Follow Up Group Level Modelling

Anonymised for peer review

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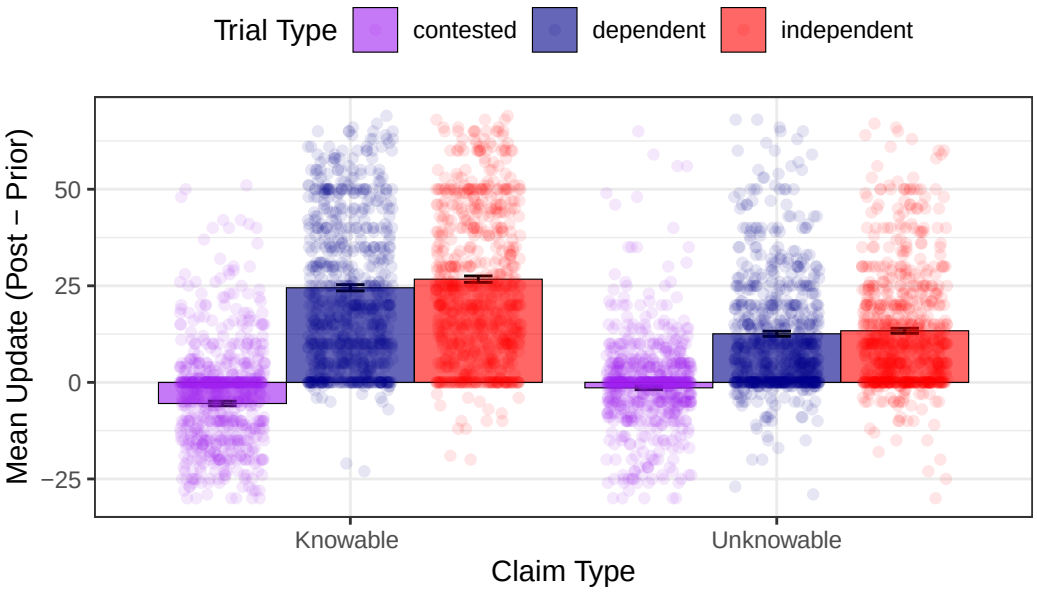
1 Modelling With Broad Claim Type Categories: Knowable vs. Unknowable

We preregistered that if we did not find an interaction between consensus X claim type for the four categories of claims then we would repeat the analyses on the two categories of claims. We did not find a claim type X consensus interaction for the independent X dependent comparison, so here we report the modelling with the two broad claim types.

1.1 Qualitative Evalulation



Looking at the plot, though there's a slightly bigger difference between independent and dependent in the knowable category, it's not clear if it is statistically meaningful.

1.2 Modelling

1.2.1 Excluding contested condition (independent v dependent)

Only looking at it for this comparison because we found an interaction for with the full claim types for the other one.

1.2.1.1 Model Comparison

	model	excluded_condition	all_looic	model_rank
1	group-prior	contested	26952.57	4
2	group-prior-consensus	contested	26945.75	3
3	group-prior-consensus-claim	contested	26515.33	1
4	group-prior-consensusXclaim	contested	26517.42	2

Model that does not include an interaction still the best according to LOOIC.

1.2.1.2 Estimates

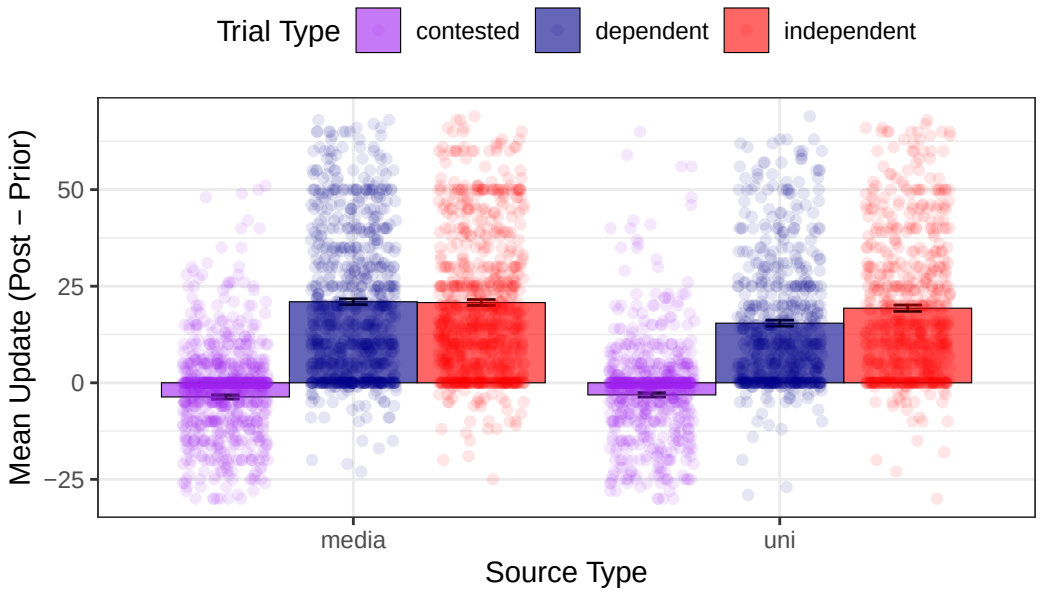
	Estimate	Lower	Upper
b_Intercept	41.203	39.052	43.349
b_pre_adjusted	0.668	0.649	0.686
b_consensusindependent	2.213	0.862	3.525
b_broad_claim_typeUnknowable	-12.332	-13.717	-10.985
b_consensusindependent:broad_claim_typeUnknowable	-0.896	-2.806	1.053

Large proportion of the posterior distribution of the interaction overlapping with zero. Reasonable to conclude that there is no claim type X consensus interaction for independent vs. dependent, even when using the two broad claim types.

2 Source Type as a Predictor?

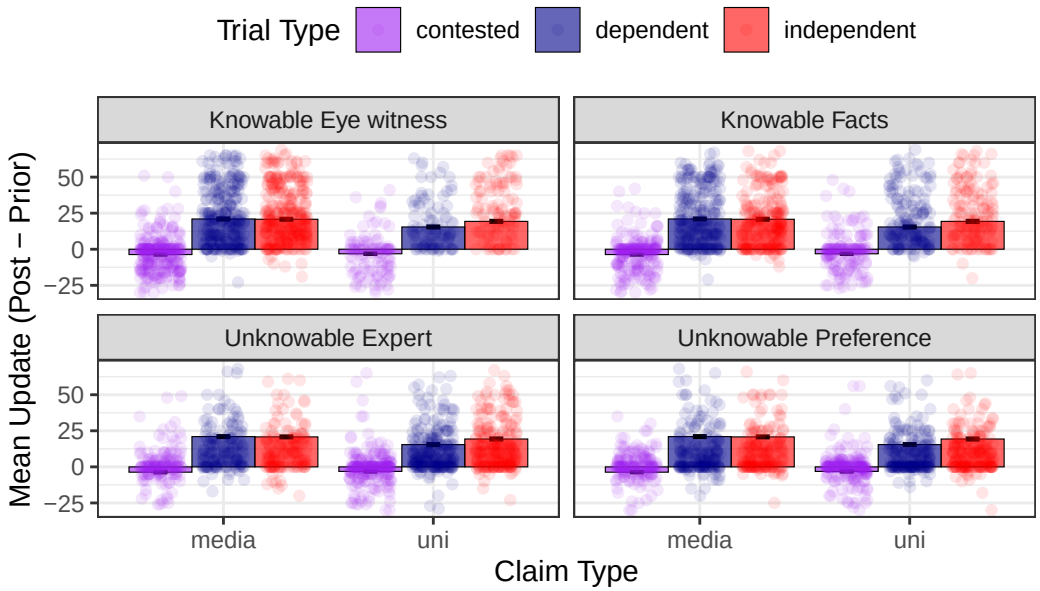
In our experiment, primary sources could either be a university or news organisation. These were reasonably balanced across the experiment such that there was an even amount of trials with each source type within each claim type. We mentioned in our pre-registration that we would look to see if there was any effect of source type, but we did not specify what analyses we would do, nor any specific predictions as it was not a central focus of the study.

2.1 Qualitative Evaluation



It looks like the effect of independence only appeared when the primary source was a university. When it was a news outlet, there did not appear to be any difference between independent and dependent sources at the group level. The standard consensus effect (contested v independent) did not appear to be influenced by source type.

2.1.1 Update as a function of claim type *and* source type



Across all claim types, it seems that the effect of source independence only occurred when the source was a university.

2.2 Modelling

Are the qualitative patterns supported statistically?

2.2.1 Independent vs. contested

2.2.1.1 Model Comparison

	model	all_looic	all_se	model_rank
1	group-prior	27693	100	5
2	group-prior-consensus	26633	116	4
3	group-prior-consensus-claim	26565	117	3
4	group-prior-consensusXclaim	26335	121	1
5	group-prior-consensusXclaimXsource	26337	121	2

The model that includes an added three way interaction of source type is not better than the two-way interaction model, suggesting that there is no statistically credible three-way interaction here. There coefficient estimates could still reveal an effect, though.

2.2.1.2 Estimates

	Estimate	
b_Intercept	9.782	
b_pre_adjusted	0.716	
b_consensusindependent	32.077	
b_claim_typeKnowableFacts	1.975	
b_claim_typeUnknowableExpert	6.501	
b_claim_typeUnknowablePreference	3.538	
b_sourceuni	-1.021	
b_consensusindependent:claim_typeKnowableFacts	-6.386	
b_consensusindependent:claim_typeUnknowableExpert	-18.095	
b_consensusindependent:claim_typeUnknowablePreference	-18.824	
b_consensusindependent:sourceuni	3.208	
b_claim_typeKnowableFacts:sourceuni	0.216	
b_claim_typeUnknowableExpert:sourceuni	0.344	
b_claim_typeUnknowablePreference:sourceuni	1.713	
b_consensusindependent:claim_typeKnowableFacts:sourceuni	3.351	
b_consensusindependent:claim_typeUnknowableExpert:sourceuni	-2.957	
b_consensusindependent:claim_typeUnknowablePreference:sourceuni	-6.620	
	Lower	Upper
b_Intercept	7.837	11.710
b_pre_adjusted	0.699	0.734
b_consensusindependent	29.934	34.255
b_claim_typeKnowableFacts	-0.369	4.422
b_claim_typeUnknowableExpert	3.892	9.014
b_claim_typeUnknowablePreference	1.081	6.022
b_sourceuni	-3.868	1.841
b_consensusindependent:claim_typeKnowableFacts	-9.803	-3.134
b_consensusindependent:claim_typeUnknowableExpert	-21.825	-14.519
b_consensusindependent:claim_typeUnknowablePreference	-22.303	-15.250
b_consensusindependent:sourceuni	-0.937	7.281
b_claim_typeKnowableFacts:sourceuni	-3.697	4.137
b_claim_typeUnknowableExpert:sourceuni	-3.493	4.311
b_claim_typeUnknowablePreference:sourceuni	-2.174	5.693
b_consensusindependent:claim_typeKnowableFacts:sourceuni	-2.321	8.993
b_consensusindependent:claim_typeUnknowableExpert:sourceuni	-8.579	2.536
b_consensusindependent:claim_typeUnknowablePreference:sourceuni	-12.204	-0.997

The estimates reveal a few things. They suggest that for this comparison, there was no statistically credible difference in beliefs for universities versus, as evidenced by a small coefficient with a large proportion of the distribution overlapping with zero. Similarly, there did not appear to be a two way interaction between source type and consensus, not was there credible evidence for a three way interaction, as suggested by the model comparison.

2.2.2 Independent vs. dependent

The plots shown above seemed to suggest the effect of consensus independence only occurred when the source was a university. Let's see whether the models supported this.

	model	all_looic	all_se	model_rank
1	group-prior	26952	103	5
2	group-prior-consensus	26946	103	4
3	group-prior-consensus-claim	26493	111	2
4	group-prior-consensusXclaim	26496	111	3
5	group-prior-consensusXclaimXsource	26489	111	1

The model comparison supported a three way interaction between consensus independence, claim type, and source.

	Estimate	
b_Intercept	43.807	
b_pre_adjusted	0.665	
b_consensusindependent	0.287	
b_claim_typeKnowableFacts	-3.931	
b_claim_typeUnknowableExpert	-10.748	
b_claim_typeUnknowablePreference	-14.518	
b_sourceuni	-3.262	
b_consensusindependent:claim_typeKnowableFacts	0.259	
b_consensusindependent:claim_typeUnknowableExpert	-0.282	
b_consensusindependent:claim_typeUnknowablePreference	-0.483	
b_consensusindependent:sourceuni	5.709	
b_claim_typeKnowableFacts:sourceuni	3.540	
b_claim_typeUnknowableExpert:sourceuni	-1.465	
b_claim_typeUnknowablePreference:sourceuni	0.759	
b_consensusindependent:claim_typeKnowableFacts:sourceuni	-0.996	
b_consensusindependent:claim_typeUnknowableExpert:sourceuni	-1.473	
b_consensusindependent:claim_typeUnknowablePreference:sourceuni	-5.345	
	Lower	Upper
b_Intercept	41.275	46.300

```
b_pre_adjusted                                                  0.647   0.683
b_consensusindependent                                         -1.953   2.486
b_claim_typeKnowableFacts                                      -6.182  -1.636
b_claim_typeUnknowableExpert                                  -13.418  -8.025
b_claim_typeUnknowablePreference                              -17.082 -11.921
b_sourceuni                                                    -6.512  -0.077
b_consensusindependent:claim_typeKnowableFacts                 -2.938   3.500
b_consensusindependent:claim_typeUnknowableExpert              -4.098   3.561
b_consensusindependent:claim_typeUnknowablePreference          -4.024   3.131
b_consensusindependent:sourceuni                                1.303  10.163
b_claim_typeKnowableFacts:sourceuni                            -0.661   7.854
b_claim_typeUnknowableExpert:sourceuni                         -5.629   2.757
b_claim_typeUnknowablePreference:sourceuni                     -3.383   5.060
b_consensusindependent:claim_typeKnowableFacts:sourceuni       -6.914   5.096
b_consensusindependent:claim_typeUnknowableExpert:sourceuni    -7.543   4.171
b_consensusindependent:claim_typeUnknowablePreference:sourceuni -11.292   0.550
```

The coefficients revealed that it was the two way source X independence interaction that was driving the model's performance, as the credible intervals of the three way interaction were failry uncertain (had a reasonably high overlap with zero), whereas those for the two-way interaction were reasonably credible These results suggest that the effect of source independence only emerged for university sources and not news organisations at the group level.

3 Prior *certainty* as well as prior belief

It is possible that our claim type results could be driven by the fact that people's prior beliefs weren't as strong for certain kinds of claims, which therefore made them more likely to change their beliefs. For example, people are likely to have stronger prior beliefs about things that are about facts, which they could have heard before, or personal preferences compared to things like eyewitness claims that they have never seen themselves. To test this, we ran another model that, in addition to all of the other predictors, looked at people's prior certainty. As done in Orticio, Martí, and Kidd (2022), we operationalized certainty as the absolute value of participants' prior belief minus the scale midpoint (50), such that a belief was less certain if it was closer to the mid point. This analysis was not pre-registered.

3.1 Independent vs. contested

```
                              model all_looic all_se model_rank
1                       group-prior     27693    100          5
2           group-prior-consensus     26633    116          4
```

```
3           group-prior-consensus-claim     26565    117          3
4           group-prior-consensusXclaim     26335    121          1
5 group-prior-consensusXclaim-certainty     26335    121          2
```

For the standard consensus comparison, a model that included certainty was equally as good (according to the balance of fit and parsimony defined by LOOIC) compared to the model that did not.

```
                                                 Estimate   Lower   Upper
b_Intercept                                         9.850   8.054  11.671
b_pre_adjusted                                      0.718   0.700   0.735
b_pre_certainty                                    -0.026  -0.059   0.006
b_consensusindependent                             32.868  31.051  34.741
b_claim_typeKnowableFacts                           1.934   0.012   3.839
b_claim_typeUnknowableExpert                        6.523   4.563   8.376
b_claim_typeUnknowablePreference                    4.422   2.504   6.331
b_consensusindependent:claim_typeKnowableFacts     -4.562  -7.276  -1.944
b_consensusindependent:claim_typeUnknowableExpert -18.685 -21.323 -16.039
b_consensusindependent:claim_typeUnknowablePreference -21.402 -24.075 -18.769
```

All of the main effects and interactions that were credible in the best performing model that excluded certainty were still credible when we included certainty. Notably though, the 89% CI for certainty overlapped with zero and was quite small relative to the un-transformed prior beliefs, suggesting that the consensus X claim type interaction cannot only be explained by people having weaker priors for certain claims.

3.2 Independent vs. Dependent

```
                                model all_looic all_se model_rank
1                           group-prior     26952    103          5
2                 group-prior-consensus     26946    103          4
3           group-prior-consensus-claim     26493    111          2
4           group-prior-consensusXclaim     26496    111          3
5 group-prior-consensusXclaim-certainty     26460    114          1
```

3.3

The model performs better according to LOOIC when we consider prior certainty in addition to the other factors. However, to what extent does this reduce the credibility of the other main effects that were 89% credible in the next best performing model?

	Estimate	Lower	Upper
b_Intercept	44.861	42.383	47.289
b_pre_adjusted	0.665	0.647	0.684
b_pre_certainty	-0.119	-0.153	-0.087
b_consensusindependent	1.726	-0.173	3.666
b_claim_typeKnowableFacts	-2.855	-4.739	-0.951
b_claim_typeUnknowableExpert	-11.937	-13.963	-9.939
b_claim_typeUnknowablePreference	-13.925	-15.874	-11.960
b_consensusindependent:claim_typeKnowableFacts	0.880	-1.784	3.552
b_consensusindependent:claim_typeUnknowableExpert	0.960	-1.730	3.696
b_consensusindependent:claim_typeUnknowablePreference	-1.697	-4.423	1.017

Even though the model that included certainty and an interaction did best, the main effects of claim type are still credible, suggesting the effects of claim type on beliefs is not just because they vary in how certain people are about them. Controlling for certainty also did not make the claim type X consensus independence interaction more credible. However, it is worth noting that as prior certainty decreases, participants were more likely to be persuaded by the consensus.

References

Orticio, Evan, Louis Martí, and Celeste Kidd. 2022. "Social Prevalence Is Rationally Integrated in Belief Updating." *Open Mind* 6 (July): 77–87. https://doi.org/10.1162/opmi_a_00056.