Does the wording of health messages influence their effectiveness?

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BACKGROUND

Health messages often include negations such as 'no' and 'not'[1].

Negations are more likely to be misinterpreted and take longer to read and understand, causing more comprehension errors than positive statements[2-3]. Negations are also short words, and so are likely to be frequently skipped[4].

Increasing the salience of a word is using methods such as bold and underlining to increase its prominence. No studies to date have assessed the impact of increasing the salience of the negation in health messages, e.g. '**not**'.

It is known that skim reading results in reduced understanding[5], however the impact of negations and increasing word salience on skimming have not yet been assessed. This is crucial for improving health message communication.

PLAN/AIM

Aim: Three experiments are planned, all assessing the impact of increasing the salience of negation on the understanding and remembering of health messages during normal and skim reading.

Experiment 1: Online normal reading experiment (Completed)
Experiment 2: Online skim reading experiment (Completed)
Experiment 3: In-person eye tracking experiment (Not yet completed)

Hypotheses, method and analysis preregistered: https://osf.io/s7gr9 & https://osf.io/v8uk6

METHODS

Two online experiments, each had 48 adults (aged 18-35), recruited using Prolific.

Negation conditions: 160 statements described fictional health conditions; 40 positive, 40 standard negation (e.g. 'not), 40 salient negation (e.g. '**not**') , and 40 positive fillers.

Question time: Statements followed by immediate and delayed comprehension questions.

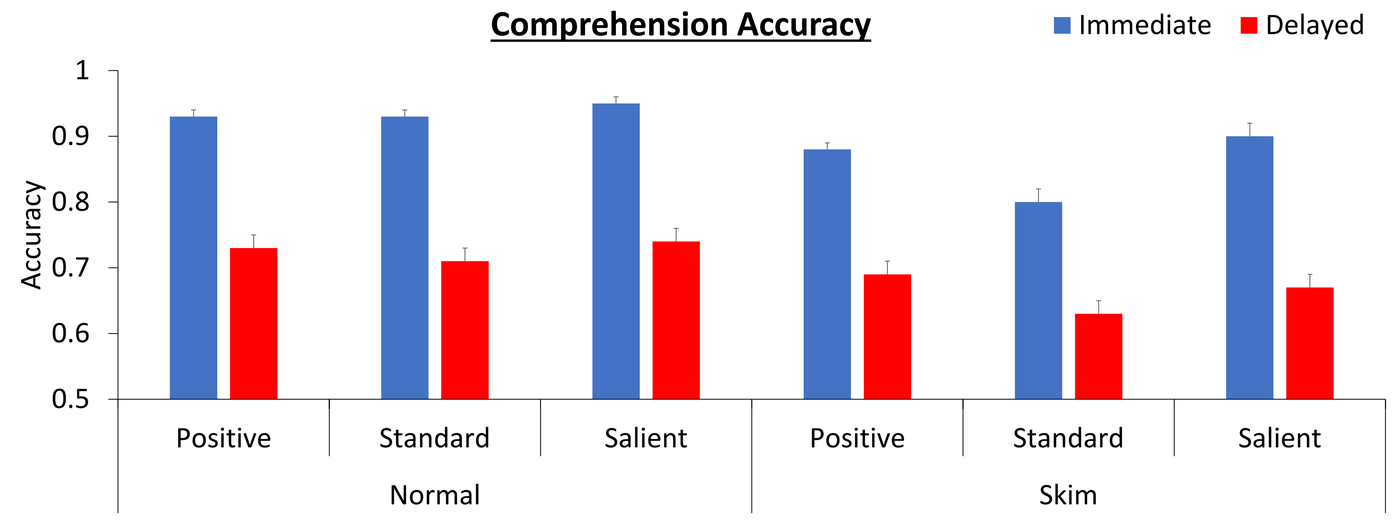
Strategy: Experiment 1: Normal reading; Experiment 2: Skimming

Example sentence & question		
Positive	Fever is a core symptom of frigavirus.	
Standard negation	Fever is not a core symptom of frigavirus.	
Salient negation	Fever is **not** a core symptom of frigavirus.	
Question	Frigavirus sufferers are...	likely to have a high temperature. unlikely to have a high temperature.

Analysis: G/LMMs, with by participant and by item random intercept and random slope

- DVs : **Evaluation time; Comprehension accuracy**
- Model 1: Negation (positive vs. standard; standard vs. salient) * Question (immediate vs. delayed) * Strategy (reading vs. skimming)
- Model 2: Negation (positive vs. salient) * Question (immediate vs. delayed) * Strategy (reading vs. skimming)

RESULTS

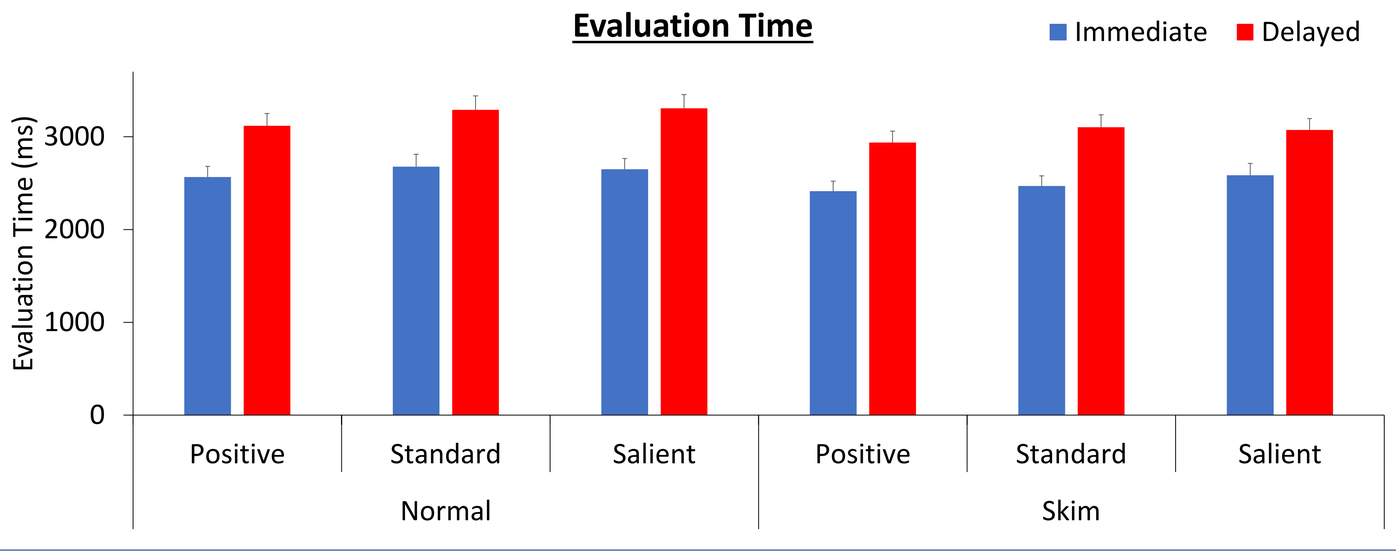


Accuracy lower for skimming than normal reading, and lower for delayed than immediate. Effect of strategy larger for immediate than delayed.

Positive vs. Standard negation: Accuracy lower for standard negation than positive, but only during skimming, and more pronounced for immediate than delayed questions.

Standard vs. Salient negation: Accuracy lower for standard than salient negation statements, with this difference more pronounced during skimming than reading normally, particularly for immediate questions.

Positive vs. Salient negation: Similar accuracy between positive and salient negation, with no interaction with time and/or strategy.



Evaluation times did not differ between strategies, but longer times for delayed than immediate questions.

Positive vs. standard negation: Longer evaluation times for standard negation than positive. No interactions.

Standard vs. Salient negation: For skimming, longer evaluation times for salient than standard negation for immediate questions.

Positive vs. Salient negation: Longer evaluation times for salient negation than positive.

DISCUSSION AND CONCLUSIONS

- Poorer accuracy was seen for standard negation statements than positives, but only during skimming. This suggests that skimming standard negation statements very likely causes misinterpretation, possibly due to skipping of the negations.
- Increasing the salience of negations improved comprehension accuracy to the level of positives. This could be due to a reduction in the skipping of the negator, reduced processing, or more careful decision making.
- Skimming resulted in lower accuracy, but no difference in the time spent evaluating the questions. Thus, lower comprehension during skimming may be related to the processing stage, e.g. shorter processing times, poorer integration.
- Overall, negations cause reduced understanding and so should be avoided in health messages that are likely to be skim read. If negations are needed, then increasing the salience of the negation, by underlining and bolding it, is beneficial for understanding and remembering.

PROPOSED EYE MOVEMENT STUDY

Effects of standard negation in Experiments 1 and 2 may be driven by the negator being skipped or only fixated for a short time (particularly during skimming). Similarly, benefits of increased negator salience may be due to reduced skipping and/or longer fixation times for the negator.

Experiment 3: Using the same materials as Experiments 1 and 2, we will track reader's eye movements as they read sentences and answer comprehension questions.

- Within-subject manipulations of negation (positive, standard negation, salient negation) and reading goal (normal reading, skimming).
- It is expected that increased salience will result in increased fixations and/or increased rereading. During skimming, heightened effects of salience are likely, with increased skipping and reduced rereading.
- The results will inform us about why negations are more difficult to process (both in health messages and other types of text), and why increasing negator salience may alleviate this.

References

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