The association between "contextual dependence" and replicability in psychology may be spurious

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A commented Stata do-file that reproduces all the analyses in this commentary is posted at https://db.tt/Ts3YZBrk

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The Reproducibility Project: Psychology (RP:P) attempted to replicate 100 cognitive and social-personality psychology studies (1). Van Bavel, Mende-Siedlecki, Brady, and Reinero (VMBR) (2) report an association (r = -.23, p = .024) between a study's rated "contextual dependence" and whether the study was successfully replicated by the RP:P. However, this association is entirely the result of an omitted third variable: whether the study was in cognitive or social-personality psychology. *Within* each sub-discipline there is no relationship between context dependence and replicability: r = -.08, p = .54 for social-personality psychology; r = -.04, p = .79 for cognitive psychology (point-biserial correlations).

The third-variable problem

The RP:P coded studies as cognitive (n = 43) or social-personality (n = 57) psychology; the former were much more likely to replicate successfully (53% vs. 28%, by the standard VMBR use). Cognitive psychology studies were also rated by VMBR as less context-dependent than social-personality psychology studies (d = -1.85, p < .001). Therefore, the "third variable" of sub-discipline could explain the relationship between context-dependence and replicability. VMBR are aware of this possibility, and report an analysis that they suggest addresses it—the interaction between sub-discipline and context dependence does not predict replicability (p=.877). But this analysis does not answer the question of interest. It asks "does the effect differ by sub-discipline?" not "is there an effect controlling for sub-discipline?"

To see the problem, suppose a researcher discovered a positive relationship

between beardedness and height, but was concerned about a gender confound: a) men are more likely than women to have beards; and b) men are (on average) taller than women. Would it help the researcher to show that when considering men and women separately, there is no relationship in either group between beardedness and height (and thus no interaction)? It would not—but this is exactly what VMBR do. VMBR report an effect of contextual sensitivity on replicability of OR = .823 (p = .54) for social-personality studies, and of OR = .892 (p = .78) for cognitive studies—i.e., a null effect within each sub-discipline. Controlling for sub-discipline in a logistic regression (rather than testing the interaction), the previously-significant effect of context dependence disappears, OR = .85, Z = -.66, p = .51. These null effects are not due to restriction of range, as there is substantial variability in context sensitivity within each sub-discipline (see Figure 1).

Conclusion

VMBR describe their data as showing that "contextual sensitivity appears to play an important role in replication success across multiple areas of psychology." A more apt summary is that contextual sensitivity is no longer associated with replicability once sub-discipline is taken into account.

Of course, cognitive psychology studies may be more replicable *because* they are less context-sensitive. However, cognitive and social-personality psychology differ in many other ways, such as greater use of within-subject designs in cognitive psychology. With VMBR's data, it is simply not possible to say which—if any—of these differences are responsible for the observed differences in replicability between the two areas.

References

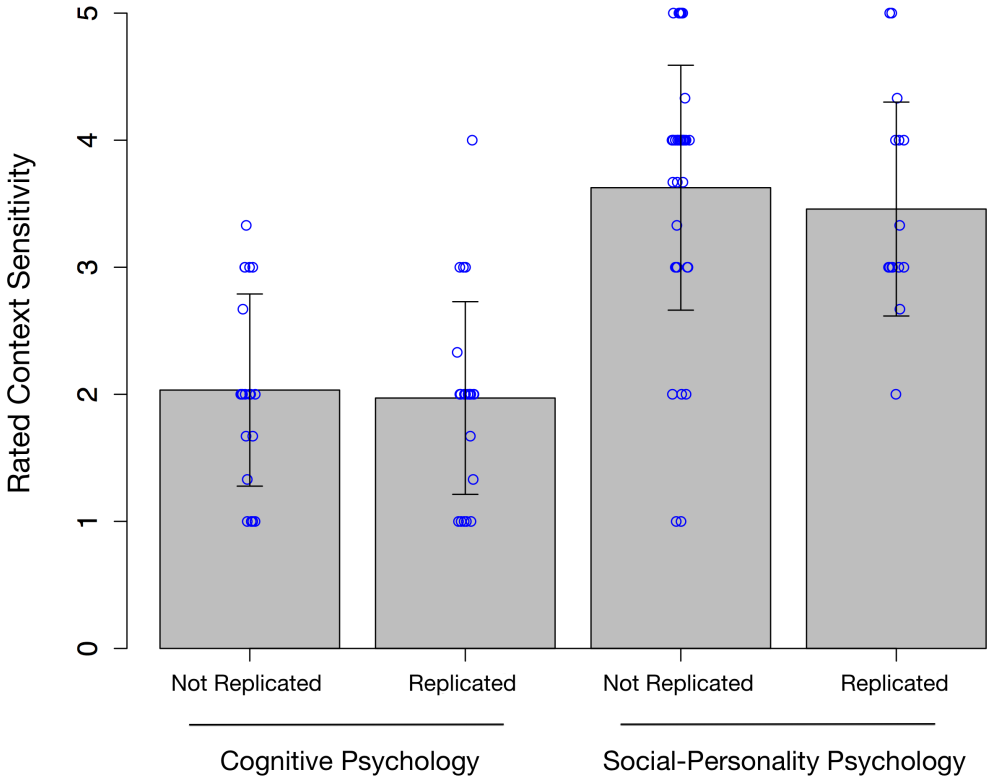
1. Open Science Collaboration (2015) Estimating the reproducibility of psychological science. *Science* 349(6251):

2. Van Bavel JJ, Mende-Siedlecki P, Brady WJ, Reinero DA (2016) Contextual sensitivity in scientific reproducibility. *Proc Natl Acad Sci.*

3. Bickel PJ, Hammel EA, O'Connell JW (1975) Sex bias in graduate admissions: Data from Berkeley. *Science* 187(4175): 398-404.

Figure Caption

Figure 1. Rated context sensitivity by replicability and sub-discipline. Error bars are standard deviations; data points are overlaid. Data are from VMBR as posted on https://osf.io/cgur9/


Rated Context Sensitivity
0
1
2
3
4
5
Not Replicated
Replicated
Not Replicated
Replicated
Cognitive Psychology
Social-Personality Psychology