Retelling Uncertainty

Numerical formats improve serial reproduction of probability compared to verbal formats

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In choosing a format to communicate uncertainty, we aim to transmit our message accurately and without bias. The present research demonstrates, using messages from official documents on politics, environment, public health and economy, that numbers are more likely to achieve this goal than words.

Summary

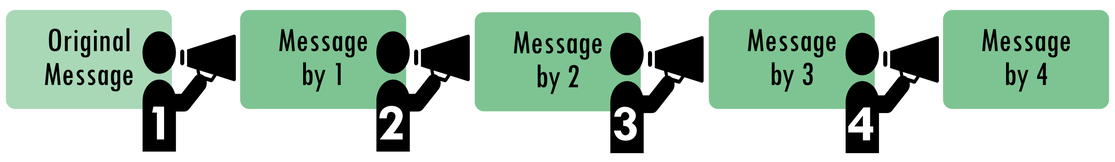
Formats to Communicate Uncertainty

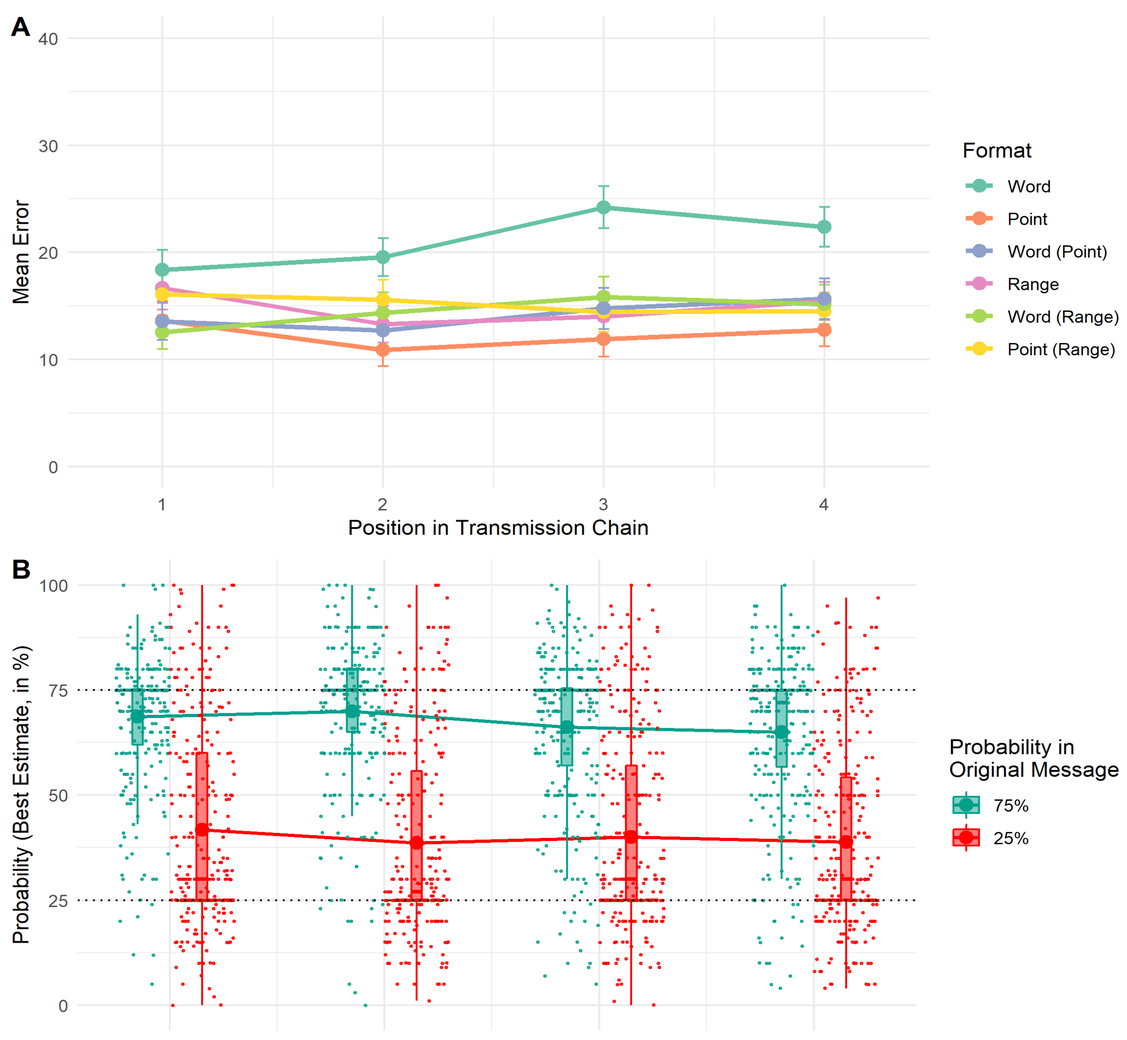
- The signs we use in communication shape the information we pass on to receivers (e.g., listeners, readers; Fiedler et al., 2008)
- To communicate uncertainty, we can choose from various signs: *verbal* and *numeric* formats are most frequently used (e.g., Dhami & Mandel, 2021)
- Therefore, we investigated how the choice of format influences how probability estimates change after communication.

	Russia is developing a ground-launched anti-satellite missile system for targeting in low-Earth orbit.
Word	It is **likely** to be operational within the next 3 years.
Numeric Point	It has a **75% chance** to be operational within the next 3 years.
Numeric Range	It has a **70-80% chance** to be operational within the next 3 years.
Word (Point)	It is **likely (75% chance)** to be operational within the next 3 years.
Word (Range)	It is **likely (70-80% chance)** to be operational within the next 3 years.
Point (Range)	It has a **75% (70-80%) chance** to be operational within the next 3 years.

Telling and Retelling
The Serial Reproduction Paradigm

- Rather than receiving uncertainty messages directly (e.g., from a report), people may receive them indirectly from 'retellings' (e.g., in meetings, media coverage). The main goal of retelling uncertainty information is to communicate the original message **accurately** (exactly reproducing the original probability) and without **bias** (deviations from the original probability occur at random).
- To investigate how probability estimates change when they are passed on between persons, we employed the **serial reproduction paradigm** (Bartlett, 1932)
- In this paradigm, one group of participants receives the original messages (**first position in the transmission chain**). They then retell the messages for the next participants. Another group of participants (second position in the transmission chain) then receives the retold messages from the first group, without ever seeing the original messages. They retell the messages to the next group of participants (third position in the transmission chain) and so forth.





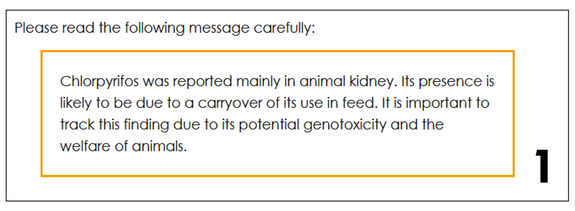
Method

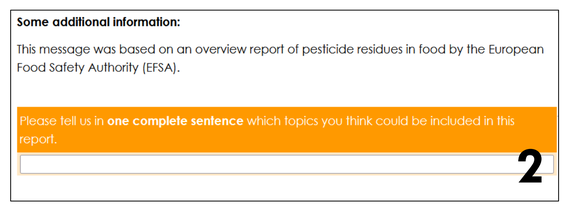
Participants: 204 English-speakers (105 male, age m = 28.32, 18 – 66)

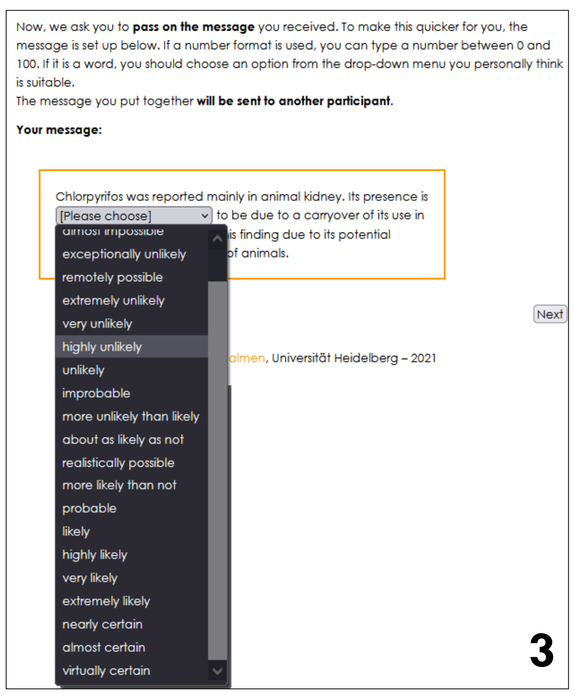
Design: 4 x 6 x 2 mixed design with participants in four positions of the transmission chain (between-subjects), who each received messages in six different formats (word, numeric-range, numeric-point, and their combinations) with a high and a low starting probability value (75%, 25%)

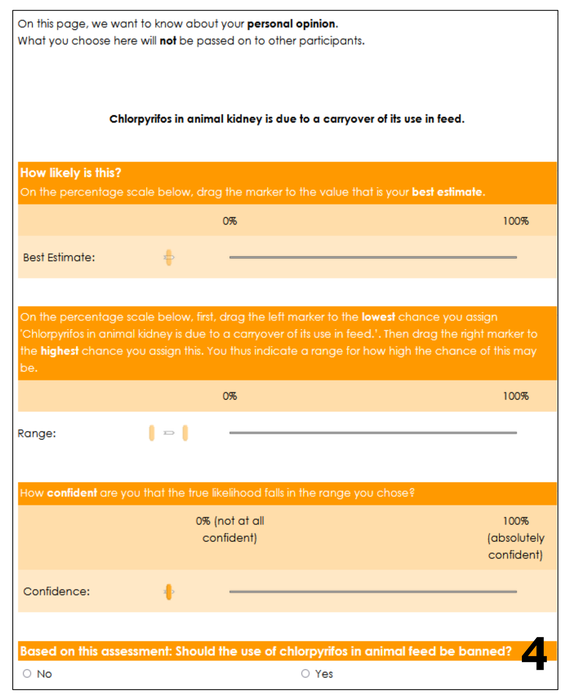
Material: 24 statements including expressions of uncertainty taken from official documents and reports from international, EU and UK institutions within four domains (politics, environment, public health, economy)

Procedure: Each participant received 12 messages in total.









Analyses: The experimental conditions are used as predictors in linear (error and bias measures) and logistic (message distortion and choices) mixed-effects regression, which include random effects for participants and statements.

Results

(1) Messages that used **words were most likely distorted** (different from the original message), *OR* = 2.36 – 2.77, $p < .001$
Messages that used **purely numeric formats were least likely distorted** *OR* = 0.51 – 0.32, $p < .001$
Amount of **distortion increased across the transmission chain for the verbal format** (b = 2.58 [0.80 – 4.35], $t(1112.1) = 2.84$, $p < .01$).
Distortion remained constant across the transmission chain for the five other formats.
See **Graph A** for corresponding error (deviation of best estimate from original probability) data.

(2) Messages are **more persuasive (lead to more choices to act) when we use numbers compared to words**
OR = 1.71 – 2.00, $p < .001$

(3) Messages with **low probabilities transmitted less faithfully than high probabilities** (b = 11.11 [7.98 – 14.25], $t(2170.6) = 6.95$, $p < .001$).
Low starting probabilities show stronger regression to the mean (b = 16.25 [10.64 – 21.85], $t(1330.7) = 5.68$, $p < .001$) compared to high starting probabilities (b = -4.14 [-9.75 – 1.47], $t(1330.7) = -1.45$, $p = .15$). See **Graph B**.

Conclusion

- the **choice of format to communicate uncertainty should not be arbitrary**. It has clear-cut downstream consequences for judgment and decision making
- information exchange through communication and retold material is an integral part of harnessing the power of expertise and pooling knowledge to deal with uncertainty
- the findings can inform organizations and practitioners who aim to communicate and retell uncertainty accurately

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References