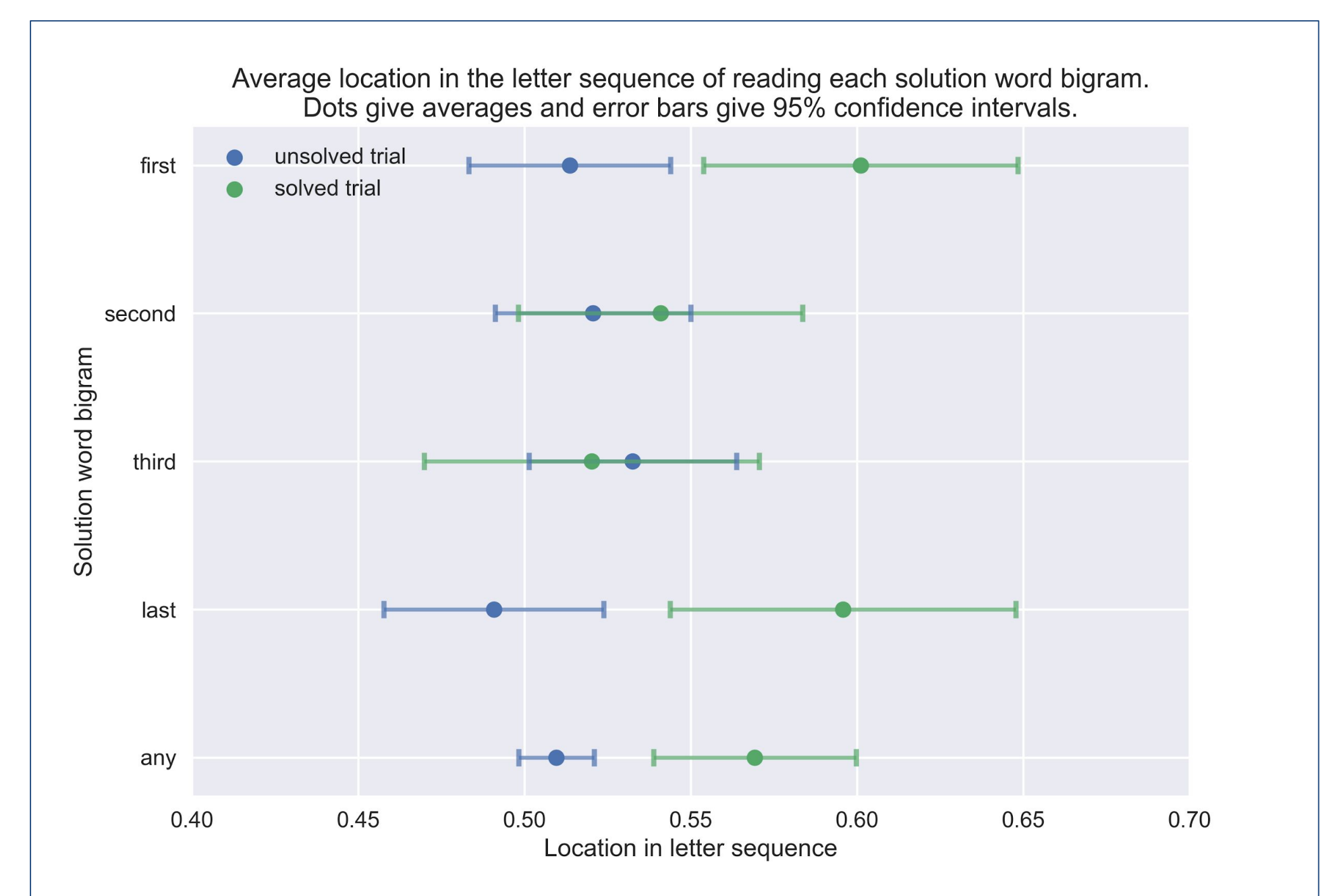Example letter sequence (solved trial):

UJONRIUJNOIURUJNJOUIRNO**JU**INO**JUOR**INRURUJI**OR**NRIO**JU**RI**ORJU**NON**JU**RNR**JU**
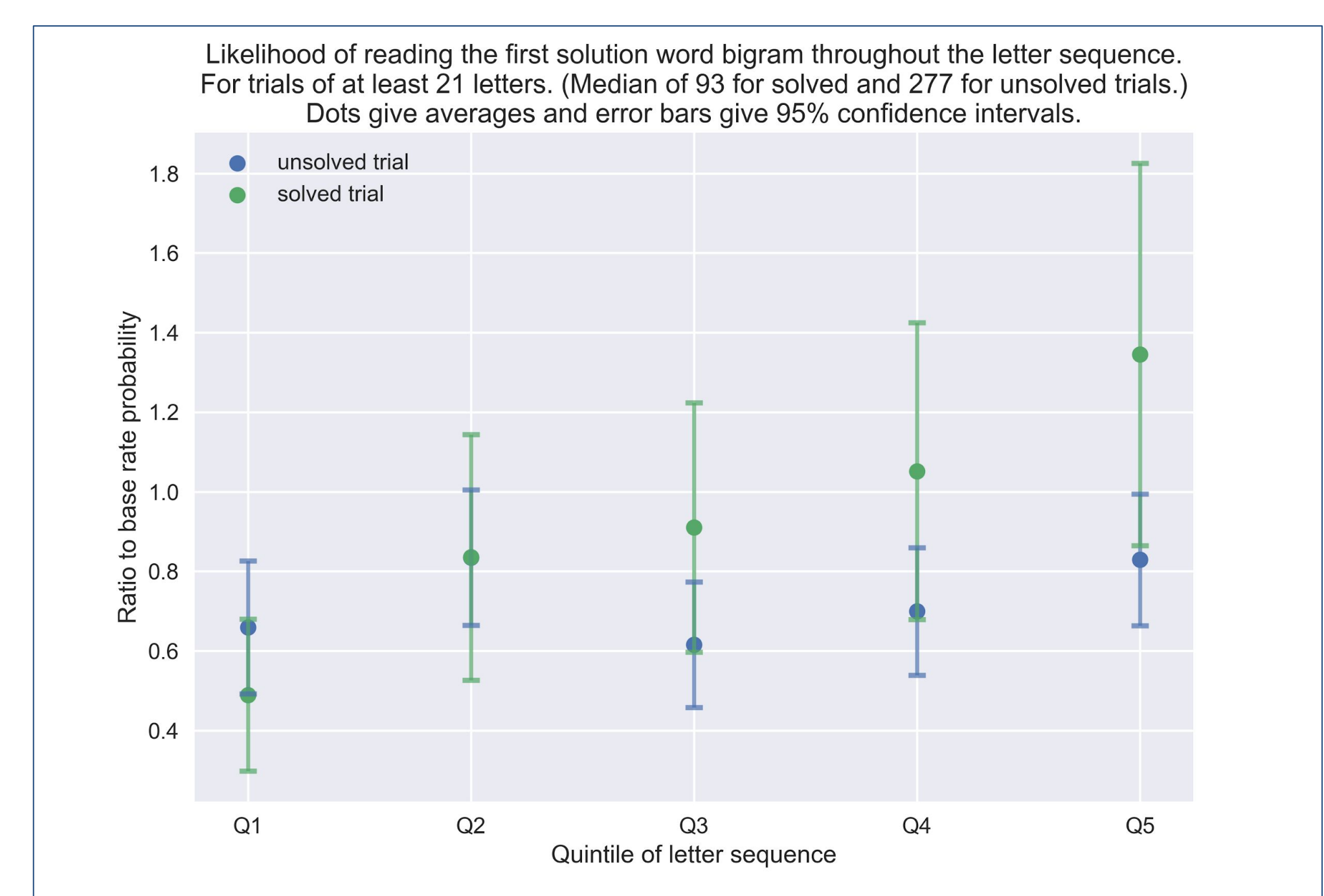
Solution Word: JUNIOR

first bigram   last bigram

JU average location = 0.72   OR average location = 0.66

For solved trials, the first and last solution word bigrams tend to be located closer to the end of the letter sequence.

Long before a solution is reached, the likelihood of reading the first and last solution word bigrams becomes significantly greater in solved trials than in unsolved trials.

Discussion

Our results indicate that the first and last bigrams of the solution word are important pieces of partial solution knowledge. This partial solution knowledge is detected early in the problem-solving process, likely before it is accessible to subjective phenomenal awareness [1]. Future experiments will seek to compare the relevance to solution knowledge of more common bigrams - such as 'th' or 'er' - to less frequent bigrams in the English language.