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Letter to the Editor

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Response to the letter to the editor: "The price of love: how sleep, and dysregulated clocks may account for its obsessive-compulsive related behaviors" by Miguel Meira e Cruz

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To the Editor:

I read with interest the letter to the editor of Dr. Miguel Meira e Cruz commenting on the paper entitled "The price of love: how sleep, and dysregulated clocks may account for its obsessive-compulsive related behaviors" by McLauchlan et al. published in *CNS Spectrums* in December 2022.[1]

Although potentially rewarding for the authorship that also includes myself, in my opinion, Dr. Miguel Meira e Cruz overestimates the results of our paper. Indeed, our aim was simply to investigate the possible impact of romantic love on some obsessive-compulsive disorder (OCD) characteristics. The conclusions were that love-precipitated OCD shows a greater severity of sensory phenomena and later age at onset of obsessions.

The author intended to draw readers' attention toward the potential link among dysregulated sleep, obsessive-compulsive-related behaviors, and romantic love. Although the topic is of interest, the theme was not well developed. Love is a form of bonding that is crucial for the survival of the human species and that can be considered sort of paradox, as we are attracted to, courted by, and breed with genetically not related individuals whom they would otherwise instinctively avoid. From the neurobiological point of view, love can be defined as a complex and integrated neurobiobehavioral system or process which promotes proximity and reproduction, and reduces feelings of stress or anxiety, while eliciting a deep sense of safety, joy, and reward. Therefore, love can be considered a blend of brain mechanisms and related physical phenomena, and also of cultural and social factors that may shape some features and regulate its expression. The sum of the emotions + behaviors + subjective awareness of the whole processes constitutes, perhaps, the essence of love.[2,3] As such, it can be viewed as the result of different components probably subserved by several neural substrates. Romantic love is the first phase of love, and is characterized by altered mental state, specific behavioral patterns with the aim of evoking a reciprocate response, meager interest in usual activities, and intrusive thoughts regarding the partner, due to rapid changes of neurotransmitters. The altered mental state, due to overactivity of norepinephrine and dopamine, resembles the manic and hypomanic phases of bipolar disorders generally accompanied by changes in sleep patterns. Not surprisingly, the paper of Brand et al.[4] underlines that adolescence, early-stage intense romantic love is comparable to a hypomanic state, as also reflected in altered sleep patterns, mood, and daytime functioning. In adults, data are opposite, as an intense romantic love was associated with hypomania, symptoms of depression, anxiety, and a better sleep quality, with no relationship to sleep duration.[5] Again, according to us, the intrusive thoughts regarding the partner cognitive part of love, typical of the early, romantic phase of the relationship, can be understood along a dimensional approach comprising OCD, but also paranoia and mania, while considering a continuum of serotonergic and other neurotransmitter dysfunctions.[2,3]. These are just examples of how complex is love and how dangerous and reductionistic might be to relate it to deranged sleep, circadian, or seasonal patterns that nobody has still demonstrated, so that eventually they might be just some of its correlates or epiphenomena related to hormonal and neurochemical changes.[2,3] However, within this framework, it would have been of importance if Dr. Miguel Meira e Cruz would have discussed the functions of sleep, eg in emotions and attachment, to summarize the association between disturbed sleep and OCD, and then reviewed the potential links with romantic love. Therefore, more information on clock and sleep mechanisms should have been given.

The mention of oxytocin (OT) in this letter is also minimal, as the author seems to neglect all the amount of evidence implicating OT in the mediation of complex social behaviors, and how this hormone might be one of the effectors securing the rewarding and health-promoting consequences of love.[3]

It is evident that the letter of Dr. Miguel Meira e Cruz is a simplistic, albeit brave attempt to include sleep and biological clocks in trying to provide explanations of a really multifaceted and complex phenomenon such as romantic love.

The science of love is an emerging and intriguing field of research that only recently has become the topic of intensive scientific investigations and has received benefits from the application of the most advanced neuroscientific methods. The data gathered until now, albeit preliminary permit to set up an initial framework and intriguing hypotheses that require to be tested. With no doubt, even the deepening of sleep, circadian rhythms, and biological clocks will be of value to potentially add another tile in the complex mosaic that is love, love that represents a large part of our human nature and being. That is why, as Johan Wolfang von Goethe wrote in 1809 in his masterpiece "Elective affinities," "*it is certain that in the human world nothing is necessary except love.*"

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