

## PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	The Relationship Between Mental Health, sleep status and Screen Time Among University Students During the COVID-19 Pandemic: a cross-sectional study
<b>AUTHORS</b>	Wang, Wei; Jiang, Jingfeng; Qi, Lerong; Zhao, Fanqi; Wu, Jingying; Zhu, Xiaoqi; Wang, Bei; Hong, Xiang

### VERSION 1 – REVIEW

<b>REVIEWER</b>	Hu, Cheng-Yang Anhui Medical University, Department of Medical Humanistic, School of Medical Humanistic
<b>REVIEW RETURNED</b>	14-Jul-2023

<b>GENERAL COMMENTS</b>	<p>Thank you for providing the opportunity to review the manuscript, "Relationship Between Mental Health Status (Depression, Anxiety, and Loneliness) and Screen Time among University Students During the COVID-19 Pandemic: The Mediating Role of Sleep Status." In this cross-sectional study, Wang et al. have sought to investigate the effect of screen time on the mental health status of university students and the potential mediating role of sleep status. The study is generally well-executed, and the authors propose that enhancing sleep status could potentially alleviate the impact on students' mental health status. For further improvement and clarity, I offer the following comments and questions for the authors' consideration:</p> <ol style="list-style-type: none"><li>(1) Regarding the study design and sample, could the authors provide the formula used for sample size calculation? Additionally, it would be helpful to know the exact number of ethics approvals obtained.</li><li>(2) In section 2.2.1, is there consideration for the potential bias in the classification of screen time? Clarification on this point would be appreciated.</li><li>(3) It is important to accurately define covariates. For instance, the term "education (bachelor, master, PhD)" may be misleading as all participants are students and thus do not yet possess these degrees. Instead, it would be more appropriate to use terms like "PhD candidate/student."</li><li>(4) For statistical analysis, it's recommended to test for the normal distribution of continuous variables before choosing a statistical analysis method. Could the authors confirm if this was done?</li><li>(5) The authors should mention the specific analysis software utilized in the methods section of the paper.</li><li>(6) In the discussion section, it would be beneficial to provide a comparative analysis of the study results with those from other related studies. This could offer readers a broader context and understanding of your findings, as well as illuminate the</li></ol>
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	uniqueness or significance of your study within the existing body of research.
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<b>REVIEWER</b>	Chang, Xuhong Lanzhou University
<b>REVIEW RETURNED</b>	22-Aug-2023

<b>GENERAL COMMENTS</b>	<p>This is an interesting study for the relationship between mental health status and screen time. The statistical methods were well-designed and the results will provide some new ideas about how to improve the students' mental health when pandemic.</p> <ol style="list-style-type: none"> <li>1. Although COVID-19 pandemic is over, this finding still have potential values. The authors should emphasize the public health values of this study, especially in the post-pandemic period.</li> <li>2. Some new findings around this area should be updated in the discussion, such as       <ul style="list-style-type: none"> <li>--Miura M, Tanimoto T. Study Inclusions in the Association Between Screen Time and Neurodevelopment in Early Childhood. JAMA Pediatr. 2023 Jul 1;177(7):738-739.</li> <li>--Champion KE, Newton NC, et al. Health4Life eHealth intervention to modify multiple lifestyle risk behaviours among adolescent students in Australia: a cluster-randomised controlled trial. Lancet Digit Health. 2023 May;5(5):e276-e287.</li> </ul> </li> <li>3. How to improve the sleep status is a difficult problem to solve, which will limit the public health values of this study. Add some discussions about interventions.</li> <li>4. Insomnia may also induce longer screen time. How to understand the underlying reversed causal relationship?</li> </ol> <p>Other minor suggestions:</p> <ol style="list-style-type: none"> <li>1. Page 4, line 11. In Strengths and limitations of this study, the past tense should be used for 'Internationally recognized scales are used to estimate mental health'.</li> <li>2. Page 4, line 15. It would be more appropriate to replace "many" with "multiple" in "many sensitivity analyses".</li> <li>3. Page 5, line 10. In the Introduction, it would be more appropriate to replace the word "stimulate" in "stimulating people to maintain distance" with "restrict".</li> <li>4. In the conclusion, it should be noted that the results of this study are based on the context of the COVID-19 outbreak.</li> <li>5. The titles of Figure S2-S4 are completely consistent and should be different to state what kind of sensitivity analysis were done.</li> </ol>
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### VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Comments to the Author

(1) Regarding the study design and sample, could the authors provide the formula used for sample size calculation? Additionally, it would be helpful to know the exact number of ethics approvals obtained.

**Responds:** Thank you for your careful review of the manuscript, We have added the sample size estimation procedure in the supplementary material and describe it in the main text.

(2) In section 2.2.1, is there consideration for the potential bias in the classification of screen time? Clarification on this point would be appreciated.

**Responds:** Thank you for your reminding. We have provided additional explanations in the text.

**Specific modifications in response to reviewer's comments:**

In the **2.2.1 Screen Time** we have added: *Screen time is divided into four parts according to the purpose of the screen time: work and study, social activities, audio-visual entertainment, and shopping and takeaway, we defined the different screen times categorizations in detail in the questionnaire to avoid bias.*

(3) It is important to accurately define covariates. For instance, the term "education (bachelor, master, PhD)" may be misleading as all participants are students and thus do not yet possess these degrees. Instead, it would be more appropriate to use terms like "PhD candidate/student."

**Responds:** Thank you for your professional opinions. We have taken your suggestion and revised the relevant content.

(4) For statistical analysis, it's recommended to test for the normal distribution of continuous variables before choosing a statistical analysis method. Could the authors confirm if this was done?

**Responds:** Thank you for your professional opinions. We have taken your suggestion.

**Specific modifications in response to reviewer's comments:**

In the **2.3 statistical analysis** we have added: *Continuous variables are presented as mean and standard deviation after passing the normality test, and categorical variables are presented as absolute values and proportions.*

(5) The authors should mention the specific analysis software utilized in the methods section of the paper.

**Responds:** Thank you for your professional opinions. We have taken your suggestion and revised the relevant content.

**Specific modifications in response to reviewer's comments:**

In the **2.3 statistical analysis** we have added: *All statistical analyses were conducted by Stata 17. STATA version 17.0 (Stata Corp, College Station, TX).*

(6) In the discussion section, it would be beneficial to provide a comparative analysis of the study results with those from other related studies. This could offer readers a broader context and understanding of your findings, as well as illuminate the uniqueness or significance of your study within the existing body of research.

**Responds:** Thanks for your comments. We have compared and analyzed with other related studies in the second and third paragraphs of the **Discussion** section and discussed the possible mechanisms involved.

**Reviewer: 2**

**Comments to the Author**

1. Although COVID-19 pandemic is over, this finding still have potential values. The authors should emphasize the public health values of this study, especially in the post-pandemic period.

**Responds:** Thank you for your professional advice, and we have already emphasized the public health value of this research in the later stages of a pandemic in our discussions.

2. Some new findings around this area should be updated in the discussion, such as

--Miura M, Tanimoto T. Study Inclusions in the Association Between Screen Time and Neurodevelopment in Early Childhood. *JAMA Pediatr.* 2023 Jul 1;177(7):738-739.

--Champion KE, Newton NC, et al. Health4Life eHealth intervention to modify multiple lifestyle risk behaviours among adolescent students in Australia: a cluster-randomised controlled trial. *Lancet Digit Health.* 2023 May;5(5):e276-e287.

**Responds:** Thank you for the relevant literature, which we have carefully read and updated in our discussions of these studies.

**Specific modifications in response to reviewer's comments:**

Added content in the **Discussion**:

*Organized sports are one of the most common forms of physical activity for teens, but they are also eliminated during COVID-19, and using a screen to connect with friends and family is the only option.*

*Screen time also has adverse effects on early childhood neurodevelopment. For example, children with longer screen time have significantly lower communication and daily living skill scores.*

3. How to improve the sleep status is a difficult problem to solve, which will limit the public health values of this study. Add some discussions about interventions.

**Responds**: Thank you for your professional opinions. We have taken your suggestion.

**Specific modifications in response to reviewer's comments:**

We've added more methods to improve sleep status: *But how to improve sleep conditions is a question worthy of attention, Reducing alcohol and caffeine intake, following a regular bedtime and engaging in meditation practices are more effective ways to improve sleeping conditions.*

4. Insomnia may also induce longer screen time. How to understand the underlying reversed causal relationship?

**Responds**: Thank you for your professional opinions. This is indeed the limitation of this study, which is supplemented by us in the manuscript.

**Specific modifications in response to reviewer's comments:**

We add this limitation in the **Discussion**: *Finally, insomnia may also lead to increased screen time, with potential reverse causality needing to be explored in further longitudinal studies.*

Other minor suggestions:

1. Page 4, line 11. In Strengths and limitations of this study, the past tense should be used for 'Internationally recognized scales are used to estimate mental health'.
2. Page 4, line 15. It would be more appropriate to replace "many" with "multiple" in "many sensitivity analyses".
3. Page 5, line 10. In the Introduction, it would be more appropriate to replace the word "stimulate" in "stimulating people to maintain distance" with "restrict".
4. In the conclusion, it should be noted that the results of this study are based on the context of the COVID-19 outbreak.
5. The titles of Figure S2-S4 are completely consistent and should be different to state what kind of

sensitivity analysis were done.

**Responds:** Thank you for your careful review. I have taken the suggestions, revised some tenses and words, and added specific differences in sensitivity analysis in the supplementary material.

#### VERSION 2 – REVIEW

<b>REVIEWER</b>	Hu, Cheng-Yang Anhui Medical University, Department of Medical Humanistic, School of Medical Humanistic
<b>REVIEW RETURNED</b>	13-Nov-2023
<b>GENERAL COMMENTS</b>	The authors have adequately addressed my previous concerns. I have no further comments on the manuscript.