

Computer-generated MNREAD sentences for measuring acuity and reading-speed: A comparison of Times and Courier

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MNREAD sentences

The MNREAD Acuity Chart¹ uses sentences that are standardized for their vocabulary, length, and physical layout.

Vocabulary

Selected from the 3000 highest frequency words in 3rd-grade printed materials²

Length

60 characters, including a space between each word and an implied period at the end of the sentence

Layout

$20 \times \bar{w} - w_{\text{space}}$

They said it was an
easy drive from the
caves to her school

- 3 lines of left-right justified text in Times-Roman
- line length = $20 \times \bar{w} - w_{\text{space}}$
 - $\bar{w}$ = average character width (calculated from 11,000 60-character sentences with first letter in uppercase)
 - w_{space} = width of a space character
- the between-word spaces may be narrowed by no less than 80% or widened by no more than 125% to achieve left-right justification

There is a demand for a large corpus of sentences:

- ▶ for clinical research requiring many repeated measures,
- ▶ for new vision tests that use multiple trials at each print size,
- ▶ for evaluating effects of text variables other than print size.

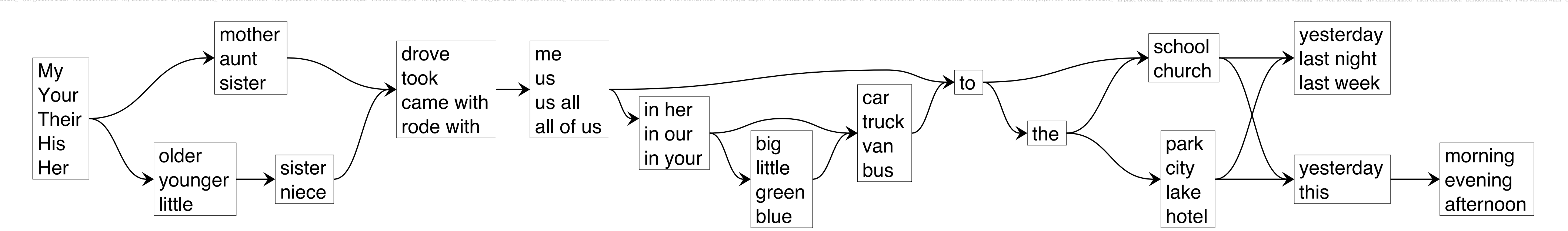
But it has been difficult to create sentences that meet all the MNREAD constraints. There are **only 95 sentences** distributed across five versions of the MNREAD Acuity Chart.

Until now!

We have created algorithmic sentence generators that write sentences that meet the MNREAD vocabulary, length, and layout constraints.

Sentence generators

1. Each generator has a phrase-structure grammar that produces simple declarative sentences using 3rd-grade-level vocabulary.



Example sentence grammar. To increase the number of sentences that will fit the MNREAD constraints, the grammars use a variety of word lengths and sentence structures, and are tailored to produce sentences with an average length of 60 characters.

We have 11 generators that differ in their sentence structures and vocabulary selections. These generators have spewed³ out more than a billion candidate sentences.

2. We filter these to select sentences with 60 characters ...

0 10 20 30 40 50 60
Their sister drove us in your blue truck to the school last week
His aunt came with all of us in our van to church last week
My aunt took me in her big van to school this evening
Her aunt rode with us all in her van to church last night
His mother came with us all in your van to school yesterday
His younger sister came with all of us in her big van to school yesterday morning
Her younger niece took us in her truck to school last night

Approximately 1 in 30 sentences fit the length constraint.

3. ... that fit the MNREAD layout constraints.

His aunt came with
all of us in our van
to church last week

His mother came
with us all in your
van to school
yesterday

Her younger niece
took us in her truck
to school last night

Approximately 1 in 8000 sentences fit the length and layout constraints.

Overall, this has yielded **116,000** MNREAD-compliant sentences.

A) His aunt came with me in her small bus to church last night
B) Your friend usually loves to play at the pool on sunny days
C) I must write poems to your father while watching television
D) The young girl told me not to hide near the beach for a day
E) It was almost seven kilometers from the ocean to their town
F) My uncle told both of you to row to the island this morning
G) Your brother asked for the chicken and potato pie for lunch
H) Our coach asked us for a glass of water and a piece of cake
I) Your mother hoped the students put the string in the church
J) Rather than making dinner we will play in the cabin tonight
K) Our mom has a pet pig with a big pink patch on its left leg

Example sentences from each of the 11 generators (A-K)

Reading performance with these sentences is comparable to that with the original MNREAD sentences.⁴

MNREAD variations

Our sentence generators also allow us to test variations of the MNREAD constraints. For example:

Font — We can create sentences for any font (given the font's width metrics.) Some sentences fit the MNREAD constraints for more than one font. This allows for comparisons of reading performance across different fonts using identical sentences.

There are four stop
lights between your
school and the lake

**There are four stop
lights between your
school and the lake**

There are four stop
lights between your
school and the lake

There are four stop
lights between your
school and the lake

There are four stop
lights between your
school and the lake

Example sentence that fits the MNREAD format for Eido, Maxular, Courier, Helvetica, and Times.

Line length — We can create sentences with different line lengths. This allows testing for situations where text layout is constrained by the reader's device (e.g., tablet, iPhone, desktop display, etc.)

The farmer likes to have breakfast when it is sunny outside
His child ate a cup of chicken and vegetable soup for lunch
I will often read the newspaper out loud to our grandmother
Her aunt came with me in her blue car to the lake yesterday
This young girl keeps a goat with a white mark over its eye

Example MNREAD sentences generated to fit 1, 2, 3, 4, and 5 lines.

Reading speed for Times & Courier

Here we demonstrate the use of our generated sentences to compare reading performance with the Times and Courier fonts.

Participants

- 50 students with normal or corrected-to-normal vision

Materials

- 480 MNREAD sentences in both Times and Courier
- Printed in 8-page booklets, 60 sentences per page (print size= 1M)
- The sentence order was the same in each booklet
- The font order (alternating pages of Times and Courier) was counterbalanced between booklets.

Procedure

- For each page, the students read as many sentences as they could in 2 mins (indicating whether each sentence 'made sense').

Results

Times was read 3.5% faster than Courier [CI=0.6%–6.4%, $p < 0.05$].

This outcome is consistent with findings using earlier versions of the MNREAD chart, showing a reading speed advantage for Times over Courier in readers with normal vision.⁵

Conclusions

Our sentence generator substantially expands the reading materials for clinical research on reading vision using the MNREAD test.

References

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