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Appendix 5: Example Tables for Reporting mixed-effect models

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A5: Example tables for reporting LMMs

Table were adapted from excellent examples in Stevenson et al, 2013 (Table 2), Goldhammer et al, 2014 (Table 1) and Li et al, 2014.

Table A5.1 Example for reporting model comparison and the model building/selection process

Sampling Units		N total obs = 7628 N Subjects = 40; N items = 200										
Model specification	Model name	Nested / simpler Model	Fixed Effects added		Random Effects		Model fit				LRT Test against nested	
					Subjects	Items	AIC	BIC	LL	df	df	X2
RE only	Null	-	-		intercepts	intercepts	5241.5	5260.9	-2617.8	3		
FE main effects	Main effects 1	Null	Group + ItemVariable1 + ItemVariable2 + ItemVariable 3		intercepts	intercepts	5204.1	5262.1	-2593.0	6	3	49.427*
FE two-way interactions	Group x ItemVariable1		Group x (ItemVariable1 + ItemVariable2 + ItemVariable3)		"	"	convergence warning - item variance close to zero. Removed item intercepts.					
FE main effects	Main effects 2		Group + ItemVariable1 + ItemVariable2 + ItemVariable 3		intercepts	none	5202.1	5253.7	-2593	6		
Two way interactions	Group x ItemVariables	Main effects 2	Group x (ItemVariable1 + ItemVariable2 + ItemVariable3)		"	"	4858.1	4942	-2416.1	8	2	353.98*
Three way interaction	ItemVariable1 x ItemVariable2	Group x ItemVariables	+ Group x (ItemVariable1 x ItemVariable2)		"	"	4858.1	4954.8	-2414.1	8	2	4.0182
Three way interaction	ItemVariable1 x ItemVariable3	Group x ItemVariables	+ Group x (ItemVariable1 x ItemVariable3)		"	"	4850.5	4947.3	-2410.3	8	2	11.566*
Three way interaction	ItemVariable2 x ItemVariable3	Group x ItemVariables	+ Group x (ItemVariable2 x ItemVariable3)		"	"	4860.3	4957	-2415.2	8	2	1.8214

Table A5.1 Key:

This table provides an example format for reporting, concisely, a succession of models that are fit to the data and (in this case) compared against each other using Likelihood Ratio Tests (LRT). For this example, we have used generic terms such as 'Group' and 'ItemVariable1', 'ItemVariable2' rather than using names of 'real' variables or groups from a specific study.

AIC – Aikake Information Criterion

BIC – Bayesian Information Criterion

LL – LogLikelihood

df – degrees of freedom

LRT – Likelihood Ratio Test

X² – Chi-square

Model Specification – the current model and what it includes. In the above example this refers to the interactions that have been added. Researchers may choose the labels based on variables that have been added (e.g. subject variable X, item variable X) or a different label that summarises in some consistent way how a model is specified and how complex it is.

Model Name – A short-hand to refer to the larger / more complex model that has been created. In the above example the model name has been derived from the addition of different variables. If researchers are testing successive nested models they may simply refer here to 'Model 1', 'Model 2', 'Model 3' etc.

Nested / simpler model – the model against which the current, more complex one is being tested, using the Model Name as a label.

Fixed effects added – which fixed effect / predictor variables have been added in order for a model comparison to take place (against the nested model).

Random Effects – the random effect structure included in the model, identified by column names for the groupings added as random effects (in this case, Subjects and Items) and whether these were intercepts, or intercepts and slopes for specific fixed effects. In this example, random intercepts have been fit for subjects and items. Where these are unchanged in subsequent models there is a " in the table cell. For models where slopes are fit for fixed effects, authors could enter text such as 'Slopes for ItemVariable 1' etc.

Model Fit – column names that provide information on aspects of model fit, depending on which variables a researcher is choosing to use (e.g. AIC, BIC, Log Likelihood, R² etc.)

LRT Test against nested - results of a Likelihood Ratio Test for the current model against the nested model.

Table A5.2 Example for reporting a ‘final’ model

Fixed Effects					
	Est/Beta	SE	95% CI	t	p
Intercept	-1.02	0.32	-1.65 - -0.39	-3.2	0.001
Group	1.11	0.47	0.18 - 2.03	2.35	0.019
Item var 1	-0.52	0.05	-0.62 - -0.42	-10.24	0.0003
Item var 2	0.63	0.05	0.52 - 0.73	11.67	0.0004
Group X Item var 1	0.79	0.08	0.64 - 0.94	10.05	0.0001
Group X Item var 2	-1.16	0.08	-1.32 - -1.00	-13.97	0.00002
Item var 1 X Item var 2	0.13	0.06	0.02 - 0.24	2.38	0.017
Group X (Item var1 X Item var2)	0.02	0.09	-0.14 - 0.19	0.27	0.788
Random Effects					
			Variance	S.D.	Correlation
Participant (Intercept)			1.88	1.37	
Items (Intercept)			1.8	1.34	
Item var 1 Participant (Intercept)			0.27	0.52	
Item var 1 (slope)			0.12	0.35	0.24
Model fit					
R ²			Marginal	Conditional	
			0.34	0.56	
Key: p-values for fixed effects calculated using Satterthwaites approximations. Confidence Intervals have been calculated using the Wald method. Model equation: Measure ~ (1 Participant) + (1 Item) + (1 + Item var 1 Participant) + Group x (Item var1 x Item var2)					

Table A5.2 Legend

An example of a table reporting a linear mixed effect model. The top of the table is similar to reporting regression, with predictors, estimates/betas, standard error (SE) and confidence intervals (95% CI), with test statistics (t) and p values (p) for the coefficients. Wherever possible, p values should be reported exactly rather than the shorthand 'p<0.05' or p<0.01'.

For this example, we have used generic terms such as 'Group' and 'Item Variable 1', 'Item Variable 2' (shortened to Item Var 1 and Item Var 2) rather than using names of 'real' variables or groups from a specific study. This model includes three main effects (Group, Item Variable 1, Item Variable 2), three two-way interactions and one three way interaction.

Random effects have been fit with intercepts for Participants, Items and intercepts and correlated slopes over Participants for one variable (Item variable 1).

Random effects are reported underneath the fixed effects, with variance and SD reported for each, and correlations where appropriate (in this case, for correlated intercepts and slopes for Item variable 1).

A measure of model fit is included at the bottom, note that researchers may choose alternative measures of model fit (e.g. AIC/BIC/Log Likelihoods when models are compared).

Finally, the table key reports how p values and confidence intervals have been calculated, and the model equation is reported.

Additional examples of tables such as this can be found in Meteyard & Bose (2018; Tables 3 and 4 and Appendices B and C).