Peer Review

There are three components of working memory, viz. phonological loop, visiospatial sketchpad and central executive function. You tested only the the first component. Why were the other two components not tested for ? Therefore, revise your manuscript to state this instead of using the general term “working memory”

The test states that points are deducted for incorrect responses. Were they? Please describe and explain in the manuscript.

According to this study, :https://doi.org/10.3389/fpsyg.2023.1091126, the phonological loop (which you tested for) had the weakest correlation with mathematical problem solving (LMQ on your test). Since this result is already available in the public domain, is there a point to duplicating this research ? Especially when you have incorrectly? identified this as a ‘gap’ in research ? Please explain and describe in the manuscript with appropriate references.

Various studies indicate that working memory load has a causal effect on fluid intelligence and test taking scores, see:https://doi.org/10.1016/j.cognition.2023.105438 and the Embreton paper (referenced below). However, in your test, the (phonological loop) part of WM was administered at the end of the test. What would have been the impact of the correlation between WM and (LMQ+VMQ), and the correlation between WM and (IEQ and IAQ), were the (phonological loop) part of WM were to be administered as the first question on the test with the test time still being 15 minutes ? Please discuss and explain in the manuscript.

Present the correlation coefficient (or the coefficient of determination), R^2 for all your figures where you claim correlation. As far as I can see, the values of R^2 are low, therefore your linear model is not able to explain (an estimated > 50%) of the variance in the data; this can be easily seen by overlaying the histograms of WM on the two types of intelligences. Therefore your claim of moderate correlation is statistically incorrect since your results could be due to random chance (a calculation of MAPE can be presented in the manuscript). Please explain and discuss in the manuscript.

The claim of WM being bimodal appears to be a stretch. Please confirm by a regression analysis for an exponential decay curve, a second degree polynomial and a linear curve. Present and discuss in the manuscript.

References must be sequentially numbered in the body of the text. The reference section should contain numbered referenes that correpond to the ones in the text. Please check the formating guidelines for references at the website.

If you scored some responses, based on general consensus, this means that you may be effectively reinforcing the gaussian distribution (regardless of whether or not centered on zero). Please explain and discuss in the manuscript. Also, what did you define as ‘general consensus’ ? 60% similar answers? 70%, 80%…?

Please have these questions evaluated by an ‘expert’ and then present the difference in histrogram distribution to see if this difference is significant. Explain and discuss the implications in the manuscript.

The number of references related to the content of the manuscript miss out several important ones. I have listed some of them below, there could be others. Please perform a thorough search of the literature.

In a supplementary file, provide one sample of a completed test and the three quotients for that test. Also provide points for each question and how the final score was generated.

More references:
INTELLIGENCE 20, 1699189 (1995)
The Role of Working Memory Capacity
and General Control Processes
in Intelligence
SUSAN E. EMBRETSON, University of Kansas
https://elmirmohammedmemorypsy.com/wp-content/uploads/2017/11/working-memory-and-intelligence.pdf
http://dx.doi.org/10.1016/j.jecp.2009.11.003
https://doi.org/10.3389/fpsyg.2023.1091126
http://dx.doi.org/10.18823/asiatefl.2019.16.3.4.817
https://doi.org/10.1016/j.cognition.2023.105438

---

1. There are three components of working memory, viz. phonological loop, visiospatial sketchpad and central executive function. You tested only the the first component. Why were the other two components not tested for ? Therefore, revise your manuscript to state this instead of using the general term “working memory”
Answer: In order to resubmit my manuscript, I redid a similar test to the one originally completed, although with the different components of working memory. The Digit Span Task was used to test for the phonological loop, the Spatial Span Task was used to test for the visuospatial sketchpad, and an adaptation of the Wisconsin Card Sorting Task was used to test for central executive function. As such, the quotients PLQ, VSQ, and CEFQ were created with their average being WMQ.

2. The test states that points are deducted for incorrect responses. Were they? Please describe and explain in the manuscript.
Answer: This was an unintentional mistake in the original manuscript which did not persist into the study associated with this resubmission.

3. According to this study, :https://doi.org/10.3389/fpsyg.2023.1091126, the phonological loop (which you tested for) had the weakest correlation with mathematical problem solving (LMQ on your test). Since this result is already available in the public domain, is there a point to duplicating this research ? Especially when you have incorrectly? identified this as a ‘gap’ in research ? Please explain and describe in the manuscript with appropriate references.
Answer: Rather than my study’s gap being the relationship between working memory and mathematical problem solving, it is truly the relationship between working memory and Gardner’s intelligences as he described them. The intent of this study was to follow closely to what Gardner had defined in his book which was radically different in comparison to the general idea of mathematical problem solving. This actually further advocates for the importance of my research as, while mathematical problem solving is expected to be related to working memory, logical-mathematical intelligence as was defined by Gardner does not. This shows that the concept of mathematical abilities being based in cognitive function is likely, however logical-mathematical intelligence is unlikely to be

founded in cognitive abilities due to its distinct definition that is more similar to a talent or ability than an intelligence.

4. Various studies indicate that working memory load has a causal effect on fluid intelligence and test taking scores, see:https://doi.org/10.1016/j.cognition.2023.105438 and the Embreton paper (referenced below). However, in your test, the (phonological loop) part of WM was administered at the end of the test. What would have been the impact of the correlation between WM and (LMQ+VMQ), and the correlation between WM and (IEQ and IAQ), were the (phonological loop) part of WM were to be administered as the first question on the test with the test time still being 15 minutes ? Please discuss and explain in the manuscript.
Answer: This was rectified in the updated version of my study as all parts of a single working memory test were conducted in the same area. It's clear that the impact of using a more realistic and correct measure of working memory would have further offered evidence against Gardner's theory as each of the sections were tested individually.

5. Present the correlation coefficient (or the coefficient of determination), R^2 for all your figures where you claim correlation. As far as I can see, the values of R^2 are low, therefore your linear model is not able to explain (an estimated > 50%) of the variance in the data; this can be easily seen by overlaying the histograms of WM on the two types of intelligences. Therefore your claim of moderate correlation is statistically incorrect since your results could be due to random chance (a calculation of MAPE can be presented in the manuscript). Please explain and discuss in the manuscript.
Answer: All correlation coefficients between components of working memory and Academic and Personal intelligences are written directly within the Results section. As such, terms such as "moderate correlation" are no longer used and the paper instead discusses the impacts of a potential lack of a correlation. The R^2 values for all different relationships are as follows: ● PLQ and LMQ = ● PLQ and VLQ = ● PLQ and Academic = ● PLQ and IEQ = ● PLQ and IAQ = ● PLQ and Personal = ● VSQ and LMQ = ● VSQ and VLQ = ● VSQ and Academic = ● VSQ and IEQ = ● VSQ and IAQ = ● VSQ and Personal = ● CEFQ and LMQ = ● CEFQ and VLQ = ● CEFQ and Academic = ● CEFQ and IEQ = ● CEFQ and IAQ = ● CEFQ and Personal = ● WMQ and LMQ = ● WMQ and VLQ = ● WMQ and Academic = ● WMQ and IEQ = ● WMQ and IAQ = ● WMQ and Personal =

6. The claim of WM being bimodal appears to be a stretch. Please confirm by a regression analysis for an exponential decay curve, a second degree polynomial and a linear curve. Present and discuss in the manuscript.
Answer: WMQ was no longer seen as bimodal because of the separate and more individual means of testing for it. As such, this issue was mitigated in the revised manuscript by no longer being present due to the revamping in how WMQ was tested.

7. References must be sequentially numbered in the body of the text. The reference section should contain numbered referenes that correpond to the ones in the text. Please check the formating guidelines for references at the website.
Answer: This was fixed and updated accordingly with all references added along with resubmission.

8. If you scored some responses, based on general consensus, this means that you may be effectively reinforcing the gaussian distribution (regardless of whether or not centered on zero). Please explain and discuss in the manuscript. Also, what did you define as 'general consensus' ? 60% similar answers? 70%, 80%…? Please have these questions evaluated by an 'expert' and then present the difference in histrogram distribution to see if this difference is significant. Explain and discuss the implications in the manuscript.

Answer: I changed the means by which these questions were scored so that they were scored by both expert opinion and general consensus. In order to decide if an answer was correct when scoring based on general consensus, the answer needed to have the majority of responses or 5 more responses than the second most selected answer. In order for something to be correct based on expert opinion, an answer needed a majority. If neither criteria were met then multiple answers would be equally correct. As answers moved further from the correct answer, participants received fewer points. The histograms shown as supplementary reveal that the difference between general consensus and expert opinion for both IEQ and IAQ are not radical, with expert opinion yielding slightly lower scores. This makes sense because when they disagreed then a large number of people who choose the most chosen answer would receive less points.

9. The number of references related to the content of the manuscript miss out several important ones. I have listed some of them below, there could be others. Please perform a thorough search of the literature.
Answer: I added the given articles to the literature review, implications, and research connections sections. These were used to show the difference between common definitions of intelligence and MI theory while also supporting the connection that working memory has with Gf and cognition. These sources furthered the claim against Gardner's theory presented in my paper.

10. In a supplementary file, provide one sample of a completed test and the three quotients for that test. Also provide points for each question and how the final score was generated.
Answer: The completed test and the quotients are provided in a supplementary file. The equations used to score the test are provided in an Appendix. Points were scored for the provided test in the following ways: PLQ ● Q1 - 2701 - 4/4 ● Q2 - 80910 - 5/5 ● Q3 - 126948 - 6/6 ● Q4 - qhsm - 4/4 ● Q5 - qxtba - 0/0 ● Q6 - vfkavfw - 3/6 ● Q7 - bcqa0tb6 - 2/8 ● Q8 - 9icjlba - 5/8 ● Q9 - 4naqlbj - 3/8 VSQ ● Q1 - 10, 26, 6 - 1/3 ● Q2 - 23, 17, 4, 24 - 4/4 ● Q3 - 15, 6, 2, 19, 11 - 5/5 ● Q4 - 10, 20, 10, 24, 13 - 1/6 ● Q5 - 2, 20, 2, 23, 23, 17 - 2/7 CEFQ ● S1 - 2/2 ● S2 - 0/2 ● S3 - 3/4 LMQ ● S1 - 3/8 ● S2 - 3/5 VLQ ● Q1 - 5/5 ● Q2 - 3/5 ● Q3 - 4/5 ● S2 - 3/4 IEQ - General Consensus & Expert Opinion ● Q1 - Much - 5/5 & 5/5 ● Q2 - None - 5/5 & 5/5 ● Q3 - None - 5/5 & 5/5 ● Q4 - None - 5/5 & 5/5 ● Q5 - None - 5/5 & 5/5 ● Q6 - Moderate - 3/5 & 3/5 ● Q7 - Extreme - 5/5 & 5/5 ● Q8 - None - 5/5 & 5/5 ● Q9 - Moderate - 4/5 & 4/5 ● Q10 - Little - 4/5 & 4/5 ● Q11 - None - 5/5 & 5/5 ● Q12 - None - 5/5 & 5/5 ● Q13 - None - 5/5 & 5/5 ● Q14 - None - 5/5 & 5/5 ● Q15 - None - 4/5 & 4/5 ● Q16 - Little - 4/5 & 4/5 ● Q17 - None - 5/5 & 5/5 ● Q18 - Little - 5/5 & 5/5 ● Q19 - Extreme - 3/5 & 3/5 ● Q20 - Little - 4/5 & 4/5 ● Q21 - Moderate - 3/5 & 3/5 ● Q22 - Much - 5/5 & 5/5 ● Q23 - None - 5/5 & 5/5 ● Q24 - Much - 4/5 & 5/5 ● Q25 - Not Useful - 5/5 & 4/5 ● Q26 - Moderately Useful - 4/5 & 5/5 ● Q27 - Very Useful - 5/5 & 4/5 ● Q28 - Slightly Useful - 5/5 & 4/5 ● Q29 - Very Useful - 5/5 & 5/5 ● Q30 - Not Useful - 5/5 & 5/5 IAQ - General Consensus & Expert Opinion ● S1 - 1/2 & 1/2 ● Q3 - Very Effective - 5/5 & 5/5 ● Q4 - Very Effective - 5/5 & 5/5 ● Q5 - Not Effective - 5/5 & 5/5 ● Q6 - Effective - 5/5 & 4/5

Thank you for addresssing my eariler comments. I have some housekeeping suggestions. I went ahead and revised your manuscript (see attached iteration1). Please check thoroughly to see if it still says what you want it to say. Then address these comments and resubmit
1.The graphs need legend titles. Some have partial titles, some don't have titles at all.
2.Need a school affiliation
3.Appendix G appears incomplete.
4.For you supplementary file pdf, please remove the email and any information that can be used to identify the test-taker. This is important as you did not seek or obtain IRB permission to perform this study.

5.In the limitation section add that "IRB approval was not required for this study because no data or identity or personal information was collected about individual test takers. Although a hypothesis was being tested, the study was not designed to draw conclusions that are intended to be applicable and/or shared beyond the populations or situations being studied.

The graphs need legend titles. Some have partial titles, some don't have titles at all.
Answer: I noticed that the colors used and the R^2 values were cut off for the scatter plots. As long as they are shown in the final version, then the new, more clear, legend titles on all of the supplemental graphs should be good. Additionally, figure numbers and descriptions remain unchanged so I only resubmitted the graphs themselves.

Need a school affiliation
Answer: I added it below my name and it can be moved if necessary.

Appendix G appears incomplete.
Answer: Although the Intrapersonal Section was shorter than the Interpersonal Section, Appendix G is complete

For your supplementary file pdf, please remove the email and any information that can be used to identify the test-taker. This is important as you did not seek or obtain IRB permission to perform this study.
Answer: The name and email address are now blacked out on the supplementary pdf file so that the entirety of their response can be used without identifying information.

In the limitation section add that "IRB approval was not required for this study because no data or identity or personal information was collected about individual test takers. Although a hypothesis was being tested, the study was not designed to draw conclusions that are intended to be applicable and/or shared beyond the populations or situations being studied."
Answer: This was added to the limitations section in an appropriate location. The completed test and the quotients are provided in a supplementary file. The equations used to score the test are provided in Appendix G. Points were scored for the provided test in the following ways: PLQ ● Q1 - 2701 - 4/4 ● Q2 - 80910 - 5/5 ● Q3 - 126948 - 6/6 ● Q4 - qhsm - 4/4 ● Q5 - qxtba -0/0 ● Q6 - vfkavfw - 3/6 ● Q7 - bcqa0tb6 - 2/8 ● Q8 - 9icjlba - 5/8 ● Q9 - 4naqlbj - 3/8 VSQ ● Q1 - 10, 26, 6 - 1/3 ● Q2 - 23, 17, 4, 24 - 4/4 ● Q3 - 15, 6, 2, 19, 11 - 5/5 ● Q4 - 10, 20, 10, 24, 13 - 1/6 ● Q5 - 2, 20, 2, 23, 23, 17 - 2/7 CEFQ ● S1 - 2/2 ● S2 - 0/2 ● S3 - 3/4 LMQ ● S1 - 3/8 ● S2 - 3/5 VLQ ● Q1 - 5/5 ● Q2 - 3/5 ● Q3 - 4/5 ● S2 - 3/4 IEQ - General Consensus & Expert Opinion ● Q1 - Much - 5/5 & 5/5 ● Q2 - None - 5/5 & 5/5 ● Q3 - None - 5/5 & 5/5 ● Q4 - None - 5/5 & 5/5 ● Q5 - None - 5/5 & 5/5 ● Q6 - Moderate - 3/5 & 3/5 ● Q7 - Extreme - 5/5 & 5/5 ● Q8 - None - 5/5 & 5/5 ● Q9 - Moderate - 4/5 & 4/5 ● Q10 - Little - 4/5 & 4/5 ● Q11 - None - 5/5 & 5/5 ● Q12 - None - 5/5 & 5/5 ● Q13 - None - 5/5 & 5/5 ● Q14 - None - 5/5 & 5/5 ● Q15 - None - 4/5 & 4/5 ● Q16 - Little - 4/5 & 4/5 ● Q17 - None - 5/5 & 5/5 ● Q18 - Little - 5/5 & 5/5 ● Q19 - Extreme - 3/5 & 3/5 ● Q20 - Little - 4/5 & 4/5 ● Q21 - Moderate - 3/5 & 3/5 ● Q22 - Much - 5/5 & 5/5 ● Q23 - None - 5/5 & 5/5 ● Q24 - Much - 4/5 & 5/5 ● Q25 - Not Useful - 5/5 & 4/5 ● Q26 - Moderately Useful - 4/5 & 5/5 ● Q27 - Very Useful - 5/5 & 4/5 ● Q28 - Slightly Useful - 5/5 & 4/5 ● Q29 - Very Useful - 5/5 & 5/5 ● Q30 - Not Useful - 5/5 & 5/5 IAQ - General Consensus & Expert Opinion ● S1 - 1/2 & 1/2 ● Q3 - Very Effective - 5/5 & 5/5 ● Q4 - Very Effective - 5/5 & 5/5 ● Q5 - Not Effective - 5/5 & 5/5 ● Q6 - Effective - 5/5 & 4/5

Accepted