₁ YOUR PAPER TITLE

₂ YOUR NAME[1,2], YOUR CO-AUTHOR[2,3], & YOUR OTHER CO-AUTHOR[2]

₃ [1] Language Science, University of HERE, STATE

₄ [2] Brain and Cognitive Sciences, University of THERE

₅ [3] Computer Science, University of THERE

₆ Author Note

10 Abstract

11 YOUR ABSTRACT GOES HERE. All data and code for this study are shared via OSF,

12 including the R markdown document that this article is generated from, and an R library that

13 implements the models we present.

14   *Keywords:* KEY-WORD1; KEY-WORD2; KEY-WORD3; ...

YOUR PAPER TITLE

1 My TO DO list for this paper

This is a place where you can summarize your to-do list while you're working on the paper. By putting it at the beginning of your paper and using a logical flag to switch it on and off (in the main document), you can keep this information accessible to your collaborators while also making it easy to remove when you want to share your document with someone else.

1.1 Highest priority

- AUTHOR:
    - Do ….
    - Fix …
    - Make new plot for …
- CO_AUTHOR 1:
- Re-read … and make sure that we present their hypothesis correctly.
- CO-AUTHOR 2:
    - Code analysis for Experiment 2 …
    - Double check formula in Section …

1.2 To do later

- Everyone: Eat ice-cream and perhaps have a beer.

1 Introduction

The template uses many cool R packages. In particular, the package relies heavily on papaja, knitr, citr, and other packages. Make sure to read the great https://frederikaust.com/papaja_man/writing.html.

To get started on using this manuscript, have a look at any of the files with "START-HERE" in the filename. It's the parent Rmd file that loads all the other Rmd files, one for each section of the paper.

> You can also leave comments for yourself or collaborators with the todo tag.

1.1 Issues with biblatex

This document uses biblatex, in order to allow multiple bibliographies—one at the end of the main text, and one at the end of the supplementary information. Biblatex and biber can be a bit difficult to handle, and you might see errors "Error: Failed to build the bibliography via biber" or lots of unrecognized references even when the .bib file contains them. In that case, make sure your biblatex and biber version are compatible. E.g., if you see something like:
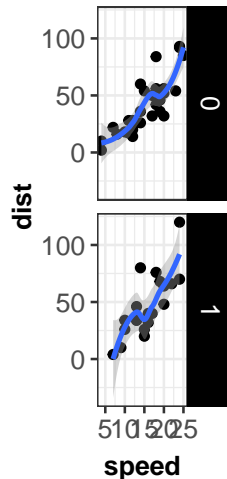
```
ERROR - Error: Found biblatex control file version 3.11, expected version 3.10.
This means that your biber (2.19) and biblatex (3.20) versions are incompatible.
See compat matrix in biblatex or biber PDF documentation.
```

You need to make sure that you update your latex environment and that those updates are visible to RStudio. Generally, the easiest way to do that is via the R package `tinytex::tlmgr_update()`. Sometimes, however, this is not enough. In those cases, try `tinytex::tlmgr_install("biber")` and `tinytex::tlmgr_install("biblatex")`.

2 Another section with some examples of citations, figures, etc.

How humans managed to survive so far remains one of the central questions of the social sciences. ... Here are some references [**nygaard1994**, **Perrachione2016**, **wade2007**, **weil2001a**, e.g., 1, 4, 6]. And here is a figure references to Figure 1.

Figure 1. You should use a verbose caption that is self-contained and clearly states the main points of the figure. When you look at the R markdown for this document, note that the caption is *outside* of the R-chunk but linked to the R-chunk through a reference in the chunk option fig.cap. Notice also how the reference in the main text uses the label fig:label, whereas the caption and the R chunk option fig.cap that generates the figure use the label ref:label. Finally, the R-chunk itself is called label. Make sure to follow this format in order to make sure that your figure references and captions knit correctly. This example also demonstrates how you can use a globally defined base width and height for all figures. In this example, the base height is multiplied by two because we're faceting the data into two rows.

⁵⁷ You can also make phonetic symbols, e.g., for the sound category [ʃ] [**newman2001**]. And

⁵⁸ you can type equations like Equation (1), which describes Wichmann and Hill's psychometric

⁵⁹ model with parameters α and β and more.

$$p(category|input) = (1 - \lambda)\frac{\mathcal{N}!\left(input|\mu_c, \Sigma_c\right)\pi}{\Sigma_i \mathcal{N}!\left(input|\mu_{c_i}, \Sigma_{c_i}\right)\pi_i} + \lambda\frac{\pi}{\Sigma_i \pi_i} \qquad (1)$$

⁶⁰ All data and code for this article can be downloaded from https://osf.io/q7gjp/. This

⁶¹ article is written in R markdown, allowing readers to replicate our analyses with the press of a

⁶² button using freely available software [R, 2, 3], while changing any of the parameters of our

⁶³ models. Readers can revisit any of the assumptions we make—for example, by substituting

⁶⁴ alternative models of linguistic representations. The supplementary information (SI, **??**) lists the

⁶⁵ software/libraries required to compile this document. Beyond our immediate goals here, we hope

⁶⁶ that this can be helpful to researchers who are interested in developing more informative

⁶⁷ experimental designs, and to facilitate the interpretation of existing results [see also 5].

3   General discussion

An example of a section.

3.1   Methodological advances that can move the field forward

An example of a subsection.

Supplementary information for *TITLE*

Contents

§1   Required software

Both the main text and these supplementary information (SI) are derived from the same R markdown document available via ADD-URL. It is best viewed using Acrobat Reader. The document was compiled using `knitr` [**R-knitr**] in RStudio with R:

```
##                    _
## platform      aarch64-apple-darwin20
## arch          aarch64
## os            darwin20
## system        aarch64, darwin20
## status
## major         4
## minor         5.2
## year          2025
## month         10
## day           31
## svn rev       88974
## language      R
## version.string R version 4.5.2 (2025-10-31)
## nickname      [Not] Part in a Rumble
```

You will also need to download the IPA font SIL Doulos and a Latex environment like (e.g., MacTex or the R library `tinytex`).

We used the following R packages to create this document: R [Version 4.5.2; 23] and the R-packages *assertthat* [Version 0.2.1; 26], *brms* [Version 2.23.0; 8, 6, 7], *cowplot* [Version 1.2.0; 35], *data.table* [Version 1.17.8; 10], *diptest* [Version 0.77.2; 19], *dplyr* [Version 1.1.4; 33], *forcats* [Version 1.0.1; 27], *gganimate* [Version 1.0.11; 22], *ggplot2* [Version 4.0.1; 28], *LaplacesDemon* [Version 16.1.6; 25], *latexdiffr* [Version 0.2.0; 16], *linguisticsdown* [Version 1.2.0; 18], *lme4* [Version 1.1.38; 5], *lubridate* [Version 1.9.4; 13], *magick* [Version 2.9.0; 21], *magrittr* [Version 2.0.4; 2], *Matrix* [Version 1.7.4; 4], *modelr* [Version 0.1.11; 29], *MVBeliefUpdatr* [Version 0.0.2.2; 17], *papaja* [Version 0.1.4; 1], *plotly* [Version 4.11.0; 24], *processx* [Version 3.8.6; 9], *purrr* [Version 1.2.0; 14], *Rcpp* [Version 1.1.0; 12, 11], *readr* [Version 2.1.6; 32], *rlang* [Version 1.1.6; 15], *stringr* [Version 1.6.0; 30], *tibble* [Version 3.3.0; 20], *tidyr* [Version 1.3.1; 31], *tidyverse* [Version 2.0.0; 34], *tinylabels* [Version 0.2.5; 3], and *tufte* [Version 0.14.0; 36]. If opened in RStudio, the top of the R markdown document should alert you to any libraries you will need to download, if you have not already

installed them. The full session information is provided at the end of this document.

§1.1 Interested in using R markdown do create APA formatted documents that integrate your code with your writing?

A project template, including R markdown files that result in APA-formatted PDFs, is available at https://github.com/hlplab/template-R-project. Feedback welcome. We aim to help others avoid the mistakes and detours we made when first deciding to embrace literal coding to increase transparency in our projects.

§2 Other sections

§3 Session Info

```
## - Session info ---------------------------------------------------------------------------
##   setting   value
##   version   R version 4.5.2 (2025-10-31)
##   os        macOS Sonoma 14.5
##   system    aarch64, darwin20
##   ui        X11
##   language  (EN)
##   collate   en_US.UTF-8
##   ctype     en_US.UTF-8
##   tz        America/New_York
##   date      2025-12-08
##   pandoc    3.6.3 @ /Applications/RStudio.app/Contents/Resources/app/quarto/bin/tools/aarch64,
##   quarto    1.7.32 @ /Applications/RStudio.app/Contents/Resources/app/quarto/bin/quarto
##
## - Packages -------------------------------------------------------------------------------
##   package         * version   date (UTC) lib source
##   abind             1.4-8     2024-09-12 [1] CRAN (R 4.5.0)
##   arrayhelpers      1.1-0     2020-02-04 [1] CRAN (R 4.5.0)
##   assertthat      * 0.2.1     2019-03-21 [1] CRAN (R 4.5.0)
##   av                0.9.6     2025-10-20 [1] CRAN (R 4.5.0)
##   backports         1.5.0     2024-05-23 [1] CRAN (R 4.5.0)
##   base64enc         0.1-3     2015-07-28 [1] CRAN (R 4.5.0)
##   bayesplot         1.14.0    2025-08-31 [1] CRAN (R 4.5.0)
##   bayestestR        0.17.0    2025-08-29 [1] CRAN (R 4.5.0)
##   bookdown          0.46      2025-12-05 [1] CRAN (R 4.5.2)
##   boot              1.3-32    2025-08-29 [1] CRAN (R 4.5.2)
##   bridgesampling    1.2-1     2025-11-19 [1] CRAN (R 4.5.2)
##   brms              2.23.0    2025-09-09 [1] CRAN (R 4.5.0)
##   Brobdingnag       1.2-9     2022-10-19 [1] CRAN (R 4.5.0)
##   broom             1.0.11    2025-12-04 [1] CRAN (R 4.5.2)
##   cachem            1.1.0     2024-05-16 [1] CRAN (R 4.5.0)
##   checkmate         2.3.3     2025-08-18 [1] CRAN (R 4.5.0)
##   class             7.3-23    2025-01-01 [1] CRAN (R 4.5.2)
```

```
154  ##   classInt         0.4-11    2025-01-08 [1] CRAN (R 4.5.0)
155  ##   cli              3.6.5     2025-04-23 [1] CRAN (R 4.5.0)
156  ##   cluster          2.1.8.1   2025-03-12 [1] CRAN (R 4.5.2)
157  ##   coda             0.19-4.1  2024-01-31 [1] CRAN (R 4.5.0)
158  ##   codetools        0.2-20    2024-03-31 [1] CRAN (R 4.5.2)
159  ##   colorspace       2.1-2     2025-09-22 [1] CRAN (R 4.5.0)
160  ##   cowplot          1.2.0     2025-07-07 [1] CRAN (R 4.5.0)
161  ##   crayon           1.5.3     2024-06-20 [1] CRAN (R 4.5.0)
162  ##   curl             7.0.0     2025-08-19 [1] CRAN (R 4.5.0)
163  ##   data.table       1.17.8    2025-07-10 [1] CRAN (R 4.5.0)
164  ##   datawizard       1.3.0     2025-10-11 [1] CRAN (R 4.5.0)
165  ##   DBI              1.2.3     2024-06-02 [1] CRAN (R 4.5.0)
166  ##   devtools         2.4.6     2025-10-03 [1] CRAN (R 4.5.0)
167  ##   digest           0.6.39    2025-11-19 [1] CRAN (R 4.5.2)
168  ##   diptest          0.77-2    2025-08-20 [1] CRAN (R 4.5.0)
169  ##   distributional   0.5.0     2024-09-17 [1] CRAN (R 4.5.0)
170  ##   dplyr          * 1.1.4     2023-11-17 [1] CRAN (R 4.5.0)
171  ##   e1071            1.7-16    2024-09-16 [1] CRAN (R 4.5.0)
172  ##   effectsize       1.0.1     2025-05-27 [1] CRAN (R 4.5.0)
173  ##   ellipse          0.5.0     2023-07-20 [1] CRAN (R 4.5.0)
174  ##   ellipsis         0.3.2     2021-04-29 [1] CRAN (R 4.5.0)
175  ##   emmeans          2.0.0     2025-10-29 [1] CRAN (R 4.5.0)
176  ##   estimability     1.5.1     2024-05-12 [1] CRAN (R 4.5.0)
177  ##   evaluate         1.0.5     2025-08-27 [1] CRAN (R 4.5.0)
178  ##   extraDistr       1.10.0    2023-11-30 [1] CRAN (R 4.5.0)
179  ##   farver           2.1.2     2024-05-13 [1] CRAN (R 4.5.0)
180  ##   fastmap          1.2.0     2024-05-15 [1] CRAN (R 4.5.0)
181  ##   forcats        * 1.0.1     2025-09-25 [1] CRAN (R 4.5.0)
182  ##   foreach          1.5.2     2022-02-02 [1] CRAN (R 4.5.0)
183  ##   foreign          0.8-90    2025-03-31 [1] CRAN (R 4.5.2)
184  ##   Formula          1.2-5     2023-02-24 [1] CRAN (R 4.5.0)
185  ##   fs               1.6.6     2025-04-12 [1] CRAN (R 4.5.0)
186  ##   generics         0.1.4     2025-05-09 [1] CRAN (R 4.5.0)
187  ##   gganimate        1.0.11    2025-09-04 [1] CRAN (R 4.5.0)
188  ##   ggdist           3.3.3     2025-04-23 [1] CRAN (R 4.5.0)
189  ##   ggforce          0.5.0     2025-06-18 [1] CRAN (R 4.5.0)
190  ##   ggnewscale       0.5.2     2025-06-20 [1] CRAN (R 4.5.0)
191  ##   ggplot2        * 4.0.1     2025-11-14 [1] CRAN (R 4.5.2)
192  ##   ggridges         0.5.7     2025-08-27 [1] CRAN (R 4.5.0)
193  ##   gifski           1.32.0-2  2025-03-18 [1] CRAN (R 4.5.0)
194  ##   glue             1.8.0     2024-09-30 [1] CRAN (R 4.5.0)
195  ##   gridExtra        2.3       2017-09-09 [1] CRAN (R 4.5.0)
196  ##   gtable           0.3.6     2024-10-25 [1] CRAN (R 4.5.0)
197  ##   Hmisc            5.2-4     2025-10-05 [1] CRAN (R 4.5.0)
198  ##   hms              1.1.4     2025-10-17 [1] CRAN (R 4.5.0)
199  ##   htmlTable        2.4.3     2024-07-21 [1] CRAN (R 4.5.0)
200  ##   htmltools        0.5.9     2025-12-04 [1] CRAN (R 4.5.2)
201  ##   htmlwidgets      1.6.4     2023-12-06 [1] CRAN (R 4.5.0)
```

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## httpuv             1.6.16       2025-04-16 [1] CRAN (R 4.5.0)
## httr               1.4.7        2023-08-15 [1] CRAN (R 4.5.0)
## inline             0.3.21       2025-01-09 [1] CRAN (R 4.5.0)
## insight            1.4.3        2025-11-24 [1] CRAN (R 4.5.2)
## iterators          1.0.14       2022-02-05 [1] CRAN (R 4.5.0)
## jsonlite           2.0.0        2025-03-27 [1] CRAN (R 4.5.0)
## KernSmooth         2.23-26      2025-01-01 [1] CRAN (R 4.5.2)
## knitr              1.50         2025-03-16 [1] CRAN (R 4.5.0)
## labeling           0.4.3        2023-08-29 [1] CRAN (R 4.5.0)
## LaplacesDemon      16.1.6       2021-07-09 [1] CRAN (R 4.5.0)
## later              1.4.4        2025-08-27 [1] CRAN (R 4.5.0)
## latexdiffr       * 0.2.0        2024-02-16 [1] CRAN (R 4.5.0)
## lattice            0.22-7       2025-04-02 [1] CRAN (R 4.5.2)
## lazyeval           0.2.2        2019-03-15 [1] CRAN (R 4.5.0)
## lifecycle          1.0.4        2023-11-07 [1] CRAN (R 4.5.0)
## linguisticsdown  * 1.2.0        2019-03-01 [1] CRAN (R 4.5.0)
## lme4               1.1-38       2025-12-02 [1] CRAN (R 4.5.2)
## loo                2.8.0        2024-07-03 [1] CRAN (R 4.5.0)
## lpSolve            5.6.23       2024-12-14 [1] CRAN (R 4.5.0)
## lubridate        * 1.9.4        2024-12-08 [1] CRAN (R 4.5.0)
## magick             2.9.0        2025-09-08 [1] CRAN (R 4.5.0)
## magrittr         * 2.0.4        2025-09-12 [1] CRAN (R 4.5.0)
## MASS               7.3-65       2025-02-28 [1] CRAN (R 4.5.2)
## Matrix             1.7-4        2025-08-28 [1] CRAN (R 4.5.2)
## matrixStats        1.5.0        2025-01-07 [1] CRAN (R 4.5.0)
## memoise            2.0.1        2021-11-26 [1] CRAN (R 4.5.0)
## mgcv               1.9-4        2025-11-07 [1] CRAN (R 4.5.0)
## mime               0.13         2025-03-17 [1] CRAN (R 4.5.0)
## miniUI             0.1.2        2025-04-17 [1] CRAN (R 4.5.0)
## minqa              1.2.8        2024-08-17 [1] CRAN (R 4.5.0)
## modelr             0.1.11       2023-03-22 [1] CRAN (R 4.5.0)
## multcomp           1.4-29       2025-10-20 [1] CRAN (R 4.5.0)
## MVBeliefUpdatr     0.0.2.0002   2025-06-18 [1] Github (hlplab/MVBeliefUpdatr@1aa4c3f)
## mvtnorm            1.3-3        2025-01-10 [1] CRAN (R 4.5.0)
## nlme               3.1-168      2025-03-31 [1] CRAN (R 4.5.2)
## nloptr             2.2.1        2025-03-17 [1] CRAN (R 4.5.0)
## nnet               7.3-20       2025-01-01 [1] CRAN (R 4.5.2)
## otel               0.2.0        2025-08-29 [1] CRAN (R 4.5.0)
## papaja           * 0.1.4        2025-09-26 [1] CRAN (R 4.5.0)
## parameters         0.28.3       2025-11-25 [1] CRAN (R 4.5.2)
## pillar             1.11.1       2025-09-17 [1] CRAN (R 4.5.0)
## pkgbuild           1.4.8        2025-05-26 [1] CRAN (R 4.5.0)
## pkgconfig          2.0.3        2019-09-22 [1] CRAN (R 4.5.0)
## pkgload            1.4.1        2025-09-23 [1] CRAN (R 4.5.0)
## plotly             4.11.0       2025-06-19 [1] CRAN (R 4.5.0)
## polyclip           1.10-7       2024-07-23 [1] CRAN (R 4.5.0)
## posterior          1.6.1        2025-02-27 [1] CRAN (R 4.5.0)
## prettyunits        1.2.0        2023-09-24 [1] CRAN (R 4.5.0)
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## processx           3.8.6     2025-02-21 [1] CRAN (R 4.5.0)
## progress           1.2.3     2023-12-06 [1] CRAN (R 4.5.0)
## progressr          0.18.0    2025-11-06 [1] CRAN (R 4.5.0)
## promises           1.5.0     2025-11-01 [1] CRAN (R 4.5.0)
## proxy              0.4-27    2022-06-09 [1] CRAN (R 4.5.0)
## ps                 1.9.1     2025-04-12 [1] CRAN (R 4.5.0)
## purrr            * 1.2.0     2025-11-04 [1] CRAN (R 4.5.0)
## QuickJSR           1.8.1     2025-09-20 [1] CRAN (R 4.5.0)
## R6                 2.6.1     2025-02-15 [1] CRAN (R 4.5.0)
## rbibutils          2.4       2025-11-07 [1] CRAN (R 4.5.0)
## RColorBrewer       1.1-3     2022-04-03 [1] CRAN (R 4.5.0)
## Rcpp               1.1.0     2025-07-02 [1] CRAN (R 4.5.0)
## RcppParallel       5.1.11-1  2025-08-27 [1] CRAN (R 4.5.0)
## Rdpack             2.6.4     2025-04-09 [1] CRAN (R 4.5.0)
## readr            * 2.1.6     2025-11-14 [1] CRAN (R 4.5.2)
## reformulas         0.4.2     2025-10-28 [1] CRAN (R 4.5.0)
## remotes            2.5.0     2024-03-17 [1] CRAN (R 4.5.0)
## rlang            * 1.1.6     2025-04-11 [1] CRAN (R 4.5.0)
## rmarkdown          2.30      2025-09-28 [1] CRAN (R 4.5.0)
## rpart              4.1.24    2025-01-07 [1] CRAN (R 4.5.2)
## rstan              2.32.7    2025-03-10 [1] CRAN (R 4.5.0)
## rstantools         2.5.0     2025-09-01 [1] CRAN (R 4.5.0)
## rstudioapi         0.17.1    2024-10-22 [1] CRAN (R 4.5.0)
## S7                 0.2.1     2025-11-14 [1] CRAN (R 4.5.2)
## sandwich           3.1-1     2024-09-15 [1] CRAN (R 4.5.0)
## scales             1.4.0     2025-04-24 [1] CRAN (R 4.5.0)
## sessioninfo        1.2.3     2025-02-05 [1] CRAN (R 4.5.0)
## sf                 1.0-23    2025-11-28 [1] CRAN (R 4.5.2)
## shiny              1.12.0    2025-12-03 [1] CRAN (R 4.5.2)
## StanHeaders        2.32.10   2024-07-15 [1] CRAN (R 4.5.0)
## stringi            1.8.7     2025-03-27 [1] CRAN (R 4.5.0)
## stringr          * 1.6.0     2025-11-04 [1] CRAN (R 4.5.0)
## survival           3.8-3     2024-12-17 [1] CRAN (R 4.5.2)
## svUnit             1.0.8     2025-08-26 [1] CRAN (R 4.5.0)
## tensorA            0.36.2.1  2023-12-13 [1] CRAN (R 4.5.0)
## TH.data            1.1-5     2025-11-17 [1] CRAN (R 4.5.2)
## tibble           * 3.3.0     2025-06-08 [1] CRAN (R 4.5.0)
## tidybayes          3.0.7     2024-09-15 [1] CRAN (R 4.5.0)
## tidyr            * 1.3.1     2024-01-24 [1] CRAN (R 4.5.0)
## tidyselect         1.2.1     2024-03-11 [1] CRAN (R 4.5.0)
## tidyverse        * 2.0.0     2023-02-22 [1] CRAN (R 4.5.0)
## timechange         0.3.0     2024-01-18 [1] CRAN (R 4.5.0)
## tinylabels       * 0.2.5     2025-03-20 [1] CRAN (R 4.5.0)
## tinytex            0.58      2025-11-19 [1] CRAN (R 4.5.2)
## transformr         0.1.5     2024-02-26 [1] CRAN (R 4.5.0)
## tufte              0.14.0    2025-07-29 [1] CRAN (R 4.5.0)
## tweenr             2.0.3     2024-02-26 [1] CRAN (R 4.5.0)
## tzdb               0.5.0     2025-03-15 [1] CRAN (R 4.5.0)
```

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298  ##   units             1.0-0      2025-10-09 [1] CRAN (R 4.5.0)
299  ##   usethis           3.2.1      2025-09-06 [1] CRAN (R 4.5.0)
300  ##   V8                8.0.1      2025-10-10 [1] CRAN (R 4.5.0)
301  ##   vctrs             0.6.5      2023-12-01 [1] CRAN (R 4.5.0)
302  ##   viridis           0.6.5      2024-01-29 [1] CRAN (R 4.5.0)
303  ##   viridisLite       0.4.2      2023-05-02 [1] CRAN (R 4.5.0)
304  ##   withr             3.0.2      2024-10-28 [1] CRAN (R 4.5.0)
305  ##   xfun              0.54       2025-10-30 [1] CRAN (R 4.5.0)
306  ##   xtable            1.8-4      2019-04-21 [1] CRAN (R 4.5.0)
307  ##   yaml              2.3.11     2025-11-28 [1] CRAN (R 4.5.2)
308  ##   zoo               1.8-14     2025-04-10 [1] CRAN (R 4.5.0)
309  ##
310  ##   [1] /Library/Frameworks/R.framework/Versions/4.5-arm64/Resources/library
311  ##   * -- Packages attached to the search path.
312  ##
313  ##  --------------------------------------------------------------------------
```

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