

Climate scientists' wide prediction intervals may be more likely but are perceived to be less certain

Article

Supplemental Material

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Supplementary materials

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Experiment 1

9 Procedure

10 The study was part of a study taking place over 15 days, with the participants
11 responding to different questionnaires on each of the consecutive days of the study. Ninety-
12 one participants took part in the initial study when they completed a series of individual
13 differences measures, among these measures was a test of cognitive reflection (i.e., the ability
14 to override an intuitive response; Frederick, 2005). Eighty-one of these participants completed
15 a daily survey for 14 days. As explained in the main manuscript, the participants answered
16 questions about which of a narrow and a wide interval “is most likely to be correct” and
17 “conveys most uncertainty” on days 3 and 6, with the same questions repeated on day 9 and
18 11, but here, including an explanation for the variability in the expert forecasts. On day 14 the
19 participants’ belief in climate change was measured using four questions taken from Heath
20 and Gifford (2006).

21 Analysis

22 We conducted a generalized estimating equation (GEE) for multinomial dependent
23 variables (Hardin & Hilbe, 2002), with the question (“conveys most uncertainty” vs. “most
24 likely to be correct”), the scenario, the presence of an explanation for variability, and their
25 two-level interactions as independent variables, and interval choice (narrow, wide, equal) as
26 the dependent variable. Type of question affected participants’ choice: narrow intervals were
27 chosen more often as the prediction that was “most likely to be correct” than as the prediction
28 that “conveys most uncertainty” (tests of Model Effects), Wald $\chi^2(1) = 6.96, p = .008$.
29 Scenario did not have an effect on interval choice, nor did it interact with the question, Wald
30 $\chi^2(1) < 0.01, p = .971$ and Wald $\chi^2(1) = 0.29, p = .588$, respectively. The presence of an
31 explanation for variability did not affect interval selection, nor did it interact with the question
32 type, Wald $\chi^2(1) = 2.08, p = .150$ and Wald $\chi^2(1) = 0.20, p = .654$.

33 We conducted the same GEE with climate change and cognitive reflection as
34 covariates along with their interaction with the question manipulation (likely vs. uncertain)
35 because we hypothesized participants with higher cognitive reflection would endorse more
36 frequently the view that wide intervals are more likely to be correct than narrow intervals, and
37 to find narrow intervals as conveying more uncertainty than wide ones. Similarly, we
38 expected climate change belief to determine range selected: the wide range, which featured
39 more extreme climate change values was expected to be more often selected as likely but less
40 often as uncertain for those scoring higher on this variable. The introduction of the covariates
41 reduced the effect of the question manipulation which was no longer statistically significant,
42 Wald $\chi^2(1) = 1.87, p = .171$. Cognitive reflection predicted the interval selection but did not
43 interact with the condition, Wald $\chi^2(1) = 4.11, p = .043$ and Wald $\chi^2(1) = 0.82, p = .367$.
44 Specifically, participants with higher scores on the CRT less often chose the “equal” option,
45 and instead preferred any of the other two options as being “more likely to be correct”, and
46 more often chose the wide interval as conveying uncertainty. Further, climate change belief
47 did not have a main effect nor interacted with the question to determine interval selection,
48 although the interaction was close to statistical significance, Wald $\chi^2(1) = 0.11, p = .741$ and
49 Wald $\chi^2(1) = 3.43, p = .064$.

50

51 **Experiment 2**

52 **Procedure**

53 The materials were the same as in Experiment 1, but with question type and reason for
54 variability varied between subjects in a 2 x 2 design.

55 **Analysis**

56 We conducted a GEE for multinomial dependent variable with question (“conveys
57 most uncertainty” vs. “most likely to be correct”), scenario, explanation for variability

58 (present vs. absent) and their interactions as independent variables, and interval choice
59 (narrow, wide, equal) as the dependent variable. The GEE showed that only the question type
60 had an effect on the interval selection, Wald $\chi^2(1) = 24.13, p < .001$. The scenario (sea level
61 vs. temperature) and the presence of a reason did not have a main effect on the interval
62 selected, Wald $\chi^2(1) = 0.24, p = .627$ and Wald $\chi^2(1) = 1.06, p = .303$, nor were any of the
63 interaction terms statistically significant, Wald $\chi^2(1) < 1.02, p$'s $> .05$.

64

65 **Experiment 3**

66 **Procedure**

67 Participants in Experiment 3 were again given wide and narrow interval predictions
68 about sea level and temperature rise, but in this case, were given either a question about which
69 prediction “conveys more [un]certainty” or which prediction is “more [un]certain to be
70 correct”. In other words, question type (conveys vs. to be correct) and directionality
71 (uncertain vs. certain) was varied between subjects in a 2 x 2 design.

72 As a secondary hypothesis, Experiment 3 also investigated whether perceptions of the
73 forecaster may be influenced by the question types, which would evoke either the
74 informativeness or the accuracy mindset. Hence, after selecting which interval conveys more
75 (un)certainty or is more (un)certain to be correct, participants rated which team seemed more
76 trustworthy, seemed to have most knowledge (about temperature rise or sea level rise),
77 seemed to have the best models (for predicting temperature rise or sea level rise), and which
78 team seemed to be most competent, on scales from 1 (definitely the team with the wide
79 interval) to 5 (definitely the team with the narrow interval). Note that this hypothesis as well
80 as the results and analysis, is described in full in the main manuscript.

81 **Analysis**

82 We conducted a GEE for multinomial dependent variable with the question (to be
83 correct vs. convey), the directionality of the term (uncertain vs. certain) and the scenario (sea
84 level vs. temperature), and all possible interactions between them, as independent variables,
85 while interval choice (narrow, wide, equal) was the dependent variable. The analysis found
86 that interval choice was not significantly affected by the question, Wald $\chi^2(1) = 1.20, p =$
87 $.274$, but there was an effect of directionality, Wald $\chi^2(1) = 13.60, p < .001$, and, more
88 importantly, an interaction between the two main factors, Wald $\chi^2(1) = 25.50, p < .001$. The
89 scenario did not have an effect on the interval choice, nor did it interact with the question,
90 directionality, or both of them, Wald χ^2 's $(1) < 0.41, p$'s $> .52$.

91 For the analysis and results of the secondary hypothesis, see the main manuscript.

92

93

Experiment 4

94 Procedure

95 Participants were given the same scenarios as in previous experiments, and told to
96 choose which of a wide and a narrow interval conveyed more (un)certainty or was more
97 certain to be correct, in three between-subjects conditions. In this experiments, there was no
98 “equal” option, so participants chose between the wide and the narrow interval in each
99 condition. After selecting which interval conveys more (un)certainty or which interval is more
100 certain to be correct, participants rated the fluency of the predictions of sea level and
101 temperature rise featuring a narrow and a wide interval. The forecasts focused on either a
102 wide or a narrow interval and featured either the quantifier certain or uncertain. Participants
103 assessed the fluency of the resulting four forecasts in the sea rise context and in the
104 temperature rise context. The fluency of each forecast was measured through four questions:
105 the extent to which it was easy to understand, how intuitively and quickly it could be
106 understood and whether it was hard to process (reverse coded). In addition, four items

107 measured the perceived expertise of the team making the prediction in terms of how much it
 108 knew, whether the team had knowledge, experience and expertise (the full questionnaire for
 109 Experiment 4, including the questions for fluency and expertise are provided on pages 17-22
 110 in the Supplementary materials). The reliability of the fluency scale was good for certainty
 111 and uncertainty and for the two interval widths (Cronbach's $\alpha > .80$). The reliability of the
 112 expertise was also good for the two interval widths (Cronbach's $\alpha > .80$). We computed
 113 difference scores for fluency and expertise by subtracting the average score of the narrow
 114 interval by the score of the wide interval. Greater scores of fluency and expertise indicate that
 115 participants judged the narrow interval more fluent and inferred that their forecasters had a
 116 greater expertise compared to wider intervals.

117 **Analysis**

118 Participants believed that the wide interval both conveyed more uncertainty and was
 119 more certain to be correct, while the narrow interval was seen as conveying more certainty.
 120 Thus, removing the incorrect option of “the intervals are equal” led to a majority choosing the
 121 accuracy mindset when the question is focused on accuracy. The focus of the question had an
 122 effect on the interval chosen in both the temperature and the sea rise contexts, $\chi^2(2, N = 302)$
 123 $= 75.8, p < .001, \phi = .50$ and $\chi^2(2, N = 302) = 77.14, p < .001, \phi = .51$.

124

125 Table S2. Mean ratings (SD) in Experiment 4.

	Temperature intervals		Sea rise intervals	
	Narrow	Wide	Narrow	Wide
Expertise	3.79 (0.84)	2.82 (0.90)	3.70 (0.83)	2.80 (0.83)
Fluency certain	3.89 (0.89)	3.63 (1.01)	3.85 (0.90)	3.58 (1.04)
Fluency uncertain	3.34 (0.82)	3.14 (0.86)	3.38 (0.80)	3.18 (0.86)
Fluency total	3.71 (0.91)	3.47 (0.99)	3.69 (0.89)	3.45 (1.00)

126

127 *Effect of interval width on fluency and perceived expertise.*

128 As shown in Table S2, participants judged the narrow interval as reflecting more
129 expertise and to be easier to process (i.e., more fluent) than the wide interval. Further, the
130 prediction was judged harder to process if it was about uncertainty than if it was about
131 certainty. A mixed design ANOVA with interval width and scenarios as within-subject
132 independent variables and certainty word (certain vs. uncertain) as between-subjects
133 independent variable confirmed this impression, showing a main effect of the interval width
134 and certainty word on fluency, $F(1, 300) = 27.10, p < .001, \eta^2_p = .08$ and $F(1, 300) = 21.97, p$
135 $< .001, \eta^2_p = .07$. There was no interaction effect between the width of the interval and the
136 certainty word, $F(1, 300) < 1, \eta^2_p < .01$.

137
138

Experiment 5

139 Procedure

140 In Experiment 5, participants were given the same scenarios as in previous
141 experiments, but in this case, a third interval was included. This means that participants were
142 asked to select which of a (very) narrow, a “medium”, and a wide interval conveyed more
143 (un)certainty or is more certain to be correct, in three between-subjects conditions.

144 Experiment 5 also included three measures of individual differences that might be
145 related to the belief that wide intervals are more uncertain and narrow intervals are more
146 certain or convey more certainty, namely a climate change belief scale (Heath & Gifford,
147 2006), a numeracy scale (Lipkus, Samsa, & Rimer, 2001), and a disjunction task (Costello,
148 2009). The climate change and disjunction scales had satisfactory reliability, Cronbach's $\alpha =$
149 $.83$ and Cronbach's $\alpha = .98$, while the numeracy scale had a reliability that was lower than
150 expected, Cronbach's $\alpha = .54$. The individual difference measures were presented as one
151 block of questions (in randomized order), and the order of the individual differences block
152 and the interval selection block was randomized.

153 Analysis

154 **Interval selection.** Participants believed that the wide interval conveyed more
155 uncertainty and was more certain to be correct, while the narrow interval was thought to
156 convey more certainty. The focus of the question had an effect of the interval chosen in both
157 the temperature and the sea rise contexts, $\chi^2(4, N = 101) = 28.56, p < .001, \phi = .53$ and $\chi^2(4, N$
158 $= 302) = 28.85, p < .001, \phi = .49$.

159 **Individual differences.** There were no clear correlation patterns between interval
160 choice and the individual difference measures across groups. And since there were only 31-35
161 participants in each condition in this experiment, we did not have enough power to detect
162 effects within each condition. Thus, we do not further describe these results.

163
164
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Experiment 6

Procedure

166 See main text.

Analysis

Individual differences.

169 Three participants did not respond to either the CRT or the numeracy test, and one
170 additional participant did not respond to the CRT (and only partially to the numeracy test). To
171 be as conservative as possible, these four participants were included in the analyses of the
172 ratings of the two mindsets as described in the main text, but were necessarily excluded in the
173 analyses of individual differences. Participants on average had 1.54 correct answers on the
174 CRT ($SD = 1.17$), with 23.8% getting a score of zero, and 29.5% getting all answers correct.
175 The CRT score did not differ between conditions, $F(1,99) = 1.369, p = .245, \eta^2_p = .014$.
176 Sixteen participants reported seeing the CRT-questions earlier, and scored higher ($M = 2.13,$
177 $SD = .96$) than those who had not seen the questions before ($M = 1.44, SD = 1.18$), $F(1,99) =$
178 $4.854, p = .030, \eta^2_p = .047$. On the numeracy test, there were also no difference in scores
179 between conditions, $F < 1$. The mean score across participants was 3.67 ($SD = 1.36$).

180 Neither CRT ($r = .005, p = .958$) nor numeracy ($r = .093, p = .355$) correlated
181 significantly with the average difference score. However, we did find positive correlations
182 between CRT and the average separate ratings of the informativeness and the accuracy
183 mindsets, $r = .204, p = .040$, and $r = .208, p = .037$, respectively. Similarly, numeracy
184 correlates positively with the informativeness mindset, $r = .243, p = .014$, and the accuracy
185 mindset, $r = .141, p = .161$.

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189 **References**

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205 **Questionnaire Experiments 1 and 2**

206

207 Informativness-focused question

208 Without reason for variability

209 Projections of future changes in temperature

210 Two teams of climate scientists have made the following predictions regarding the
211 temperature rise by 2099. Please select the prediction that conveys the greatest level of
212 uncertainty.

- 213 Team A: The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius. (1)
214 Team B: The temperature will increase between 2.2 ° Celsius and 5.4 ° Celsius. (2)
215 The two predictions convey the same level of uncertainty. (3)

216

217 Projections of future changes in sea level

218 Two teams of climate scientists have made the following predictions regarding the sea level
219 rise by 2099. Please select the prediction that conveys the greatest level of uncertainty.

- 220 Team X: The sea level will rise between 18 centimeters and 59 centimeters. (1)
221 Team Y: The sea level will rise between 23 centimeters and 51 centimeters. (2)
222 The two predictions convey the same level of uncertainty. (3)

223

224 With reason for variability

225 Projections of future changes in temperature

226 Two teams of climate scientists have made the following predictions regarding the
227 temperature rise by 2099. Please select the prediction that conveys the greatest level of
228 uncertainty.

- 229 Team A: The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius in
230 different countries. (1)
231 Team B: The temperature will increase between 2.2 ° Celsius and 5.4 ° Celsius in
232 different countries. (2)
233 The two predictions convey the same level of uncertainty. (3)

234

235 Projections of future changes in sea level

236 Two teams of climate scientists have made the following predictions regarding the sea level
237 rise by 2099. Please select the prediction that conveys the greatest level of uncertainty.

- 238 Team X: The sea level will rise between 18 centimeters and 59 centimeters in different
239 parts of the world. (1)
240 Team Y: The sea level will rise between 23 centimeters and 51 centimeters in different
241 parts of the world. (2)
242 The two predictions convey the same level of uncertainty. (3)

243

244 Accuracy-focused question

245 Without reason for variability

246 Projections of future changes in temperature
247 Two teams of climate scientists have made the following predictions regarding the
248 temperature rise by 2099. Please select the prediction that is the most likely to be correct.
249 Team A: The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius. (1)
250 Team B: The temperature will increase between 2.2 ° Celsius and 5.4 ° Celsius. (2)
251 The predictions are equally likely to be correct. (3)

252
253 Projections of future changes in sea level
254 Two teams of climate scientists have made the following predictions regarding the sea level
255 rise by 2099. Please select the prediction that is the most likely to be correct?
256 Team X: The sea level will rise between 18 centimeters and 59 centimeters. (1)
257 Team Y: The sea level will rise between 23 centimeters and 51 centimeters. (2)
258 The predictions are equally likely to be correct. (3)

259
260 With reason for variability

261 Projections of future changes in temperature
262 Two teams of climate scientists have made the following predictions regarding the
263 temperature rise by 2099. Please select the prediction that is the most likely to be correct.
264 Team A: The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius in
265 different countries. (1)
266 Team B: The temperature will increase between 2.2 ° Celsius and 5.4 ° Celsius in
267 different countries. (2)
268 The predictions are equally likely to be correct. (3)

269
270 Projections of future changes in sea level
271 Two teams of climate scientists have made the following predictions regarding the sea level
272 rise by 2099. Please select the prediction that is the most likely to be correct.
273 Team X: The sea level will rise between 18 centimeters and 59 centimeters in different
274 parts of the world. (1)
275 Team Y: The sea level will rise between 23 centimeters and 51 centimeters in different
276 parts of the world. (2)
277 The predictions are equally likely to be correct. (3)

278
279

280 **Questionnaire Experiment 3**

281

282 Informativeness-focused questions

283 Conveys uncertainty

284 Projections of future changes in temperature

285 Two teams of climate scientists have made the following predictions regarding the
 286 temperature rise by 2100. Please select the prediction that conveys more uncertainty.

- 287 Team A: The temperature will increase between 1.5° Celsius and 5.5° Celsius (1)
- 288 Team B: The temperature will increase between 2.5° Celsius and 4.5° Celsius (2)
- 289 The two predictions convey an equal degree of uncertainty (3)

290

291 Please also indicate which team you prefer for each of the questions below.

	Definitely Team A		No difference		Definitely Team B
	1	2	3	4	5
Which team seems more trustworthy?					
Which team seems to have more knowledge about temperature rise?					
Which team do you think has better models for predicting temperature rise?					
Which team seems to be more competent?					

292

293 Projections of future changes in sea level

294 Two teams of climate scientists have made the following predictions regarding the sea level
 295 rise by 2100. Please select the prediction that conveys more uncertainty.

- 296 Team X: The sea level will rise between 20 centimeters and 60 centimeters (1)
- 297 Team Y: The sea level will rise between 30 centimeters and 50 centimeters (2)
- 298 The two predictions convey an equal degree of uncertainty (3)

299

300 Please also indicate which team you prefer for each of the questions below.

	Definitely Team X		No difference		Definitely Team Y
	1	2	3	4	5
Which team seems more trustworthy?					
Which team seems to have more knowledge about sea level rise?					
Which team do you think has better models for predicting sea level rise?					
Which team seems to be more competent?					

301

302 Conveys certainty

- 303 Projections of future changes in temperature
 304 Two teams of climate scientists have made the following predictions regarding the
 305 temperature rise by 2100. Please select the prediction that conveys more certainty.
 306 Team A: The temperature will increase between 1.5° Celsius and 5.5° Celsius (1)
 307 Team B: The temperature will increase between 2.5° Celsius and 4.5° Celsius (2)
 308 The two predictions convey an equal degree of certainty (3)

309
 310 Please also indicate which team you prefer for each of the questions below.

	Definitely Team A		No difference		Definitely Team B
	1	2	3	4	5
Which team seems more trustworthy?					
Which team seems to have more knowledge about temperature rise?					
Which team do you think has better models for predicting temperature rise?					
Which team seems to be more competent?					

- 311 Projections of future changes in sea level
 312 Two teams of climate scientists have made the following predictions regarding the sea level
 313 rise by 2100. Please select the prediction that conveys more certainty.
 314 Team X: The sea level will rise between 20 centimeters and 60 centimeters (1)
 315 Team Y: The sea level will rise between 30 centimeters and 50 centimeters (2)
 316 The two predictions convey an equal degree of certainty (3)

317
 318
 319 Please also indicate which team you prefer for each of the questions below.

	Definitely Team X		No difference		Definitely Team Y
	1	2	3	4	5
Which team seems more trustworthy?					
Which team seems to have more knowledge about sea level rise?					
Which team do you think has better models for predicting sea level rise?					
Which team seems to be more competent?					

- 320
 321 Accuracy-focused questions
 322 Uncertain to be correct
 323 Projections of future changes in temperature
 324 Two teams of climate scientists have made the following predictions regarding the
 325 temperature rise by 2100. Please select the prediction that is more uncertain to be correct.
 326 Team A: The temperature will increase between 1.5° Celsius and 5.5° Celsius (1)
 327 Team B: The temperature will increase between 2.5° Celsius and 4.5° Celsius (2)
 328 The two predictions are equally uncertain to be correct (3)

329
 330 Please also indicate which team you prefer for each of the questions below.

	Definitely Team A		No difference		Definitely Team B
	1	2	3	4	5
Which team seems more trustworthy?					
Which team seems to have more knowledge about temperature rise?					
Which team do you think has better models for predicting temperature rise?					
Which team seems to be more competent?					

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Projections of future changes in sea level

Two teams of climate scientists have made the following predictions regarding the sea level rise by 2100. Please select the prediction that is more uncertain to be correct.

- Team X: The sea level will rise between 20 centimeters and 60 centimeters (1)
- Team Y: The sea level will rise between 30 centimeters and 50 centimeters (2)
- The two predictions are equally uncertain to be correct (3)

Please also indicate which team you prefer for each of the questions below.

	Definitely Team X		No difference		Definitely Team Y
	1	2	3	4	5
Which team seems more trustworthy?					
Which team seems to have more knowledge about sea level rise?					
Which team do you think has better models for predicting sea level rise?					
Which team seems to be more competent?					

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Certain to be correct

Projections of future changes in temperature

Two teams of climate scientists have made the following predictions regarding the temperature rise by 2100. Please select the prediction that is more certain to be correct.

- Team A: The temperature will increase between 1.5° Celsius and 5.5° Celsius (1)
- Team B: The temperature will increase between 2.5° Celsius and 4.5° Celsius (2)
- The two predictions are equally certain to be correct (3)

Please also indicate which team you prefer for each of the questions below.

	Definitely Team A		No difference		Definitely Team B
	1	2	3	4	5
Which team seems more trustworthy?					
Which team seems to have more knowledge about temperature rise?					
Which team do you think has better models for predicting temperature rise?					
Which team seems to be more competent?					

350

351 Projections of future changes in sea level

352 Two teams of climate scientists have made the following predictions regarding the sea level rise by 2100. Please select the prediction that is more certain to be correct.

353 Team X: The sea level will rise between 20 centimeters and 60 centimeters (1)

354 Team Y: The sea level will rise between 30 centimeters and 50 centimeters (2)

355 The two predictions are equally certain to be correct (3)

356

357 Please also indicate which team you prefer for each of the questions below.

	Definitely Team X		No difference		Definitely Team Y
	1	2	3	4	5
Which team seems more trustworthy?					
Which team seems to have more knowledge about sea level rise?					
Which team do you think has better models for predicting sea level rise?					
Which team seems to be more competent?					

359

360 **Questionnaire Experiment 4**

361

362 Informativeness-focused questions

363

364 Conveys uncertainty

365

366 "Projections of future changes in temperatures"

367 Two teams of climate scientists have made the following predictions regarding the
368 temperature rise by 2099. Please select the prediction that conveys more uncertainty.

369 Team A: The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius. (1)

370 Team B: The temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius. (2)

371

372 "Projections of future changes in sea level"

373 Two teams of climate scientists have made the following predictions regarding the sea level
374 rise by 2099. Please select the prediction that conveys more uncertainty.

375 Team X: The sea level will rise between 18 centimeters and 59 centimeters. (1)

376 Team Y: The sea level will rise between 31 centimeters and 43 centimeters. (2)

377

378 Conveys certainty

379

380 "Projections of future changes in temperatures"

381 Two teams of climate scientists have made the following predictions regarding the
382 temperature rise by 2099. Please select the prediction that conveys more certainty.

383 Team A: The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius. (1)

384 Team B: The temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius. (2)

385

386 "Projections of future changes in sea level"

387 Two teams of climate scientists have made the following predictions regarding the sea level
388 rise by 2099. Please select the prediction that conveys more certainty.

389 Team X: The sea level will rise between 18 centimeters and 59 centimeters. (1)

390 Team Y: The sea level will rise between 31 centimeters and 43 centimeters. (2)

391

392

393 Accuracy-focused question

394

395 More certain to be correct

396 "Projections of future changes in temperatures"

397 Two teams of climate scientists have made the following predictions regarding the
398 temperature rise by 2099. Please select the prediction that is more certain to be correct.

399 Team A: The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius. (1)

400 Team B: The temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius. (2)

401

402 "Projections of future changes in sea level"
 403 Two teams of climate scientists have made the following predictions regarding the sea level
 404 rise by 2099. Please select the prediction that is more certain to be correct.

405 ○ Team X: The sea level will rise between 18 centimeters and 59 centimeters. (1)

406 ○ Team Y: The sea level will rise between 31 centimeters and 43 centimeters. (2)

407

408 Ratings of fluency

409 Certainty-conditions (conveys more certainty and more certain to be correct)

410 Please rate to what extent the sentences below are easy to understand.

	Not at all easy	Slightly easy	Quite easy	Very easy	Extremely easy
It is certain that the temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
It is certain that the temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
It is certain that the sea level will rise between 18 centimeters and 59 centimeters.					
It is certain that the sea level will rise between 31 centimeters and 43 centimeters.					

411

412

413

414 Please rate to what extent the sentences below intuitively make sense.

	Not at all intuitive	Slightly intuitive	Quite intuitive	Very intuitive	Extremely intuitive
It is certain that the temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
It is certain that the temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
It is certain that the sea level will rise between 18 centimeters and 59 centimeters.					
It is certain that the sea level will rise between 31 centimeters and 43 centimeters.					

415

416 Please rate to what extent the sentences below can be quickly understood.

	Not at all quickly	Slightly quickly	Quite quickly	Very quickly	Extremely quickly
It is certain that the temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
It is certain that the temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
It is certain that the sea level will rise between 18 centimeters and 59 centimeters.					
It is certain that the sea level will rise between 31 centimeters and 43 centimeters.					

417

418

419 Please rate to what extent the sentences below are hard to process.

	Not hard at all	Slightly hard	Quite hard	Very hard	Extremely hard
It is certain that the temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
It is certain that the temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
It is certain that the sea level will rise between 18 centimeters and 59 centimeters.					
It is certain that the sea level will rise between 31 centimeters and 43 centimeters.					

420

421 Uncertainty-condition (conveys more uncertainty)

422 Please rate to what extent the sentences below are easy to understand.

	Not at all easy	Slightly easy	Quite easy	Very easy	Extremely easy
It is uncertain that the temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
It is uncertain that the temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
It is uncertain that the sea level will rise between 18 centimeters and 59 centimeters.					
It is uncertain that the sea level will rise between 31 centimeters and 43 centimeters.					

423

424 Please rate to what extent the sentences below intuitively make sense.

	Not at all intuitive	Slightly intuitive	Quite intuitive	Very intuitive	Extremely intuitive
It is uncertain that the temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
It is uncertain that the temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
It is uncertain that the sea level will rise between 18 centimeters and 59 centimeters.					
It is uncertain that the sea level will rise between 31 centimeters and 43 centimeters.					

425

426 Please rate to what extent the sentences below can be quickly understood.

	Not at all quickly	Slightly quickly	Quite quickly	Very quickly	Extremely quickly
It is uncertain that the temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
It is uncertain that the temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
It is uncertain that the sea level will rise between 18 centimeters and 59 centimeters.					
It is uncertain that the sea level will rise between 31 centimeters and 43 centimeters.					

427

428 Please rate to what extent the sentences below are hard to process.

	Not hard at all	Slightly hard	Quite hard	Very hard	Extremely hard
It is uncertain that the temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
It is uncertain that the temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
It is uncertain that the sea level will rise between 18 centimeters and 59 centimeters.					
It is uncertain that the sea level will rise between 31 centimeters and 43 centimeters.					

429

430 Ratings of expertise (common across conditions)

431 Please rate to what extent the sentences below demonstrate that their authors have a strong
432 expertise in forecasting climate change.

	Not at all	Slightly	Quite	Very much	Extremely
The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
The temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
The sea level will rise between 18 centimeters and 59 centimeters.					
The sea level will rise between 31 centimeters and 43 centimeters.					

433

434 Please rate to what extent the sentences below indicate that their authors have a good
435 knowledge of climate change.

	Not at all	Slightly	Quite	Very much	Extremely
The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
The temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
The sea level will rise between 18 centimeters and 59 centimeters.					
The sea level will rise between 31 centimeters and 43 centimeters.					

436

437 Please rate to what extent the sentences below indicate that their authors lack experience in
438 climate change modelling.

439

	Not at all	Slightly	Quite	Very much	Extremely
The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
The temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
The sea level will rise between 18 centimeters and 59 centimeters.					
The sea level will rise between 31 centimeters and 43 centimeters.					

440

441

442

Please rate to what extent the sentences below indicate that their authors know a lot about climate change.

	Not at all	Slightly	Quite	Very much	Extremely
The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius.					
The temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius.					
The sea level will rise between 18 centimeters and 59 centimeters.					
The sea level will rise between 31 centimeters and 43 centimeters.					

443

444

445

446 **Questionnaire Experiment 5**

447

448 Informativeness-focused questions

449 Conveys uncertainty

450 Projections of future changes in temperature

451 Three teams of climate scientists have made the following predictions regarding the
452 temperature rise by 2099. Please select the prediction that conveys more uncertainty than the
453 other two.

454 Team A: The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius. (1)

455 Team B: The temperature will increase between 2.2 ° Celsius and 5.4 ° Celsius. (2)

456 Team C: The temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius. (3)

457

458 Projections of future changes in sea level

459 Three teams of climate scientists have made the following predictions regarding the sea level
460 rise by 2099. Please select the prediction that conveys more uncertainty than the other two.

461 Team X: The sea level will rise between 18 centimetres and 59 centimetres. (1)

462 Team Y: The sea level will rise between 23 centimetres and 51 centimetres. (2)

463 Team Z: The sea level will rise between 31 centimeters and 43 centimetres. (3)

464

465 Conveys certainty

466 Projections of future changes in temperature

467 Three teams of climate scientists have made the following predictions regarding the
468 temperature rise by 2099. Please select the prediction that conveys more certainty than the
469 other two.

470 Team A: The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius. (1)

471 Team B: The temperature will increase between 2.2 ° Celsius and 5.4 ° Celsius. (2)

472 Team C: The temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius. (3)

473

474 Projections of future changes in sea level

475 Three teams of climate scientists have made the following predictions regarding the sea level
476 rise by 2099. Please select the prediction that conveys more certainty than the other two.

477 Team X: The sea level will rise between 18 centimetres and 59 centimetres. (1)

478 Team Y: The sea level will rise between 23 centimetres and 51 centimetres. (2)

479 Team Z: The sea level will rise between 31 centimeters and 43 centimetres. (3)

480

481 Accuracy-focused question

482 More certain to be correct

483 Three teams of climate scientists have made the following predictions regarding the
484 temperature rise by 2099. Please select the team that is more certain to be correct than the
485 other two.

486 Team A: The temperature will increase between 1.1 ° Celsius and 6.4 ° Celsius. (1)

487 Team B: The temperature will increase between 2.2 ° Celsius and 5.4 ° Celsius. (2)

488 Team C: The temperature will increase between 3.3 ° Celsius and 4.4 ° Celsius. (3)

489

490 Three teams of climate scientists have made the following predictions regarding the sea level
491 rise by 2099. Please select the team that is more certain to be correct than the other two.

492 ○ Team X: The sea level will rise between 18 centimetres and 59 centimetres. (1)

493 ○ Team Y: The sea level will rise between 23 centimetres and 51 centimetres. (2)

494 ○ Team Z: The sea level will rise between 31 centimeters and 43 centimetres. (3)

495

496

497

498 **Questionnaire Experiment 6**

499

500 Condition 1: Focus on wide intervals

501

502 *About climate forecasts*

503 When climate scientists provide forecasts about what will happen in the future, they
 504 sometimes use intervals. This means that the researchers estimate an expected minimum value
 505 and an expected maximum value for a given outcome. Below are two forecasts of expected
 506 sea level rise in the Oslo Fjord using intervals:

507 - Forecast A: “The sea level in the Oslo Fjord will rise by a minimum of 20 cm and a
 508 maximum of 60 cm by 2100”

509 - Forecast B: “The sea level in the Oslo Fjord will rise by a minimum of 30 cm and a
 510 maximum of 50 cm by 2100”

511 Notice that Forecast A provides a WIDER interval (a larger span between the minimum and
 512 maximum value) than Forecast B. In this questionnaire, we are interested in how people
 513 understand intervals such as these, and especially how people think about interval width and
 514 uncertainty. There are two different ways of thinking about the interval width and uncertainty:

515

516 - On the one hand, WIDE intervals indicate that it is MORE UNCERTAIN what the outcome
 517 will be (the sea level could rise by anything from 20 to 60 cm, compared to 30 to 50 cm for
 518 the narrow interval)

519 - On the other hand, it is MORE CERTAIN that projections using WIDE intervals will be
 520 correct (the forecast is correct if the sea level rises by anything from 20 to 60 cm, compared to
 521 30 to 50 cm for the narrow interval)

522

523 How would you rate these two ways of thinking about the intervals and uncertainty? Please
 524 answer the questions below.

525 How INTUITIVE do you find these two ways of thinking to be?

	Not intuitive at all				Very intuitive		
	1	2	3	4	5	6	7
Wide intervals are UNCERTAIN (because it is more uncertain what the outcome will be)							
Wide intervals are CERTAIN (because it is more certain that the forecast will be correct)							

526 How NATURAL do you find these two ways of thinking to be?

	Not natural at all				Very natural		
	1	2	3	4	5	6	7
Wide intervals are UNCERTAIN (because it is more uncertain what the outcome will be)							
Wide intervals are CERTAIN (because it is more certain that the forecast will be correct)							

527

528 How APPEALING do you find these two ways of thinking to be?

	Not appealing at all				Very appealing		
	1	2	3	4	5	6	7
Wide intervals are UNCERTAIN (because it is more uncertain what the outcome will be)							

Wide intervals are CERTAIN (because it is more certain that the forecast will be correct)							
---	--	--	--	--	--	--	--

529

530 How LOGICAL do you find these two ways of thinking to be?

	Not logical at all				Very logical		
	1	2	3	4	5	6	7
Wide intervals are UNCERTAIN (because it is more uncertain what the outcome will be)							
Wide intervals are CERTAIN (because it is more certain that the forecast will be correct)							

531

532 How COMPLICATED do you find these two ways of thinking to be?

	Not complicated at all				Very complicated		
	1	2	3	4	5	6	7
Wide intervals are UNCERTAIN (because it is more uncertain what the outcome will be)							
Wide intervals are CERTAIN (because it is more certain that the forecast will be correct)							

533

534 Condition 2: Focus on narrow intervals

535

536 *About climate forecasts*

537 When climate scientists provide forecasts about what will happen in the future, they
 538 sometimes use intervals. This means that the researchers estimate an expected minimum value
 539 and an expected maximum value for a given outcome. Below are two forecasts of expected
 540 sea level rise in the Oslo Fjord using intervals:

541 - Forecast A: "The sea level in the Oslo Fjord will rise by a minimum of 20 cm and a
 542 maximum of 60 cm by 2100"

543 - Forecast B: "The sea level in the Oslo Fjord will rise by a minimum of 30 cm and a
 544 maximum of 50 cm by 2100"

545 Notice that Forecast B provides a NARROWER interval (a larger span between the minimum
 546 and maximum value) than Forecast A. In this questionnaire, we are interested in how people
 547 understand intervals such as these, and especially how people think about interval width and
 548 uncertainty. There are two different ways of thinking about the interval width and uncertainty:

549

550 - On the one hand, NARROW intervals indicate that it is MORE CERTAIN what the
 551 outcome will be (the sea level could rise by 30 to 50 cm, while it could rise by anything from
 552 20 to 60 cm for the wide interval)

553 - On the other hand, it is MORE UNCERTAIN that projections using NARROW intervals
 554 will be correct (the forecast is only correct if the sea level rises by between 30 and 50 cm,
 555 compared to 20 to 60 cm for the wide interval)

556

557 How would you rate these two ways of thinking about the intervals and uncertainty? Please
 558 answer the questions below.

559 How INTUITIVE do you find these two ways of thinking to be?

	Not intuitive at all				Very intuitive		
	1	2	3	4	5	6	7
Narrow intervals are CERTAIN (because it is more certain what							

the outcome will be)							
Narrow intervals are UNCERTAIN (because it is more uncertain that the forecast will be correct)							

560
561
562

How NATURAL do you find these two ways of thinking to be?

	Not natural at all				Very natural		
	1	2	3	4	5	6	7
Narrow intervals are CERTAIN (because it is more certain what the outcome will be)							
Narrow intervals are UNCERTAIN (because it is more uncertain that the forecast will be correct)							

563
564

How APPEALING do you find these two ways of thinking to be?

	Not appealing at all				Very appealing		
	1	2	3	4	5	6	7
Narrow intervals are CERTAIN (because it is more certain what the outcome will be)							
Narrow intervals are UNCERTAIN (because it is more uncertain that the forecast will be correct)							

565
566

How LOGICAL do you find these two ways of thinking to be?

	Not logical at all				Very logical		
	1	2	3	4	5	6	7
Narrow intervals are CERTAIN (because it is more certain what the outcome will be)							
Narrow intervals are UNCERTAIN (because it is more uncertain that the forecast will be correct)							

567
568

How COMPLICATED do you find these two ways of thinking to be?

	Not complicated at all				Very complicated		
	1	2	3	4	5	6	7
Narrow intervals are CERTAIN (because it is more certain what the outcome will be)							
Narrow intervals are UNCERTAIN (because it is more uncertain that the forecast will be correct)							

569
570