# To justify or not to justify?
# Why bad typography may be harmful for your readers

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TUG@BachoTEX 2017

# The program

**TUG 2011:** We proposed a program for "evidence based typography". Let us verify the compositors' belief by experiments. We measured:

1. Speed of reading: words per minute.
2. Comprehension on immediate test: results of a multiple-choice questionnaire immediately after reading.
3. Comprehension on delayed test: results of a multiple-choice questionnaire in 1 hour after reading.

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**Results so far**:

1. Sans serif and serif fonts have the same outcome.
2. Ragged-right non-hyphenated and justified hyphenated texts have close outcome—with slight advantage for the ragged-right.

# Problems with ragged-right vs. justified experiment

Two differences: right edge *and* hyphenation.

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# Suggestion

Let us try to separate these phenomena: justified unhyphenated text vs. ragged right unhyphenated text.

**TEXnical note**
How can you get justified unhyphenated text? You need to suppress hyphenation and allow bad spaces. With Babel:

```
\selectlanguage{nil}\sloppy
```

Without Babel:

```
\usepackage[none]{hyphenat}
\sloppy
```

# Justified vs. ragged right

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# Sloppily justified vs. correctly justified

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# Experimental setup

$n = 20$ subjects (so far!). Cyrillic texts. Elderly inpatients,
informed consent, no dementia, cerebrovascular disorders.
Each reads text A and text B. Randomized controlled trial.
(Randomized by a computer program).
Half receive text A sloppily justified, half receive it ragged right.
We measure speed of reading, immediate and delayed test results.
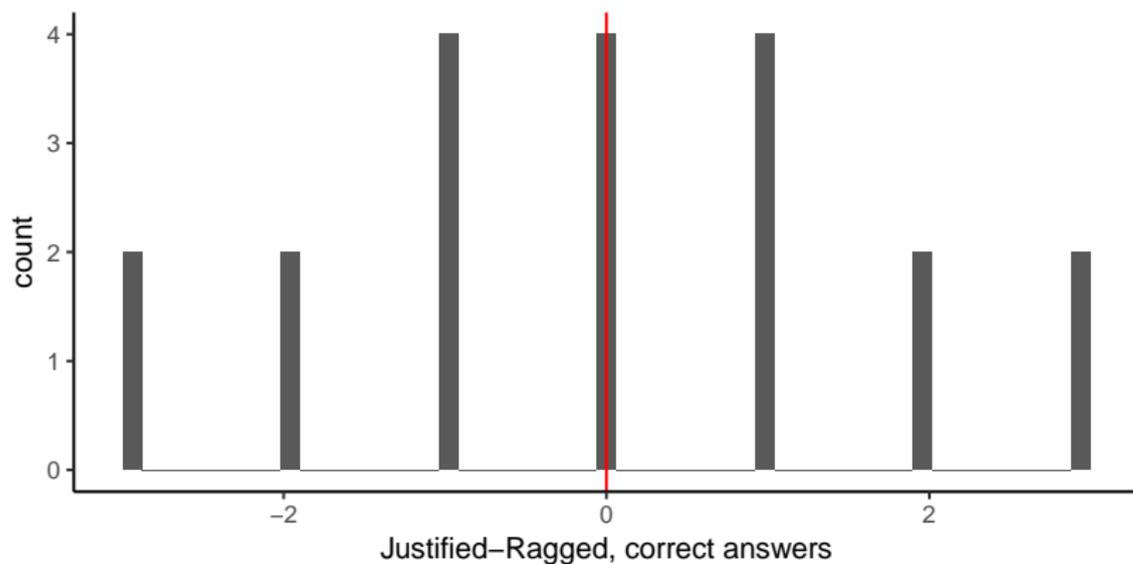
# Results: reading speed
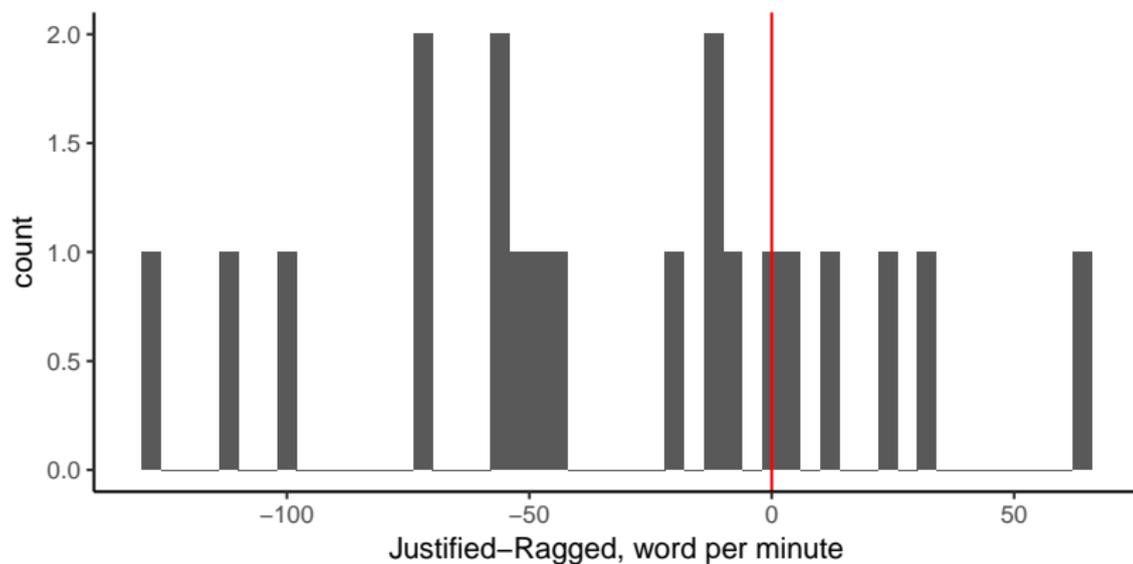


$p = 0.01$. Average difference $-32.3$ words per minute.

# Results: immediate test
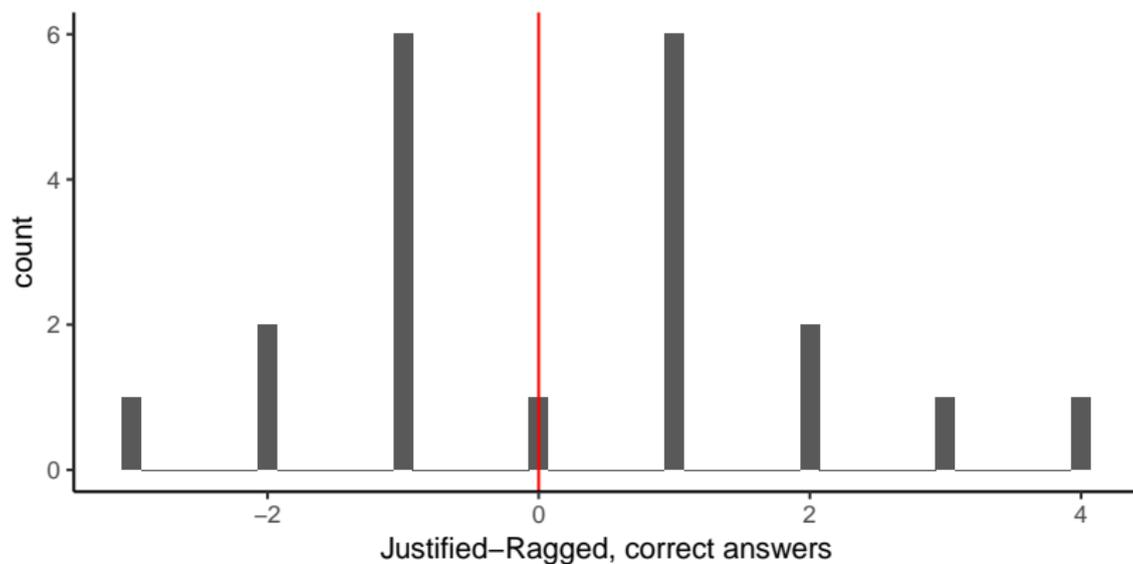


$p = 0.62$. No difference.

# Results: delayed test



$p = 1$. No difference.

# Discussion

The number of participants was small, $n = 20$. Still, we have a striking results: bad lines are bad for reading.
Why? Maybe large uneven spacing is bad for text reading?

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**Practical recommendations**

1. If you have a good hyphenation algorithm, you may justify your text for æstetic reasons.
2. If you cannot hyphenate, do not justify!
3. \sloppy is not your friend!

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An example: ACM classes.