

Peer-review report of

Johal, S. K. & Rhemtulla, M. (2024). Relating network-instantiated constructs to psychological variables through network-derived metrics: An exploratory study. *advances.in/psychology*, 2, e939409. <https://doi.org/10.56296/aip00024>

Round 1

Dear Dr. Johal and Dr. Rhemtulla,

Thank you for submitting your manuscript titled "Relating Network-Instantiated Constructs to Psychological Variables Through Network-Derived Metrics: An Exploratory Study" to our journal's special issue on Network Methods in Psychology. We have now received the comments from two expert reviewers who have assessed your work. Both reviewers found merit in your study, highlighting its clear writing, expert execution, and usefulness to the field. They also appreciated the open data and code provided.

However, the reviewers have raised several points that need to be addressed before the manuscript can be considered for publication. These include:

1. Providing more explanations and examples to make the work accessible to a broader, non-quantitative audience. This could involve unpacking the relevance of your work to various research areas, explaining terminology such as edges and nodes, and simplifying the presentation of methods and results.
2. Extending the discussion on different centrality measures, their use in psychometric network research, and their conceptual meanings. The underlying reasons for using these measures should be elaborated upon.
3. Clarifying certain aspects of the methodology, such as the average number of timepoints in the DKPK dataset, the occurrence of 100% density in temporal networks after backwards edge selection, and the handling of 0 density networks.
4. Exploring additional analyses, such as examining how well the centrality of a node predicts the outcome.

5. Addressing potential issues with the original studies, such as restriction of range in the Vazire study due to the use of GPA.

Please revise your manuscript taking into account the reviewers' comments. We would also encourage you to consider developing a companion article or section that delves deeper into explaining the code and methods to facilitate understanding for a wider audience.

We believe that your work has the potential to make a significant contribution to the field, and we look forward to receiving your revised manuscript. Please provide a detailed response to the reviewers' comments along with your resubmission.

Best Wishes,

Hudson Golino

Reviewer 1:

This is interesting work that examines that aims move from theoretical work on network models to providing clear and directive advice on summarizing network models to allow for investigation of that model associations with psychological variables. The work is clearly well written, expertly carried out, and makes a useful contribution to the field. The open data and code, although increasingly normative, has great value.

The paragraph on page 3 that starts with “the problem of how to model” includes numerous citations as examples of how the work could be applied. I would like to see this unpacked a bit with some explanations of how the various areas of research are lacking – really, just a few “for example” sentences addressing a couple of the citations in that paragraph would give a better sense of the work to non-quant folks.

Again, in the following paragraph on page 3, I would advise an example or two to give a better understanding of what has previously been done.

One thing that struck me is that the current submission could provide a great opportunity to teach these somewhat novel methods. I very much enjoyed work in Machine Learning that appeared in *Collabra: Psychology* as it had the goal of teaching how to apply the analyses.

<https://online.ucpress.edu/collabra/article/4/1/37/112987/The-Human-Penguin-Project-Climate-Social> -- I think with some additions, this piece could be that great example that serves to help others apply network analysis. Perhaps what I am saying is that writing the piece more as a teaching example and less as an article for quantitative people (although the work stands very strongly among articles from that perspective). I want to note that this is simply my preference – not a deal breaker if the authors decide on a different path.

I note that in the previous paragraph, I suggested approaches that would possibly make this a very different paper. Perhaps it would be more beneficial to develop a companion article that went deep into explain code, etc. to facilitate understanding.

Some of the terminology is going to lose non-quant readers. Edges and nodes, in particular. Some explanation of those terms with examples would be helpful.

The Method section does well to concisely describe the studies – however, I do see some issues with the original studies. The Vazire study (although a very important contribution) does provide some challenges with the use of GPA. There is bound to be some restriction of range issues as people with super low GPAs often do not persist in college.

Again – speaking to the issues of writing a broader audience. When you say things like “relatively simple network characteristic is network density, or the proportion of non-zero edges out of all possible edges. If w_{jk} represents the weight of the edge between node j and node k , then the network density is calculated as,” it can alienate readers. That is really not so simple for most people. Similarly, many sections – e.g., modularity would benefit from presentation that would appeal to a broader audience.

I would very much like more focus on explanation of most of the pieces in the method – you not a measure of network strength, but I would argue that many readers have no idea what that is. To be honest, I am a quant person but rarely deal with methods using nodes, so that is giving me issues. (Again – this is not a critique of the quality of the methods presented, only suggestions for bringing these analyses to a broader audience.) Also, adding a formula for a sum score is probably a bit over the top. It is a sum.

I was hoping to see more information on the analysis approach. It sounds like some form of regression or ML but, the approach is not explicitly named (that I saw). I do

note that some of my confusion may stem from reviewing at a time that OSF was down, so I could not review code.

In your tables, it would be helpful if there was greater explanation of the different statistics – most readers aren't going to understand density, communities, etc.

In the regression results, I was confused by R-squared for predictors. A better measure would be the squared semi-partial correlation as that represents unique variance explained by the variable in the overall model.

Finally, I again want to stress that I am reviewing from a place where you have submitted to a new outlet and that outlet hasn't yet fully formed, so I am sort of shooting in the dark on comments not really understanding what is normative for the outlet. I do think this is good work, but on issues such as the focus of the article, I will defer to the editorial team.

Chris Aberson

Reviewer 2:

The current paper titled "Relating Network-Instantiated Constructs to Psychological Variables Through

Network-Derived Metrics: An Exploratory Study" examines 4 empirical datasets, and presents how different summary metrics computed from psychometric networks, such as density, modularity, and values of nodes selected based on centrality, predict outcomes. The authors identified that the average value of the most frequent central node was the overall best predictor of outcomes. I found this study well put together for the most part, but I do have a number of comments regarding the analytic approach and conceptual implications.

1. This paper would benefit from an extended discussion of different centrality measures and how they have been used in psychometric network research. The authors do discuss the use of node degree/strength centrality, which is great, but given that they also look at modularity and number of communities, they should give more of a discussion on those topics including how they have been used, and conceptually what they mean for a psychometric network. I would also encourage the authors to discuss the general idea of centrality being used as a measure of variable importance. For example, degree/strength centrality is commonly used to identify important variables, but why? Why would this metric be useful for that (I ask rhetorically, there are conceptual reasons to think this), when it is absolutely not a direct measure of directed relations that, for example, controllability centrality would be (see Henry et al 2022, "On the Control of Psychological Networks"). In essence, the authors have a very straightforward "this is what other researchers have done",

but do not discuss the underlying reasons why these things are done, and I'd like to see more of that in this paper.

2. Love the use of multiple datasets, definitely a major strength of the paper. One question: How can the average number of timepoints in the DKPK dataset be greater than the total possible T?

3. The authors fit saturated VAR models, and then performed backwards edge selection based on significance. I don't particularly like this approach, but I'll let it pass given the issues the authors mentioned with regularized VAR (which I also don't agree with, but I'm not here to argue about another paper). What I am confused about is how any temporal network could have 100% density after this process? That would imply that every single edge was significant at the first model fit? Tad confused about this. Similarly, how did the author factor in 0 density networks? How was the "most central" node identified in the 0 density networks?

4. So conceptually, the identification of the most central node followed by the calculation of the average of the most central node (either within individual or across most individuals) does evaluate how well does centrality identify relevant nodes. I'm fine with that, but it does seem like this is really tilting the results towards having the average value of the node be the best predictor. I'd encourage the authors to look at how well the centrality of a node predicts the outcome as well.

Overall, this was a nice straightforward empirical analysis of what are the best network based predictors using a large amount of empirical data, and my comments are primarily for extension/discussion.

Round 2:

Dear authors,

I am pleased to inform you that your manuscript "Relating Network-Instantiated Constructs to Psychological Variables Through Network-Derived Metrics: An Exploratory Study" has been accepted for publication in the special issue on network methods at Advances in Psychology.

The reviewers and editorial team found that your revised manuscript successfully addressed the comments and suggestions from the initial review. We appreciate the additional explanations, examples, and analyses you have included to make the paper more accessible to a broader audience while maintaining its methodological rigor.

Your work makes a valuable contribution to the field by exploring how network-derived metrics can be used to predict psychological variables. The use of multiple datasets and the thorough investigation of various network features strengthen the conclusions of your study.

Please submit your final manuscript files as a Word document, including any supplementary materials, within the next two weeks. Our production team will be in touch if they need anything else from you.

Congratulations on your work, and thank you for choosing to publish with Advances in Psychology.

Sincerely,

Dr. Hudson Golino

Editor

Advances in Psychology

Reviewer 1:

thank you for your comments on my review. I appreciate the attention you gave to the comments and the arguments you provided when disagreeing with my suggestions.

This is good work and I appreciate the cordial back and forth.

I am happy with this revision.

Chris Aberson