

technologies. This can help ensure that AI is used in a way that promotes women's mental health and wellbeing.

The utilization of AI in women's psychological wellbeing demonstrates immense potential to revolutionize the diagnostic, therapeutic, and management approaches for mental health conditions in women. AI has the capability to offer personalized and efficient mental health support, as well as aid in the prevention of such conditions. However, it is crucial to tackle the existing challenges to fully unlock the benefits of AI in women's psychological wellbeing. Future research endeavors should prioritize addressing these challenges, ensuring ethical and transparent utilization of AI to advance women's mental health and overall well-being. Additionally, it is imperative to critically examine the potential impact of patriarchization on the development and deployment of AI systems, striving for gender

equality and the avoidance of reinforcing biases and discriminatory practices.

References

1. Deep Longevity LTD. Harvard Developed AI Identifies the Shortest Path to Human Happiness. *SciTechDaily* 2022. <https://scitechdaily.com/harvard-developed-ai-identifies-the-shortest-path-to-human-happiness/>.
2. Rana U & Govender J. Indian Women's mental calamity: A shadow pandemic. *Asian J Psychiatr* 2020; 54:102308. doi: 10.1016/j.ajp.2020.102308.
3. Rana U. Psychosocial Consequences of COVID-19 on Sex Workers: A Global Perspective. *Psychiatr Danub* 2020; 32:590-592.
4. Gavrilova Y. AI Chatbots & Mental Healthcare. *IOT for All* 2022. <https://www.iotforall.com/ai-chatbots-mental-healthcare>

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WHAT IS THE ROLE OF MITOCHONDRIA IN THE PATHOLOGY OF SCHIZOPHRENIA AND THE MECHANISM OF ACTION OF ANTIPSYCHOTICS?

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Dear Editor,

Mitochondria are known to play a key role in neurodevelopment and numerous data show that abnormalities in the structure and function of mitochondria could be associated with the development of schizophrenia. Also, mitochondria have a general role in cellular metabolism and signaling pathways. Metabolic dysfunction was also observed to be a common thread in multiple studies of human schizophrenia patient tissue. Given that antipsychotic drugs have been shown to alter transcription and protein abundance of several of the specific genes indicated in mitochondrial and metabolism defects, the cellular processes regulating metabolism appears to be a site of interplay

between known schizophrenia pathology and the action of antipsychotic drugs. Epidemiological evidence suggests that schizophrenia is caused by pathogenic genes found in mtDNA that may survive through the matrilineal inheritance pathway (Xu & Yang 2022). Mitochondria have been linked to the etiology of schizophrenia (SZ). However, studies of mitochondria in SZ might be confounded by the effects of pharmacological treatment with antipsychotic drugs (APDs) and other common medications.

A review of recent research shows that chronic administration of antipsychotics causes structural and functional changes in mitochondria and affects the processes of apoptosis and autophagy. Findings of some in vivo investigational drugs showing effects in patients provide further evidence that mitochondria are a relevant target for psychotropic drugs. Also, in responding patients, short-term treatment was not sufficient to ameliorate mitochondrial dysfunction, while a prolonged drug treatment restored mitochondrial function. Understanding the nature of these changes may contribute to the elucidation of new strategy for drug development, to improvement of mitochondrial function.

Numerous studies have demonstrated reduced activities of complex IV and complex I + III in the frontal cortex and caudate tissues, as well as diminished activities of complex IV and complex III in the basal ganglia and temporal cortex, among individuals diagnosed with schizophrenia. Furthermore, decreased complex I activity has been observed in the prefrontal cortex of individuals with bipolar disorder. In addition, postmortem analyses of brains from individuals with schizophrenia frequently reveal atypical mitochondrial ultrastructure and morphology. (Ni et al. 2022).

Studies on mitochondria in SZ, however, may be complicated by side effects from antipsychotic drugs (APDs) and other widely used prescription pharmaceuticals (Chan et al. 2020).

We are of the opinion that the results of recent studies could facilitate the understanding of the opening of new possible knowledge about the etiology and pathology of schizophrenia and possibly more effective specific therapeutic action in the future, and consequently the reduction of negative symptoms and the preservation of cognitive functions and work functionality. We conclude that further research on the effects of antipsychotics at the molecular level is needed in order to understand their role in signaling pathways and effects on the energy metabolism of neurons.

Acknowledgements: None.

Conflict of interest: The authors declare that they have nothing to disclose.

References

1. Chan ST, McCarthy MJ & Vawter MP: Psychiatric drugs impact mitochondrial function in brain and other tissues. *Schizophr Res* 2020; 217:136-47.
2. Ni P, Ma Y & Chung S. Mitochondrial dysfunction in psychiatric disorders. *Schizophr Res* 2022; S0920-9964(22)00333-4. doi: 10.1016/j.schres.2022.08.027
3. Xu H & Yang F: The interplay of dopamine metabolism abnormalities and mitochondrial defects in the pathogenesis of schizophrenia. *Transl Psychiatry* 2022; 12: 464. doi: 10.1038/s41398-022-02233-0.

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HOW ACCURATELY DO WE CALCULATE PANSS?

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Dear Editor,

The Positive and Negative Symptoms Scale (PANSS) is a worldwide used scale to evaluate the treatment response of "Schizophrenia Spectrum and Other Psychotic Disorders." The PANSS comprises 30 items, of which seven are positive (P), seven are negative (N), and 16 are general psychopathology (G) subscales. Each item is scored between 1 and 7, and the PANSS's lowest score is 30 (Kay et al. 1987).

Even though different criteria have been defined for the treatment of response and remission in schizophrenia (Leucht et al. 2009), no consensus exists on this issue. However, scoring PANSS items between 1 and 7 and the lowest PANSS score being 30, even if no symptoms are present, may cause a significant mathematical error when determining the remission as previously earlier (Leucht et al. 2007, Leucht et al. 2010, Obermeier et al. 2011).

In this letter, we would like to emphasize the mathematical error through the example of a patient with paranoid schizophrenia who followed up with PANSS.

A 20-year-old female patient with systematic, well-organized persecution delusions and auditory hallucinations was admitted to the ward. Her functionality was poor but she had no negative symptoms. Risperidone long-acting injection 37.5 mg/2 weeks and risperidone 2 mg/day were started. The PANSS score at admission to the ward was 79 (P:32, N:7, G:40). The PANSS scores were recorded weekly. In the third week her

symptoms and functionality improved. In the sixth-week, the discharge score was 42 (P:13, N:7, G:22).

The percentage change between the patient's first and last PANSS scores was 47%. She did not meet the 50% reduction criterion in the PANSS scores for remission in schizophrenia (Leucht et al. 2009). Almost complete improvement was not accurately reflected in the percentage of change in the total PANSS score. Even though she had no negative symptoms, the score of the negative subscale of PANSS was 7, and no mathematical possibility of change. At that point, a fundamental mathematical error is made because the score of "1" is given instead of '0' when the calculating the percentage change. As reported in previous articles, giving a score of "0" instead of "1" in the statement "no features related to the definition" specified in the scale item and restructuring the other ratings accordingly (0-6) will be more suitable (Leucht et al. 2007, Leucht et al. 2010, Obermeier et al. 2011). When re-scoring the patient's first PANSS according to 0-6 ratings, the PANSS score would be P:25, N:0, G:24, a total of 49, and the last PANSS score before discharge would be P:6, N:0, G:6, a total of 12. A 76% reduction would occur in the patient's total score, confirming the patient's clinical improvement.

Scoring PANSS items as 1-7 may overshadow the actual percentage change in treatment, leading to misinterpretation (Leucht et al. 2007, Leucht et al. 2010, Obermeier et al. 2011). Therefore, some researchers suggest that response rates with low cut-off values, such as 20%, are used in studies to avoid low response rates, especially with second-generation antipsychotics (Leucht et al. 2010). Moreover, some authors emphasize that the results of all studies used to determine the response rate with the 1-7 scoring system are erroneous and represent fewer improvement rates. Thereupon, they state that the 0-6 scoring system will be the correct method to determine the response status with the percentage change in future studies (Leucht et al. 2007, Leucht et al. 2010, Obermeier et al. 2011).