Validity Analyses

Erica Ann Metheney and Lauren Yehle

August 27, 2025

1 Question Source Analysis

We first fit a multilevel model with random Question intercept and a Source fixed effect to model the average number of unique codes per treatment-question pair.

Table 1: Regression Results of Question Source Analysis

	Number of Codes
(Intercept)	2.30^{***}
	(0.05)
ModelM2	0.55^{***}
	(0.04)
PersonaP2	0.22^{***}
	(0.05)
PersonaP3	-0.03
	(0.05)
SourceWVS	0.19^{**}
	(0.07)
SourceGallup	-0.31^{*}
	(0.15)
AIC	4114.94
BIC	4157.82
Log Likelihood	-2049.47
Num. obs.	1571
Num. groups: Question	262
Var: Question (Intercept)	0.17
Var: Residual	0.67

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Next, we fit a multilevel model of the likelihood of each code existing with a random Question intercept and Source fixed effect.

Lastly, we perform a Holm's correction on the p-values to account for the multiple testing of the 10 codes.

1.1 WVS with Holm's Correction

1.2 Gallup with Holm's Correction

2 Statement Order Analysis

We begin by computing the average statement placement (1-5) for each code.

Table 2: Multilevel Regression Results of Question Source Analysis - Likelihood of Codes 1 to 5

	Code 1	Code 2	Code 3	Code 4	Code 5
(Intercept)	0.98^{***}	0.01	0.07^{***}	0.50^{***}	0.10^{***}
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)
ModelM2	0.01	0.01	0.08^{***}	0.01	0.06^{***}
	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)
PersonaP2	−0.00	0.02^{*}	0.03	0.03	0.05^{**}
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)
PersonaP3	0.00	0.01	0.05^{**}	−0.01	−0.01
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)
SourceWVS	−0.00	0.07^{***}	−0.03	-0.13^{***}	−0.03
	(0.01)	(0.02)	(0.02)	(0.04)	(0.03)
SourceGallup	0.01	−0.01	−0.08	-0.24^{**}	−0.03
	(0.02)	(0.04)	(0.05)	(0.09)	(0.06)
AIC	−2644.02	−751.08	872.92	2132.29	879.20
BIC	−2601.14	−708.21	915.79	2175.17	922.07
Log Likelihood	1330.01	383.54	−428.46	−1058.15	−431.60
Num. obs.	1571	1571	1571	1571	1571
Num. groups: Question	262	262	262	262	262
Var: Question (Intercept)	0.00	0.02	0.02	0.06	0.03
Var: Residual	0.01	0.03	0.09	0.19	0.08

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table 3: Multilevel Regression Results of Question Source Analysis - Likelihood of Codes 6 to 10

	Code 6	Code 7	Code 8	Code 9	Code 10
(Intercept)	0.43^{***}	0.02^{*}	−0.00	0.06^{**}	0.02
	(0.03)	(0.01)	(0.00)	(0.02)	(0.02)
ModelM2	0.04^{*}	0.02^{*}	0.01^{**}	0.14^{***}	0.15^{***}
	(0.02)	(0.01)	(0.00)	(0.01)	(0.02)
PersonaP2	0.02	0.00	−0.00	−0.02	0.04
	(0.02)	(0.01)	(0.00)	(0.02)	(0.02)
PersonaP3	−0.04	−0.00	0.00	0.00	−0.01
	(0.02)	(0.01)	(0.00)	(0.02)	(0.02)
SourceWVS	-0.12^{**}	0.01	0.00	0.04	0.15^{***}
	(0.05)	(0.02)	(0.00)	(0.03)	(0.02)
SourceGallup	0.14	0.02	−0.00	−0.03	−0.02
	(0.10)	(0.03)	(0.01)	(0.06)	(0.05)
AIC	1787.71	−854.83	−3784.52	905.47	997.22
BIC	1830.58	−811.96	−3741.64	948.34	1040.09
Log Likelihood	−885.85	435.42	1900.26	−444.73	−490.61
Num. obs.	1571	1571	1571	1571	1571
Num. groups: Question	262	262	262	262	262
Var: Question (Intercept)	0.11	0.01	0.00	0.02	0.02
Var: Residual	0.13	0.03	0.01	0.09	0.09

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table 4: Question Source Regression Results with Holm's Multiple Testing Correction on SourceWVS

	Code 1	Code 2	Code 3	Code 4	Code 5	Code 6	Code 7	Code 8	Code 9	Code 10
(Intercept)	0.98^{***}	0.01	0.07^{***}	0.50^{***}	0.10^{***}	0.43^{***}	0.02^{*}	-0.00	0.06^{**}	0.02
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)	(0.01)	(0.00)	(0.02)	(0.02)
ModelM2	0.01	0.01	0.08^{***}	0.01	0.06^{***}	0.04^{*}	0.02^{*}	0.01^{**}	0.14^{***}	0.15^{***}
	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.00)	(0.01)	(0.02)
PersonaP2	-0.00	0.02^{*}	0.03	0.03	0.05^{**}	0.02	0.00	-0.00	-0.02	0.04
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)	(0.00)	(0.02)	(0.02)
PersonaP3	0.00	0.01	0.05^{**}	-0.01	-0.01	-0.04	-0.00	0.00	0.00	-0.01
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)	(0.00)	(0.02)	(0.02)
SourceWVS	-0.00	0.07^{**}	-0.03	-0.13^{**}	-0.03	-0.12	0.01	0.00	0.04	0.15^{***}
	(0.01)	(0.02)	(0.02)	(0.04)	(0.03)	(0.05)	(0.02)	(0.00)	(0.03)	(0.02)
SourceGallup	0.01	-0.01	-0.08	-0.24^{**}	-0.03	0.14	0.02	-0.00	-0.03	-0.02
	(0.02)	(0.04)	(0.05)	(0.09)	(0.06)	(0.10)	(0.03)	(0.01)	(0.06)	(0.05)

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

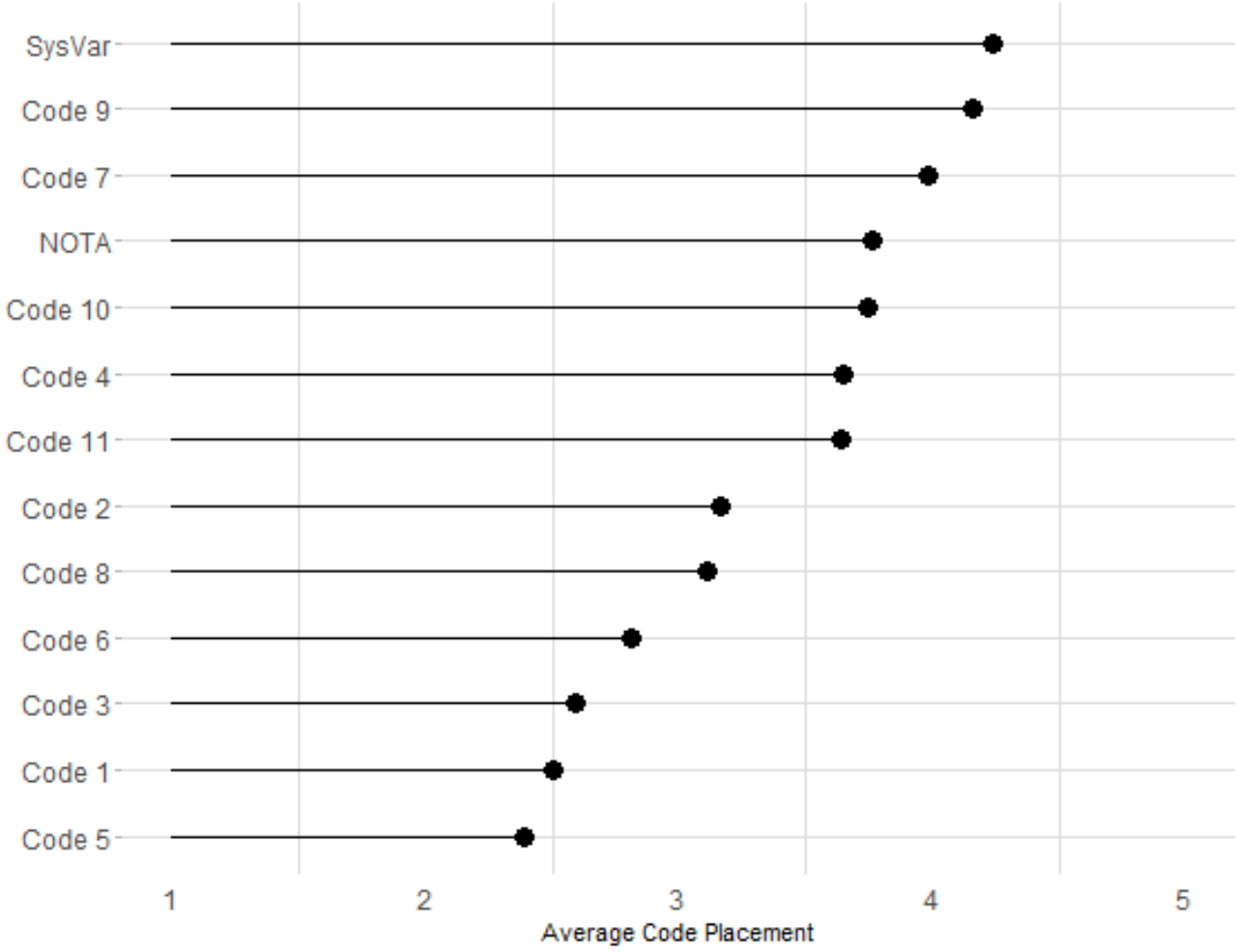
Table 5: Question Source Regression Results with Holm's Multiple Testing Correction on SourceGallup

	Code 1	Code 2	Code 3	Code 4	Code 5	Code 6	Code 7	Code 8	Code 9	Code 10
(Intercept)	0.98^{***}	0.01	0.07^{***}	0.50^{***}	0.10^{***}	0.43^{***}	0.02^{*}	-0.00	0.06^{**}	0.02
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.03)	(0.01)	(0.00)	(0.02)	(0.02)
ModelM2	0.01	0.01	0.08^{***}	0.01	0.06^{***}	0.04^{*}	0.02^{*}	0.01^{**}	0.14^{***}	0.15^{***}
	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.00)	(0.01)	(0.02)
PersonaP2	-0.00	0.02^{*}	0.03	0.03	0.05^{**}	0.02	0.00	-0.00	-0.02	0.04
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)	(0.00)	(0.02)	(0.02)
PersonaP3	0.00	0.01	0.05^{**}	-0.01	-0.01	-0.04	-0.00	0.00	0.00	-0.01
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)	(0.00)	(0.02)	(0.02)
SourceWVS	-0.00	0.07^{***}	-0.03	-0.13^{***}	-0.03	-0.12^{*}	0.01	0.00	0.04	0.15^{***}
	(0.01)	(0.02)	(0.02)	(0.04)	(0.03)	(0.05)	(0.02)	(0.00)	(0.03)	(0.02)
SourceGallup	0.01	-0.01	-0.08	-0.24	-0.03	0.14	0.02	-0.00	-0.03	-0.02
	(0.02)	(0.04)	(0.05)	(0.09)	(0.06)	(0.10)	(0.03)	(0.01)	(0.06)	(0.05)

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table 6: Average Code Placement

Code	Average
Code 1	2.503495
Code 2	3.162500
Code 3	2.591549
Code 4	3.647551
Code 5	2.387387
Code 6	2.809917
Code 7	3.982759
Code 8	3.111111
Code 9	4.156682
Code 10	3.749004
Code 11	3.643060
SysVar	4.243108
NOTA	3.767263



Next, we perform an ANOVA test to see if the codes all have the same average placement.

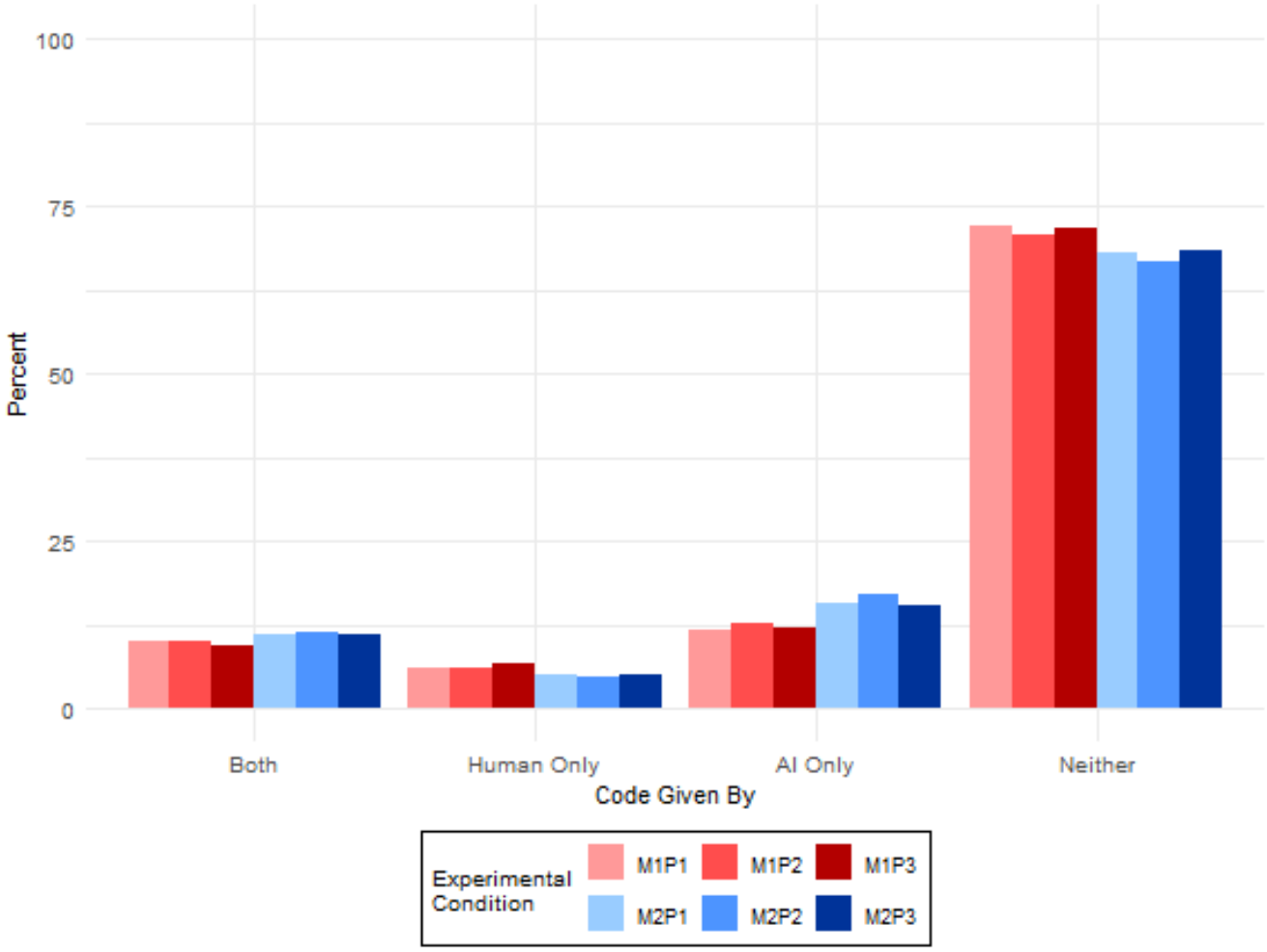
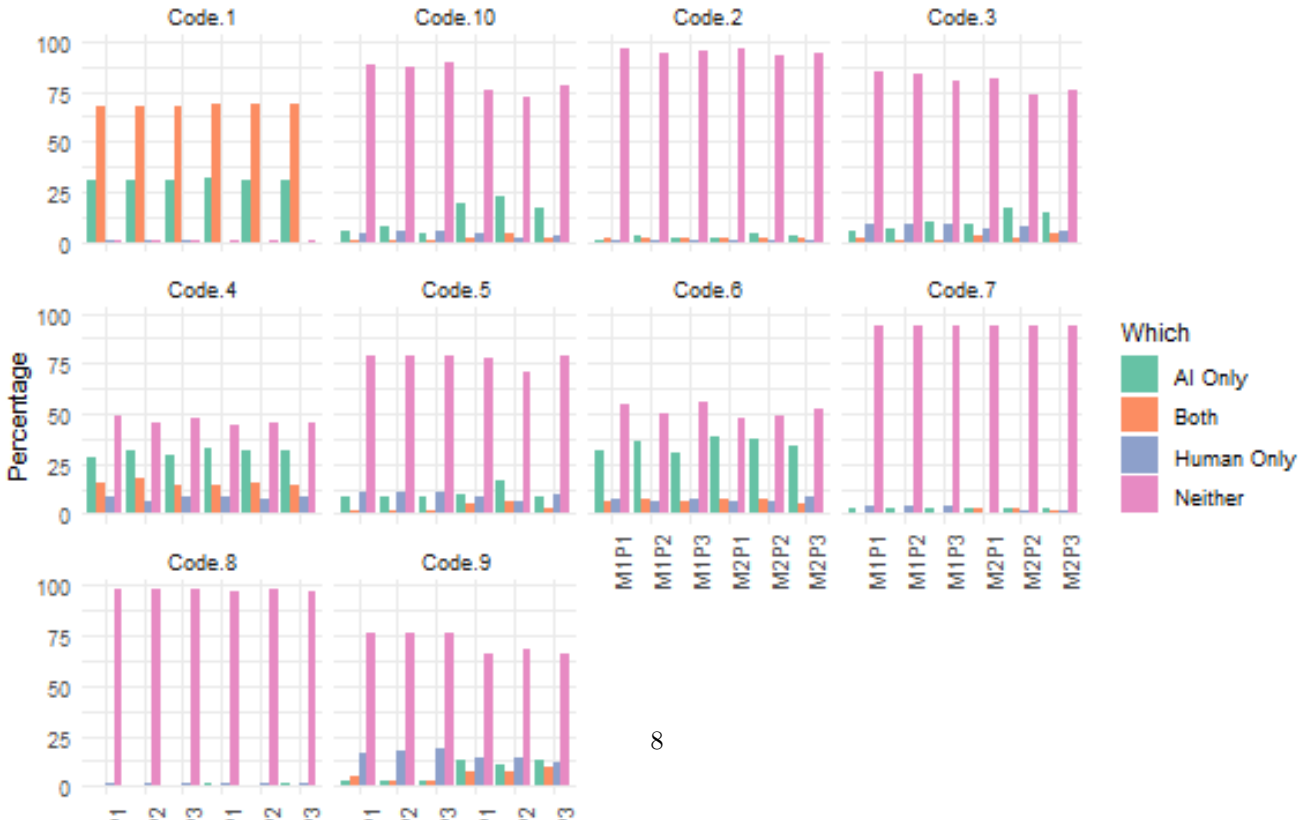
The results of the ANOVA test suggest that not all the codes have the same averabge placement. We perform a Tukey HSD test to determine which means are statistically the same and different.

	Difference	Lower CI	Upper CI	Adjusted p-Value

Code 10-Code 1	1.2455092	0.9723676	1.5186509	0.0000000
Code 11-Code 1	1.1395647	0.9064987	1.3726308	0.0000000
Code 2-Code 1	0.6590052	0.1850065	1.1330040	0.0003053
Code 3-Code 1	0.0880545	-0.2071261	0.3832352	0.9989028
Code 4-Code 1	1.1440560	0.9845168	1.3035952	0.0000000
Code 5-Code 1	-0.1161074	-0.4055510	0.1733362	0.9833451
Code 6-Code 1	0.3064226	0.1370953	0.4757499	0.0000002
Code 7-Code 1	1.4792639	0.9240813	2.0344464	0.0000000
Code 8-Code 1	0.6076164	-0.7932429	2.0084756	0.9686212
Code 9-Code 1	1.6531873	1.3606012	1.9457733	0.0000000
NOTA-Code 1	1.2637687	1.0996543	1.4278831	0.0000000
SysVar-Code 1	1.7396130	1.5192395	1.9599866	0.0000000
Code 11-Code 10	-0.1059445	-0.4525398	0.2406508	0.9986055
Code 2-Code 10	-0.5865040	-1.1254690	-0.0475390	0.0189930
Code 3-Code 10	-1.1574547	-1.5485303	-0.7663790	0.0000000
Code 4-Code 10	-0.1014532	-0.4035480	0.2006416	0.9965661
Code 5-Code 10	-1.3616166	-1.7483803	-0.9748529	0.0000000
Code 6-Code 10	-0.9390866	-1.2464631	-0.6317102	0.0000000
Code 7-Code 10	0.2337546	-0.3778304	0.8453396	0.9889652
Code 8-Code 10	-0.6378929	-2.0620470	0.7862613	0.9597872
Code 9-Code 10	0.4076780	0.0185571	0.7967990	0.0300627
NOTA-Code 10	0.0182594	-0.2862764	0.3227953	1.0000000
SysVar-Code 10	0.4941038	0.1559130	0.8322946	0.0000985
Code 2-Code 11	-0.4805595	-1.0003640	0.0392450	0.1038954
Code 3-Code 11	-1.0515102	-1.4157266	-0.6872938	0.0000000
Code 4-Code 11	0.0044913	-0.2619195	0.2709021	1.0000000
Code 5-Code 11	-1.2556721	-1.6152546	-0.8960896	0.0000000
Code 6-Code 11	-0.8331421	-1.1055273	-0.5607569	0.0000000
Code 7-Code 11	0.3396991	-0.2550694	0.9344677	0.8001042
Code 8-Code 11	-0.5319484	-1.9489623	0.8850656	0.9905658
Code 9-Code 11	0.5136225	0.1515058	0.8757393	0.0001962
NOTA-Code 11	0.1242039	-0.1449716	0.3933795	0.9497620
SysVar-Code 11	0.6000483	0.2933131	0.9067834	0.0000000
Code 3-Code 2	-0.5709507	-1.1214128	-0.0204886	0.0337155
Code 4-Code 2	0.4850508	-0.0062024	0.9763040	0.0568701
Code 5-Code 2	-0.7751126	-1.3225197	-0.2277055	0.0002039
Code 6-Code 2	-0.3525826	-0.8471013	0.1419360	0.4709051
Code 7-Code 2	0.8202586	0.0963079	1.5442093	0.0111135
Code 8-Code 2	-0.0513889	-1.5272898	1.4245120	1.0000000
Code 9-Code 2	0.9941820	0.4451069	1.5432572	0.0000002
NOTA-Code 2	0.6047634	0.1120054	1.0975215	0.0032882
SysVar-Code 2	1.0806078	0.5663691	1.5948465	0.0000000
Code 4-Code 3	1.0560015	0.7338423	1.3781607	0.0000000
Code 5-Code 3	-0.2041619	-0.6067925	0.1984687	0.9028244
Code 6-Code 3	0.2183681	-0.1087490	0.5454851	0.5822618
Code 7-Code 3	1.3912093	0.7694686	2.0129500	0.0000000
Code 8-Code 3	0.5195618	-0.9089830	1.9481066	0.9928737
Code 9-Code 3	1.5651327	1.1602372	1.9700283	0.0000000
NOTA-Code 3	1.1757141	0.8512649	1.5001634	0.0000000
SysVar-Code 3	1.6515585	1.2953306	2.0077864	0.0000000
Code 5-Code 4	-1.2601634	-1.5770743	-0.9432525	0.0000000
Code 6-Code 4	-0.8376334	-1.0505340	-0.6247328	0.0000000

Code 7-Code 4	0.3352078	-0.2347769	0.9051926	0.7661595
Code 8-Code 4	-0.5364397	-1.9432309	0.8703515	0.9891860
Code 9-Code 4	0.5091313	0.1893477	0.8289148	0.0000104
NOTA-Code 4	0.1197127	-0.0890658	0.3284911	0.7957456
SysVar-Code 4	0.5955570	0.3401760	0.8509379	0.0000000
Code 6-Code 5	0.4225300	0.1005804	0.7444795	0.0009907
Code 7-Code 5	1.5953712	0.9763337	2.2144088	0.0000000
Code 8-Code 5	0.7237237	-0.7036467	2.1510941	0.9028714
Code 9-Code 5	1.7692946	1.3685623	2.1700269	0.0000000
NOTA-Code 5	1.3798760	1.0606374	1.6991147	0.0000000
SysVar-Code 5	1.8557204	1.5042317	2.2072090	0.0000000
Code 7-Code 6	1.1728413	0.6000397	1.7456428	0.0000000
Code 8-Code 6	0.3011938	-1.1067411	1.7091286	0.9999658
Code 9-Code 6	1.3467647	1.0219870	1.6715423	0.0000000
NOTA-Code 6	0.9573461	0.7409958	1.1736963	0.0000000
SysVar-Code 6	1.4331904	1.1715831	1.6947978	0.0000000
Code 8-Code 7	-0.8716475	-2.3755878	0.6322928	0.7835397
Code 9-Code 7	0.1739234	-0.4465897	0.7944365	0.9994116
NOTA-Code 7	-0.2154952	-0.7867774	0.3557870	0.9901596
SysVar-Code 7	0.2603491	-0.3295613	0.8502596	0.9640905
Code 9-Code 8	1.0455709	-0.3824400	2.4735819	0.4252259
NOTA-Code 8	0.6561523	-0.7511651	2.0634697	0.9457837
SysVar-Code 8	1.1319967	-0.2829850	2.5469784	0.2799217
NOTA-Code 9	-0.3894186	-0.7115091	-0.0673281	0.0042024
SysVar-Code 9	0.0864257	-0.2676551	0.4405066	0.9998592
SysVar-NOTA	0.4758443	0.2175805	0.7341082	0.0000001

Table 7:

Effect	$\hat{\eta}^2_G$	90% CI	F	df	df_{res}	p
Code	.197	[.183, .208]	165.95	12	8140	$< .001$

3 Comparison to Human Expert