Sleep Patterns in Gilles de la Tourette Syndrome: A Case Illustration

Dipesh Patel[1, 2] and Himanshu Tyagi[1, 2]

1 Department of Neuropsychiatry, University College London Hospital Foundation Trust, Queen Square, London, WC1N 3BG, United Kingdom. 2 University College London - Institute of Neurology, Queen Square, London, WC1N 3BG, United Kingdom.

Objective

To present a single-subject study of sleep patterns experienced by an adult patient with Gilles de la Tourette Syndrome (GTS) over a fifteen-night study window.

Method

A twenty-four-year-old male patient with a well-established diagnosis of GTS was referred to a tertiary-care neuropsychiatry outpatient clinic in relation to his vocalization. The vocalization consisted of a throat clearing utterance which occurred in bouts of either three or four and became progressively louder until the sequence ended. The intervention involved the patient using Sleep Cycle (a mobile application that relies on an accelerometer to monitor movements) which documented sleep stage patterns and analyses sounds. Each night, the patient placed his mobile telephone next to his pillow and on flight mode with the application running in the foreground with the device unlocked (*see* Figure 1).

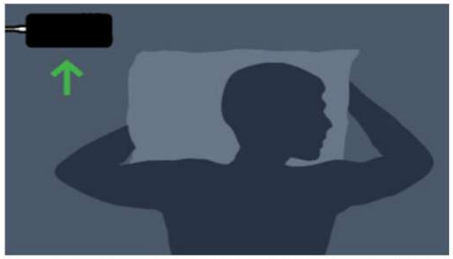

***Figure 1**. Phone Placement. The Sleep Cycle application has two motion detection modes, a microphone and an accelerometer.*

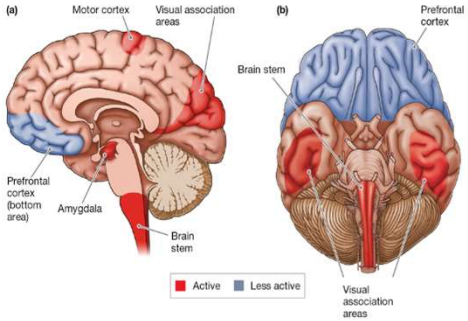

***Figure 2.** The neurobiology of sleep-wake regulation. These two views of the brain show the regions that are more active (red) and less active (blue) during REM sleep. (a) As seen here from the side, the motor cortex, the brain stem, and visual association areas are active. The prefrontal cortex is less active. (b) This view from beneath the brain shows other visual association areas and the brain stem, which are active. It also reveals the bottom of the prefrontal cortex, which is less active.*

Results

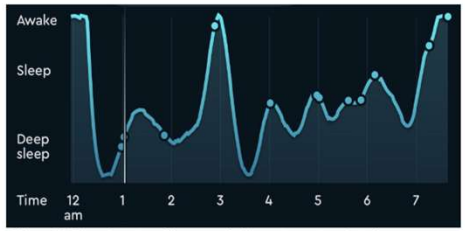

***Figure 3**. Sleep Overview. Sleep graph illustrating patients' night as a timeline, breaking down sleep into stages: 'Awake', 'Sleep' (i.e., N1/Non-REM and N2/Non-REM), and 'Deep' (i.e., N3/Non-REM).*

***Figure 4.** The Sleep Quality score is based on four measurements: (i) amount of time spent in bed, (ii) amount of time spent in deep sleep, (iii) the frequency of motion and intensity for each movement, and (iv) amount of times when the mobile application registered the patient as fully awake.*

***Figure 5.** Weekly Sleep Quality Score.*

[x] Vocalization and Sleep Stage

Pearson's correlation coefficient was −0.807 ($p < 0.001$), indicating a significant linear relationship where deeper sleep stages are associated with reduced vocalization onset. Similarly, Spearman's rho yielded a coefficient of −0.796 ($p < 0.001$), confirming a strong monotonic relationship. The results demonstrate that as the patient transitions between sleep stage, the frequency of his vocalization significantly decreases.

[x] Vocalization and Sleep Quality

Pearson's correlation coefficient ($r = 0.221$) indicated a weak positive linear relationship, suggesting that higher sleep quality might be associated with slightly reduced vocalization onset. Similarly, Spearman's Rho ($\rho = 0.216$) showed a weak positive monotonic relationship between the two variables. However, neither correlation was statistically significant, with p-values of 0.429 and 0.440 for Pearson and Spearman, respectively.

[x] Vocalization Onset Time and Time Asleep

Pearson's correlation coefficient ($r = 0.459$) and Spearman's Rho ($\rho = 0.497$) both indicated a moderate positive relationship, suggesting that longer sleep duration is associated with a reduced onset of vocalization. While the findings hint at a potential association between increased sleep duration and reduced vocalization onset, the results were not of statistically significance ($p = 0.085$ for Pearson and $p = 0.060$ for Spearman).

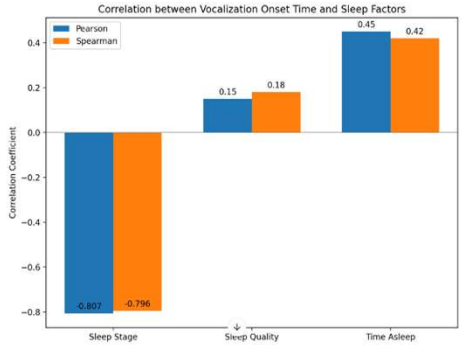

***Figure 6.** Visual representation of the relationships between vocalization onset and sleep stage, sleep quality, and time asleep. Correlation values and significance markers are provided to show the strength of these relationships.*

Conclusion

The waxing and waning phenomena observed in GTS, high prevalence rate of psychiatric comorbidities, and various confounders can prevent methodologically precise studies being conducted. Future research could (i) aim to confirm these relationships and explore mechanisms underlying the observed effects and (ii) utilise more precise sleep measurement instruments with larger samples to clarify the relationship between tic onset and sleep patterns.

Contact: Dr. Dipesh Patel

Email: dipesh.patel24@nhs.net

: @DrDipeshPatel