



# Post-COVID ‘brain fog’ will clear up only through neuropsychological examination

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## To the Editors

We read with interest the article by Chatys-Bogacka et al. on a cross-sectional study on the differences between the sexes in post-COVID ‘brain fog’ [1]. Data collection took place between April 2021 and August 2021 using previously published electronic questionnaires which were delivered via bulk email, Facebook, and a post-COVID outpatient unit [1]. It was found that females compared to males were more likely to report problems with writing, reading, counting, and thought communication at > 12 weeks post infection [1]. At > 12 weeks, no gender differences were found in multitasking, remembering past information, determining the current date, or field orientation [1]. We feel that the study is excellent, but has limitations and raise concerns that should be discussed.

The main limitation of the study is the definition of ‘brain fog’, a vague term that means different things to different people. There is no single, universally accepted definition of brain fog. Therefore, if neuropsychological deficits are recognised as a post-COVID complication, they should be described in detail after appropriate testing by a neuropsychologist, and not reported by the patient him or herself. When using electronic questionnaires in particular, there is a risk that different patients will understand the term ‘brain fog’ differently, which is why we suggest the term should be abandoned. The ambiguity of the term is supported by the different definitions in the article. In the introduction, the authors define brain fog firstly as “poor memory and concentration”, then later as “poor concentration, intellectual ambiguity, mental fatigue,

and anxiety”, and thirdly as “disorders of concentration and memory, sleep and speech disorders” [1]. Even the investigators themselves seem to be unsure about a precise definition of the term ‘brain fog’ [1].

Another limitation is that electronic questionnaires were used for data collection [1]. Electronic questionnaires have several disadvantages. There is no guarantee that the patient will provide truthful answers; it is not verified that the patient addressed will in fact answer the questionnaire themselves rather than leave it to a relative or caregiver; and there is no certainty that the patient is physically and/or mentally able to fill out the form. There is also the disadvantage that only patients who are able to use a computer can respond. Individuals in a hospital, individuals without access to electronic media, and individuals unfamiliar with using electronic media will probably not be included in such a study. Individuals with severe complications resulting from COVID-19 may not be included because they simply cannot be reached for the investigation.

Another limitation is that no distinction was made between people with and without a SARS-CoV-vaccination. Vaccinated patients may have a different type, intensity, and frequency of symptoms compared to unvaccinated patients.

Another limitation is that it remains unclear how causes other than COVID-19 were ruled out in order to explain symptoms described by the patient. Since the latency period between the onset of COVID-19 and the completion of the questionnaire was 208 days on average [1], it is conceivable that some of the included patients suffered another disease

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that was responsible for the symptoms during this period. How was depression ruled out, and what scores were used to assess depression?

Furthermore, the results and conclusions drawn may be unreliable because the sex ratio was 5:1, meaning that five times more females than males were included in the study. This inequity is a strong bias, meaning that the results must be interpreted with caution.

Overall, this interesting study has several limitations that call the results and their interpretations into question. Clarifying these weaknesses would strengthen the conclusions and so improve the study. Before identifying a gender difference

regarding post-COVID 'brain fog', we feel that the requirements for such a study must be met.

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## References

1. Chatys-Bogacka Ż, Mazurkiewicz I, Słowik J, et al. Sex-related patient-reported brain fog symptoms in non-hospitalised COVID-19 patients. *Neurol Neurochir Pol.* 2023; 57(1): 111–120, doi: [10.5603/PJNNS.a2023.0010](https://doi.org/10.5603/PJNNS.a2023.0010), indexed in Pubmed: [36799525](https://pubmed.ncbi.nlm.nih.gov/36799525/).