

## INTRODUCTION

Sleep State Misperception (SSM) is a prevalent characteristic among patients with Insomnia Disorder (ID) particularly during sleep onset (SO)<sup>1</sup>. One accredited hypothesis explaining SSM in ID is the Hyperarousal Theory, which posits that ID patients experience heightened cognitive and physiological arousal<sup>2</sup>. To further investigate the role of hyperarousal in SO misperception, this study aims to explore the role of  $\alpha$  rhythm (8-13 Hz), a predominant and stereotypical pattern characterizing quiet brain activity during the SO.

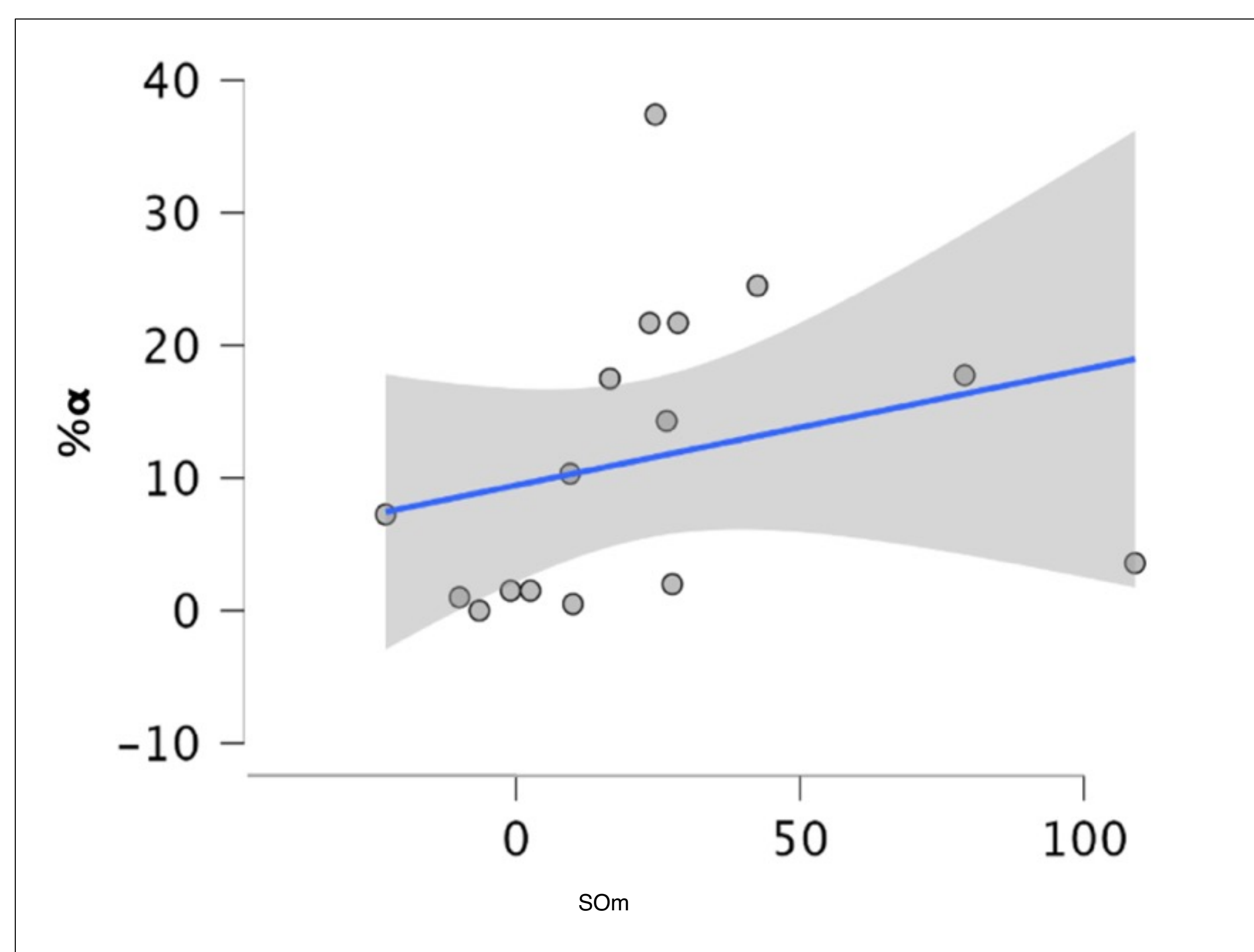
## METHODS

16 ID patients underwent a night of polysomnographic recording and completed Sleep Diary the following morning. A SO misperception index (SOM) was computed using the values of the objective SO and subjective SO (SOM = SO<sub>sub</sub> - SO<sub>obj</sub>). We derived an  $\alpha$  Density Index (% $\alpha$ ) by segmenting the subjective SO period into 3sec micro-epochs within 30sec wakefulness epochs and we visually ascertain the presence of a stereotyped  $\alpha$  rhythm (8-13 Hz) for at least 50% of each micro-epoch. Since the data did not meet the normality assumption and given the small sample size, non-parametric tests were performed.

## RESULTS

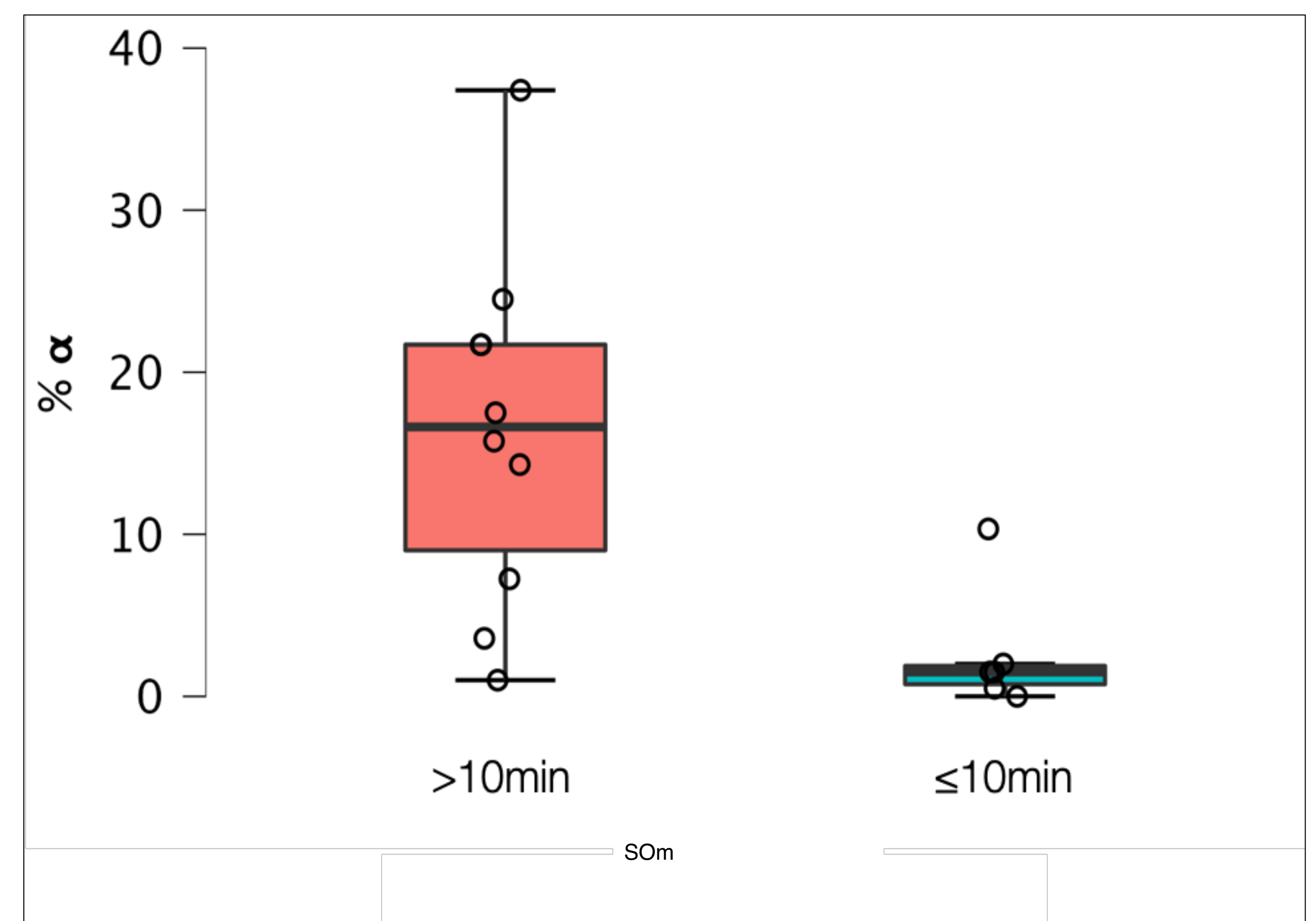
A significant positive correlation was observed between SOM and the % $\alpha$  ( $\rho_{S_s} = 0.564$ ,  $p = 0.017$ ) (Fig. 1), indicated that a higher % $\alpha$  was associated with a higher SOM.

The sample was split into two subgroups based on the degree of Som (cut-off of SOM > 10min). Subgroups were compared for the % $\alpha$  using the Mann–Whitney U test. A significant difference was observed (U = 6;  $p = 0.009$ ). The group with a SOM greater than 10min exhibited a higher mean % $\alpha$  ( $16.5 \pm 10.8$ ) compared to the group with a SOM less than 10min ( $2.6 \pm 3.8$ ) (Fig. 2).



**Fig 1.** Correlation between % $\alpha$  during waking epochs within the SO<sub>sub</sub> and SLM ( $\rho_{S_s} = 0.564$ ,  $p = 0.017$ ).

% $\alpha$ : Percentage of stereotyped  $\alpha$  rhythm; SOM: Difference between subjective and objective sleep latency.



**Fig 2.** Differences in % $\alpha$  between two groups categorized based on SOM (U = 6;  $p = 0.009$ ).

% $\alpha$ : Percentage of stereotyped  $\alpha$  rhythm; SOM: Difference between subjective and objective sleep latency.

## CONCLUSION

A positive association emerges between the % $\alpha$  during the subjective SO and the extent of SOM. The presence of  $\alpha$  rhythm is characteristic of relaxed wakefulness, which aligns with the subjective experience of sleepiness. Thus, individuals with ID who spend more time in this state may be more prone to misperceive the process of falling asleep because they might find it challenging to disengage from this physiological rhythm.

This difficulty in disengaging from this rhythm might be attributed to the considerable attention focused on sleep-related concerns and the conscious effort to relax, potentially resulting in heightened cognitive and physical activation<sup>4</sup>.

This finding is consistent with the hyperarousal hypothesis and aligns with previous studies that demonstrated a positive correlation between high-frequency activity throughout the night and the degree of SOM<sup>5</sup>. Heightened  $\alpha$  activity could indicate a sleep pattern characterized by fragmentation, shallowness, and interruptions, which could lead to frequent micro-awakenings being mistakenly perceived as a single state of wakefulness or negatively impacting overall sleep quality.

## REFERENCE

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