Documentation of attempt to computationally replicate the results of the meta-analysis reported in Vahey et al. (2015)

# Correspondence with Vahey

I emailed Vahey, as the first and corresponding author of Vahey, Nicholson & Barnes-Holmes (2015) on 01-04-2019 stating that I was trying to reproduce their analyses. I asked him for details of their analytic approach, and asked him if he’d be willing to send me the code. A copy of this email chain is available in this folder (“email correspondence with Vahey.pdf”).

Excerpts from Vahey’s replies:

*"I used the software explained in the following paper: Field, A. P., & Gillett, R. (2010). How to do a meta‐analysis. British Journal of Mathematical and Statistical Psychology, 63(3), 665-694."*

*"I used the SPSS syntax provided by Field & Gillett for the Hunter and Schmidt (2000) random effects method (cited at start of IRAP meta-analysis results section)."*

When asked if he’d be willing to provide me with his code, he declined:

*“honestly, it would take me quite a bit of time to dig out those scripts from computer backups given that I performed the relevant analyses two computers ago. All of the relevant scripts should be available with the supplementary methods of all the papers mentioned -- can you try and obtain them that way and sure if you run into problems let me know and I'll see what I can do? For efficiency's sake I'm keen to postpone deep diving into the meta-analysis paper until there are specific criticisms for me to address”*

I provided those specific criticisms in a talk at the Association for Contextual Behavioral Science entitled “The IRAP’s Predictive Validity: Updating a recent meta-analysis” on 27/06/2019. A copy of the presentation is available in this folder (“Hussey - 2019 - IRAP’s Predictive Validity - Updating a recent meta-analysis.pdf”). This talk contained a OSF link to all my data, code and materials at the time for this project. I informed Vahey in April that I would be giving the talk, and that I would make all my materials available to him. Vahey was a member of the audience and asked several questions. Vahey has not contacted me since with any questions, issues, responses, comments, etc.

# Computational replication

In the absence of access to his code, I did as he suggested and attempted to reproduce his analyses using Field & Gillett’s SPSS script.

I the Hunter & Schmidt meta-analysis (see “original from Field's website/h\_s syntax.sps”) from <https://www.discoveringstatistics.com/repository/fieldgillett/how_to_do_a_meta_analysis.html>. This was redownloaded on 16-08-2022 to maximise the chance that I had version that worked with the current version of SPSS. The only changes made to it were to (a) change it to the degree it was necessary to make it run, and (b) making changes that were mentioned in Vahey et al. as part of their analytic approach (see “modified/ h\_s syntax modified.sps”).

I created a data file containing the *r* and *N* values that Vahey et al report in their forest plot (Fig 1, p. 62; see “modified/data from Vahey et al.'s forest plot.csv” for file).

I attempted a “push-button replication” by attempting to run the script, but it threw errors.

I then removed lines 15 to 24 of the SPSS script which rename and recode the variables, as these were now redundant. I changed line 36 to the appropriate local directory on my computer. 80% credibility intervals were changed to 95% credibility intervals as Vahey et al reported the latter. This involved changing both the text labels and the multiplier (i.e., to +/- 1.96 on lines 113, 116, 117, 149 and 149). I again ran the script, but it again threw errors.

On inspection, the script required variables for the reliabilities of the two variables involved in each correlation. Corrections for the reliability of the variables was not discussed in Vahey et al.'s manuscript or supplementary materials. It is unclear if reliability estimates were used and not reported in the manuscript, or if these were artificially set to 1, or if the script was customised in some other unknown way.

In order to have the script run, I set these reliabilities (variables rx and ry) to 1 by creating new variables in the dataset. This assumes that Vahey et al were performing a "bare bones" meta-analysis, as Hunter & Schmidt referred to it, that does not correct for reliability. The script now ran. The SPSS output can be found in “modified/output.htm”.

The table below includes the original results reported in Vahey et al. and the results of the computational replication. As can be seen in the table, none of the estimates agree. Based on the information provided in the original publication and the information that the first author was willing to provide me with, the results of the meta-analysis could not be computationally replicated.

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|  | Reported in Vahey et al. (2015, Figure 1, and p.63 for confidence interval) | Computational replication | Difference | Agreement (to two decimal places) |
| *k* studies | 15 | 15 | 0 | TRUE |
| Total *N* | 494 | 494 | 0 | TRUE |
| Effect size *r* | .45 | .467 | .017 | FALSE |
| 95% Confidence Interval |  |  |  |  |
| Lower | .40 | .1955 | -.2045 | FALSE |
| Upper | .54 | .7392 | .1992 | FALSE |
| 95% Credibility Interval |  |  |  |  |
| Lower | .23 | .4674 | .2374 | FALSE |
| Upper | .67 | .4674 | -.2026 | FALSE |