

**Processing multiple expository texts with statistical data:  
Evidence from the eye movements of L2 readers**

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Science-based texts are more challenging than those based on personal cases, and one of the causes is statistical evidence in such texts [1]. Interpreting statistical reports requires not only statistical knowledge but also a variety of skills, including reading and critical thinking [2]. A correlation study revealed that reading skills contributed to statistical literacy in both first language (L1) and second language (L2) [3]. Furthermore, processes of reading multiple narrative texts by L2 readers are influenced by types of comprehension questions; intertext questions encourage readers to read entire texts, while intratext questions lead readers to rely on specific areas to find answers [4]. Considering these findings, we conducted an eye-tracking study to determine whether question types elicit processing differences when reading expository texts with statistical information.

Thirty-one Japanese undergraduate and graduate students who had studied English as a foreign language read 16 English text pairs, each consisting of a lead sentence setting the context, two texts of four sentences each, a comprehension question, and four answer options. Half of the comprehension questions ( $n = 8$ ) asked about the content of one text (intratext questions), while the other half ( $n = 8$ ) required the participants to integrate information across the two texts (intertext questions). Moreover, half of the questions forced readers to interpret statistical or numeric information ( $n = 8$ ), while the other questions were based on linguistic information only ( $n = 8$ ). The participants saw one of the comprehension questions for each text pair. We recorded their eye-tracking data using the EyeLink Portable Duo at 2,000 Hz. We focused on fixation counts and dwell time in the questions, the areas necessary to answer the questions, and the total reaction time. We analyzed processing time data using linear mixed-effects models, while we analyzed accuracy and frequency data using generalized linear mixed-effects models with negative binomial distribution.

We found that intertext questions led to more fixations on the question area than intratext questions (Incidence Rate Ratios; IRR = 0.85,  $p = .007$ ), while numeric questions led to more fixations than linguistic questions (IRR = 1.45,  $p < .001$ ). Our findings are consistent with [1] in that the processing of statistical data affects multiple-text reading processes regardless of L1 or L2. Furthermore, the longer reaction time for intertext questions than intratext questions aligned with our previous work on narrative texts [4].

## Sample of the Material Set

**[Lead sentence]** There are many fascinating World Heritage Sites.

**[Text A]** As of 2024, Japan had 21 cultural and 5 natural World Heritage Sites. The first four sites, which included Himeji Castle and Yakushima, were registered in 1993. In 2024, the Sado Island Gold Mines were added to the list of cultural sites. Japan ranks 11th globally in terms of the number of World Heritage Sites.

**[Text B]** As of 2024, there were 1,223 World Heritage Sites worldwide, including 952 cultural, 231 natural, and 40 mixed. In 2024, 24 new sites were included. However, 56 sites are endangered due to wars, landscape collapse, and economic priorities. Currently, Italy leads with 60 sites, followed by China with 59, Germany with 54, and France with 53.

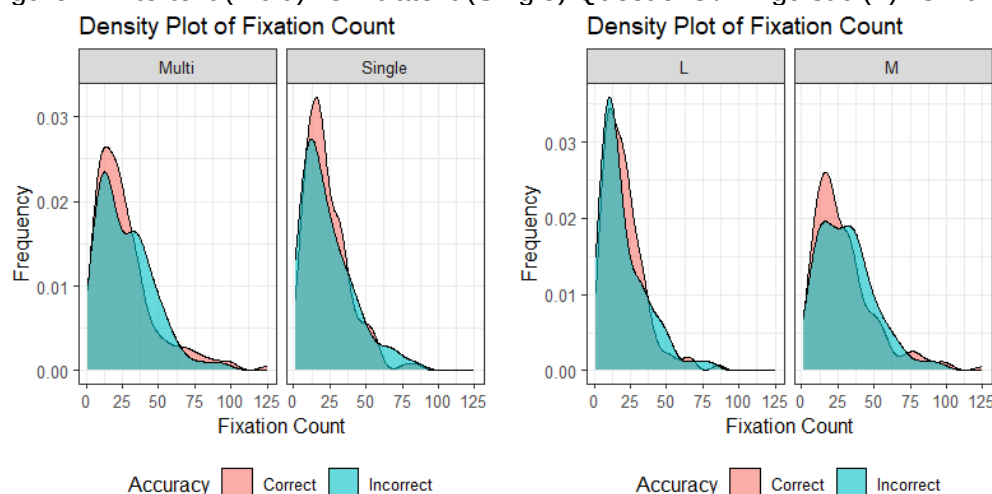
**[Intertext questions]** (Numerical) How many more World Heritage Sites does Italy have than Japan? (a) About 1.5 times (b) About 2.3 times (c) About 3 times (d) About 12 times (Linguistic) What point in common do the two texts make regarding World Heritage Sites? (a) Three categories of sites exist (b) Few sites are at risk (c) Rankings change rapidly (d) New sites have been registered

**[Intrertext questions]** (Numerical) O What percentage of Japan's current World Heritage Sites were registered in 1993? (a) About a quarter (b) About one-fifth (c) About one-sixth

Table 1: Means (SDs) of Fixation Counts on the Questions

|            |           | Numerical     | Linguistic    |
|------------|-----------|---------------|---------------|
| Intrertext | Correct   | 26.81 (16.60) | 19.23 (12.02) |
|            | Incorrect | 29.50 (19.03) | 17.03 (13.78) |
| Intertext  | Correct   | 31.93 (25.09) | 21.58 (15.87) |
|            | Incorrect | 32.88 (19.55) | 22.97 (17.32) |

Figure 1: Intertext (Multi) vs Intrertext (Single) Questions / Linguistic (L) vs Numerical (M)



## References

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