Follow Up Group Level Modelling

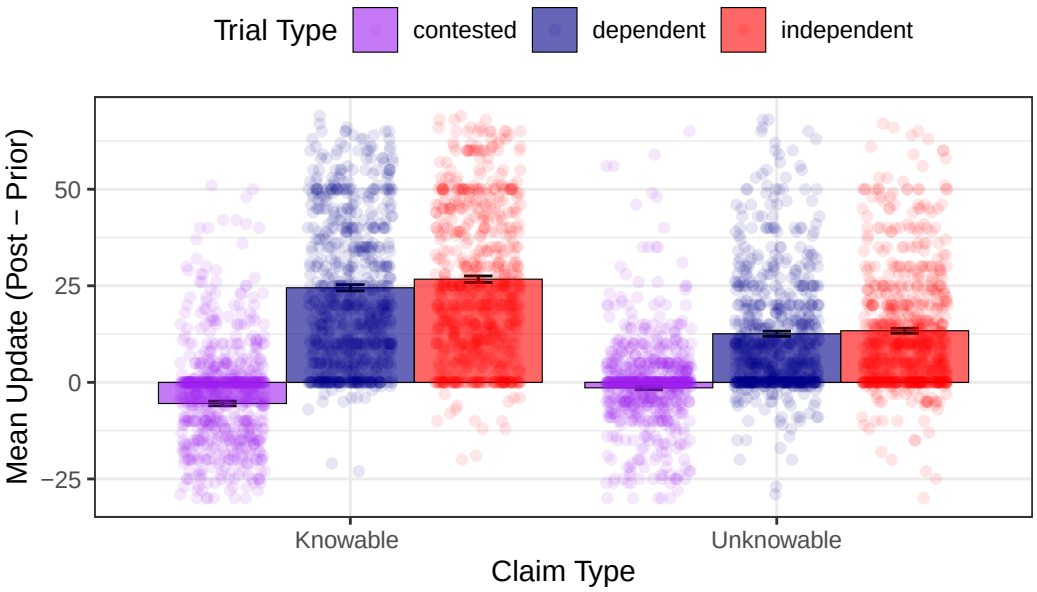
Anonymised for peer review

Table of contents

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 Evaluation



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	26952.60	4
2	group-prior-consensus	contested	26945.93	3
3	group-prior-consensus-claim	contested	26515.60	1
4	group-prior-consensusXclaim	contested	26517.97	2

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

1.2.1.2 Estimates

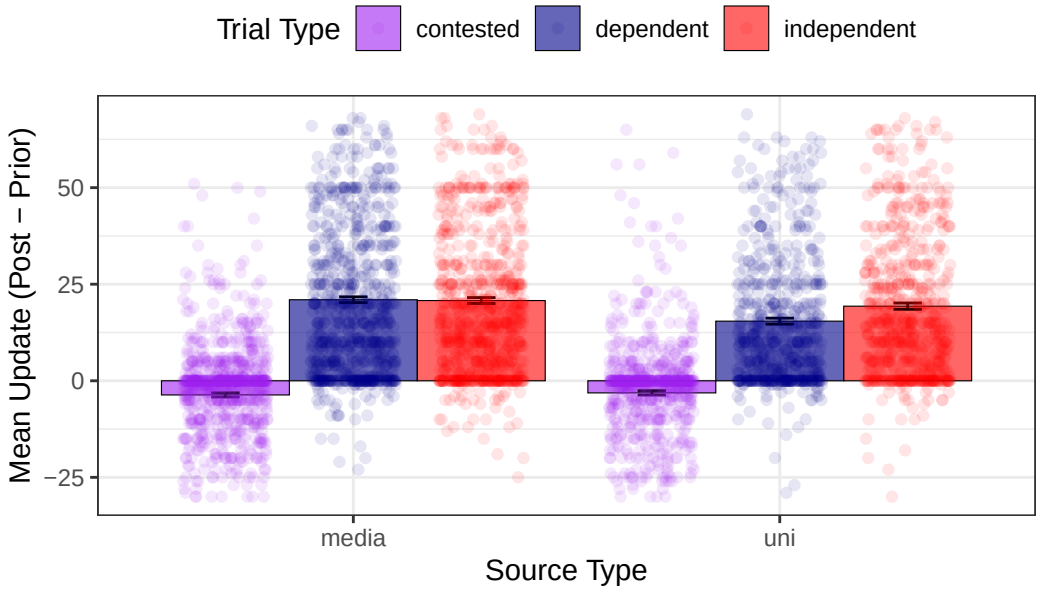
	Estimate	Lower	Upper
b_Intercept	41.187	39.084	43.310
b_pre_adjusted	0.668	0.649	0.686
b_consensusindependent	2.199	0.833	3.554
b_broad_claim_typeUnknowable	-12.361	-13.775	-10.952
b_consensusindependent:broad_claim_typeUnknowable	-0.871	-2.847	1.081

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?

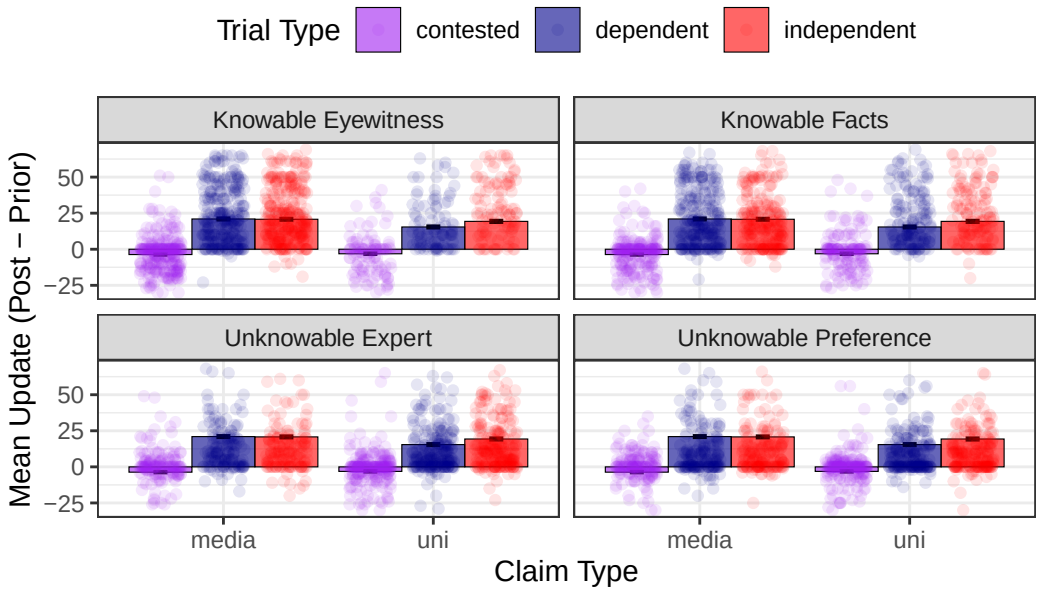
In our experiment, primary sources could either be a university or news organisation. These were reasonably balanced across the experiment such that there was an even amount of trials with each source type within each claim type. We mentioned in our pre-registration that we would look to see if there 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	27692	100	5
2	group-prior-consensus	26633	116	4
3	group-prior-consensus-claim	26565	117	3
4	group-prior-consensusXclaim	26335	121	2
5	group-prior-consensusXclaimXsource	26335	121	1

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	9.791	
b_pre_adjusted	0.716	
b_consensusindependent	32.052	
b_claim_typeKnowableFacts	1.983	
b_claim_typeUnknowableExpert	6.543	
b_claim_typeUnknowablePreference	3.569	
b_sourceuni	-1.023	
b_consensusindependent:claim_typeKnowableFacts	-6.399	
b_consensusindependent:claim_typeUnknowableExpert	-18.102	
b_consensusindependent:claim_typeUnknowablePreference	-18.814	
b_consensusindependent:sourceuni	3.230	
b_claim_typeKnowableFacts:sourceuni	0.183	
b_claim_typeUnknowableExpert:sourceuni	0.318	
b_claim_typeUnknowablePreference:sourceuni	1.717	
b_consensusindependent:claim_typeKnowableFacts:sourceuni	3.362	
b_consensusindependent:claim_typeUnknowableExpert:sourceuni	-2.991	
b_consensusindependent:claim_typeUnknowablePreference:sourceuni	-6.682	
	Lower	Upper
b_Intercept	7.820	11.725
b_pre_adjusted	0.698	0.734
b_consensusindependent	29.900	34.198
b_claim_typeKnowableFacts	-0.404	4.326
b_claim_typeUnknowableExpert	3.956	9.149
b_claim_typeUnknowablePreference	1.039	6.034
b_sourceuni	-3.957	1.837
b_consensusindependent:claim_typeKnowableFacts	-9.751	-3.081
b_consensusindependent:claim_typeUnknowableExpert	-21.721	-14.401
b_consensusindependent:claim_typeUnknowablePreference	-22.328	-15.340
b_consensusindependent:sourceuni	-0.985	7.385
b_claim_typeKnowableFacts:sourceuni	-3.738	4.193
b_claim_typeUnknowableExpert:sourceuni	-3.562	4.229
b_claim_typeUnknowablePreference:sourceuni	-2.193	5.804
b_consensusindependent:claim_typeKnowableFacts:sourceuni	-2.525	9.072
b_consensusindependent:claim_typeUnknowableExpert:sourceuni	-8.755	2.591
b_consensusindependent:claim_typeUnknowablePreference:sourceuni	-12.104	-1.092

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	26947	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	43.780	
b_pre_adjusted	0.665	
b_consensusindependent	0.338	
b_claim_typeKnowableFacts	-3.914	
b_claim_typeUnknowableExpert	-10.723	
b_claim_typeUnknowablePreference	-14.498	
b_sourceuni	-3.240	
b_consensusindependent:claim_typeKnowableFacts	0.152	
b_consensusindependent:claim_typeUnknowableExpert	-0.366	
b_consensusindependent:claim_typeUnknowablePreference	-0.587	
b_consensusindependent:sourceuni	5.652	
b_claim_typeKnowableFacts:sourceuni	3.483	
b_claim_typeUnknowableExpert:sourceuni	-1.542	
b_claim_typeUnknowablePreference:sourceuni	0.708	
b_consensusindependent:claim_typeKnowableFacts:sourceuni	-0.916	
b_consensusindependent:claim_typeUnknowableExpert:sourceuni	-1.381	
b_consensusindependent:claim_typeUnknowablePreference:sourceuni	-5.232	
	Lower	Upper
b_Intercept	41.288	46.287

```
b_pre_adjusted                                                  0.647   0.684
b_consensusindependent                                         -1.894   2.596
b_claim_typeKnowableFacts                                      -6.237  -1.619
b_claim_typeUnknowableExpert                                  -13.476  -7.934
b_claim_typeUnknowablePreference                              -17.009 -11.969
b_sourceuni                                                    -6.419   0.031
b_consensusindependent:claim_typeKnowableFacts                 -3.163   3.415
b_consensusindependent:claim_typeUnknowableExpert              -4.124   3.385
b_consensusindependent:claim_typeUnknowablePreference          -4.237   2.938
b_consensusindependent:sourceuni                                1.301  10.035
b_claim_typeKnowableFacts:sourceuni                            -0.851   7.754
b_claim_typeUnknowableExpert:sourceuni                         -6.029   2.722
b_claim_typeUnknowablePreference:sourceuni                     -3.498   4.922
b_consensusindependent:claim_typeKnowableFacts:sourceuni       -6.863   4.923
b_consensusindependent:claim_typeUnknowableExpert:sourceuni    -7.267   4.597
b_consensusindependent:claim_typeUnknowablePreference:sourceuni -11.072   0.786
```

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     27692    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                                          9.870   8.027  11.651
b_pre_adjusted                                       0.717   0.699   0.735
b_pre_certainty                                     -0.026  -0.058   0.006
b_consensusindependent                              32.903  31.008  34.745
b_claim_typeKnowableFacts                            1.959   0.088   3.838
b_claim_typeUnknowableExpert                         6.559   4.690   8.421
b_claim_typeUnknowablePreference                     4.471   2.622   6.283
b_consensusindependent:claim_typeKnowableFacts      -4.617  -7.326  -1.879
b_consensusindependent:claim_typeUnknowableExpert  -18.758 -21.401 -16.089
b_consensusindependent:claim_typeUnknowablePreference -21.472 -24.133 -18.795
```

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     26947    103          4
3           group-prior-consensus-claim     26493    111          2
4           group-prior-consensusXclaim     26496    111          3
5 group-prior-consensusXclaim-certainty     26462    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	44.972	42.514	47.483
b_pre_adjusted	0.665	0.647	0.683
b_pre_certainty	-0.119	-0.153	-0.086
b_consensusindependent	1.663	-0.252	3.606
b_claim_typeKnowableFacts	-2.895	-4.802	-0.907
b_claim_typeUnknowableExpert	-11.976	-13.935	-9.952
b_claim_typeUnknowablePreference	-13.958	-15.938	-11.930
b_consensusindependent:claim_typeKnowableFacts	0.982	-1.791	3.727
b_consensusindependent:claim_typeUnknowableExpert	1.047	-1.814	3.783
b_consensusindependent:claim_typeUnknowablePreference	-1.616	-4.437	1.191

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.