

QUANTITATIVE RESEARCH | CHEAT SHEET



PREREQUISITES

- Write clear research questions, order them by priority and importance, and write them out in full.

DESIGN AND ANALYSIS

- Design is more important than analysis.
- Before collecting data**, ensure that your analysis matches your design, and vice versa.
- Obtaining more data is always better, no matter what.
- Check whether your proposed study is **ORANGE** or **GREEN** in each row of the table on the right. For explanation, see notes.
- If your study has **at most TWO orange cells** and no **RED** cell in the table on the right, then proceed with caution. If your study has **more than two orange cells or one red cell**, go back and reconsider your design and analysis.
- Beware of order effects (priming, learning, emerging strategies, fatigue, boredom, etc) within a participant's session and across multiple sessions for the same participant. Test for these effects in your analyses.
- Check ALL assumptions of a statistical test or model BEFORE conducting that test or fitting that model.

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	LAX, PERMISSIVE, LIBERAL	STRICT, RESTRICTIVE, CONSERVATIVE	NOTES	MY STUDY IS...
1	No prior evidence against H0 (significant outcome may be false positive)	Strong prior evidence against H0 (significant outcome may be true positive)	If most of H0's (!) being tested are true, a priori, then most of significant outcomes are false positives (Ioannidis, 2005). See point 4.	<input type="checkbox"/> ORANGE <input type="checkbox"/> GREEN
2	Key factors vary between participants	Key factors vary within participants	See tables below, and see Quené (2010)	<input type="checkbox"/> ORANGE <input type="checkbox"/> GREEN
3	Large variation between participants (items)	Small variation between participants (items)	Larger variation requires larger numbers of participants (items), see point 5. Consider (i.e. balance) both internal and external validity.	<input type="checkbox"/> ORANGE <input type="checkbox"/> GREEN
4	Exploratory research, developing tentative ideas	Experimental research, testing pre-existing hypothesis		<input type="checkbox"/> ORANGE <input type="checkbox"/> GREEN
5	Few participants OR few items	Many participants AND many items	See 3. Should be GREEN for GLMM or LMM, for participants AND items. NB "few" means 12 or fewer, "many" means 30 or more	<input type="checkbox"/> ORANGE <input type="checkbox"/> GREEN
6	Low power	High power	NB "low" means .8 or less, "high" means .9 or more	<input type="checkbox"/> ORANGE <input type="checkbox"/> GREEN
7	Dependent variable (response) measured on categorical scale	Dependent variable (response) measured on continuous scale	Related to point 5. "categorical" or qualitative response: e.g. correct-incorrect response, scale with 5 or fewer options; "continuous" or numerical response: e.g. response time in ms, scale with 7 or more options, most phonetic measurements.	<input type="checkbox"/> ORANGE <input type="checkbox"/> GREEN
8	Predicted effect is small in size: small difference, large variation	Predicted effect is large in size: large difference, small variation	Obtain estimates of variation from previous studies, or from pilot work (see Quené, 2010). Background: Quené & Van den Bergh (2020), \$13.8.	<input type="checkbox"/> ORANGE <input type="checkbox"/> GREEN
9	Many factors or predictors: risk of overfitting	Few factors or predictors: "less is more", "keep it simple", robust	with k number of continuous predictors, m number of levels of categorical factors, and N number of observations: $N > 20(k+m)$, or, $(k+m) < N/20$ (Cohen, 1990; Quené, 2010)	<input type="checkbox"/> ORANGE <input type="checkbox"/> GREEN
10	Some concepts mentioned in this table are not familiar to me	I have learned about and I fully understand all concepts mentioned in this table	H0, variation, variance, effect size, power, significance, predictor, levels, response, n and N , model, test, inference, sample, participants, stimuli, groups, treatment, ...	<input type="checkbox"/> RED <input type="checkbox"/> GREEN

The following two tables illustrate row 2 of the table above. ($power > .8$, $sd = .5$ for fixed effects, $sd = 1.0$ for random effects)

TREATMENT VARIES BETWEEN PARTICIPANTS

	Treat.A	Treat.B
groups 1+2 (each n=32)	1.A	2.B
groups 3+4 (each n=32)	3.A	4.B
total N=128 participants		

TREATMENT VARIES WITHIN PARTICIPANTS

	Treat.A	Treat.B
group 1 (n=48)	1.A	1.B
group 2 (n=48)	2.A	2.B
total N=96 participants		