CHARACTERIZING PREMONITORY URGES IN TOURETTE SYNDROME

Maio G.[1,2,4], Zanaboni Dina C.[1,4], Porta M.[3,4] , Malgaroli A.[1,2,4]

[1]IRCCS San Raffaele Hospital Turro, Milano; [2]University Vita Salute San Raffaele, Milano; [3]IRCCS Ospedale Galeazzi Sant'Ambrogio, Milano; [4]AIST - Associazione Italiana S. Tourette

BACKGROUND

- Premonitory Urges (PU) are sensory phenomena preceding tic execution, typically decreasing after the tic occurs[1]
- Despite their clinical relevance, PU remain significantly less explored than tics[2]
  Evidence on the PU-tic relationship is conflicting, regarding[3,4]:
  - The subjective sensation
  - The body localization of the sensation
  - The spatial overlap between the localization of tics and PU

METHODS

- *An ad hoc* questionnaire to evaluate the nature of tics and urges
- Identification of the characteristic of the most disturbing PU and tics
- Mapping each specific tic and PU on pre-defined body 2D representation
- Quantification of the overlap between PU and tics by the Jaccard index

$$\text{Jaccard Index} = \frac{|A \cap B|}{|A \cup B|}$$

PARTICIPANTS

A cross-sectional observational study is conducted on a sample of 47 subjects, (mean age ± SD = 22.4 ± 18.14 years/median age = 16.0 years, range = 3–82, Fig. 2; 24 females, 23 males). Self-reported measures are used to assess clinical history (Fig. 1).

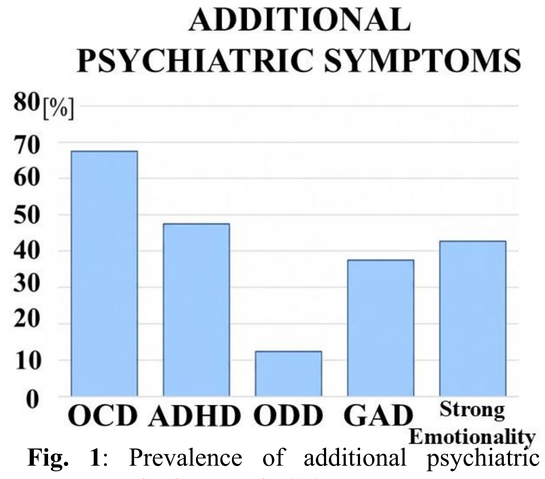

Fig. 1: Prevalence of additional psychiatric symptoms in the sample (%)

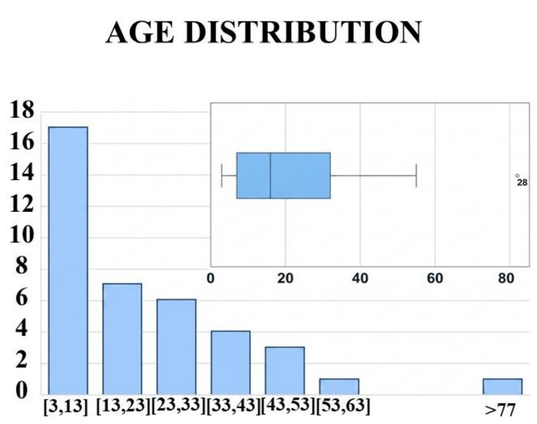

Fig. 2: Age distribution of the study participants

RESULTS

Topographical Analysis:

- Tics were significantly more abundant and widespread than PU (***p* = .043**).
- PU show a significantly higher concentration in anterior vs posterior regions (***p* = .001**).
- The head and neck areas, of both PU and tics, show the highest degree of spatial convergence.

Spatial Convergence:

- The heatmap (Fig. 5) reveals consistent synchronic activation (Fig. 3 and Fig. 4), and highlights regions with the highest frequency of tic-PU with a one-to-one associations.
- Micro-areas could be aggregated into broader macro-areas (Fig. 6) based on their anatomical proximity.

These results demonstrate that some macro-areas are more susceptible to the overlap between urges and tics (Tab. 1).

	Macroareas	Microareas
N	47	47
Mean	.5491	.3802

Tab. 1: Mean synchronic activation across micro- and macro-areas

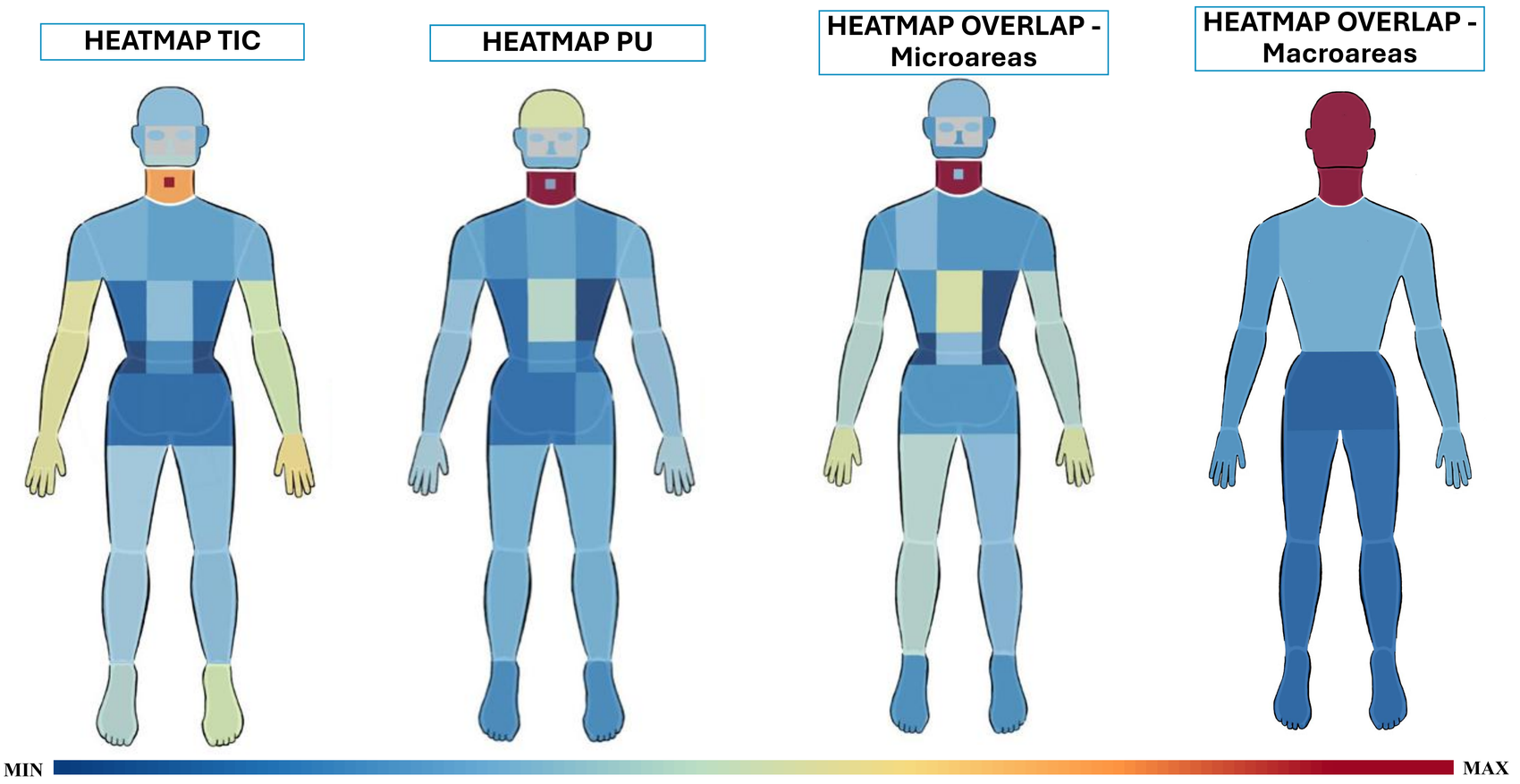

Fig. 3: % of activation in every tic area.
Gradient Range: Min (0), Max (40)

Fig. 4: % of activation in every PU areas.
Gradient Range: Min (0), Max (35)

Fig. 5: Overlap between PU and tic in microareas
Gradient Range: Min (0), Max (15)

Fig. 6: Overlap between PU and tic in macroareas
Gradient Range: Min (0), Max (60)

- 3 items show high internal consistency (***α* = .803**): PU anticipatory awareness, PU intensity and PU frequency. Items are pooled into a composite urge score (*SEM*=0,365).
- The composite urge score correlates with Jaccard Index (***Rs* = .363, *p* = .013**; Fig. 7), it suggests that stronger urge links to higher PU-tic spatial overlap.
- While frequency and intensity characterize the premonitory urge, only anticipatory awareness significantly predicts a participant's perceived ability to inhibit tics (***p* = .047**) suggesting that the conscious detection of early signals is the key mechanism for managing symptoms.

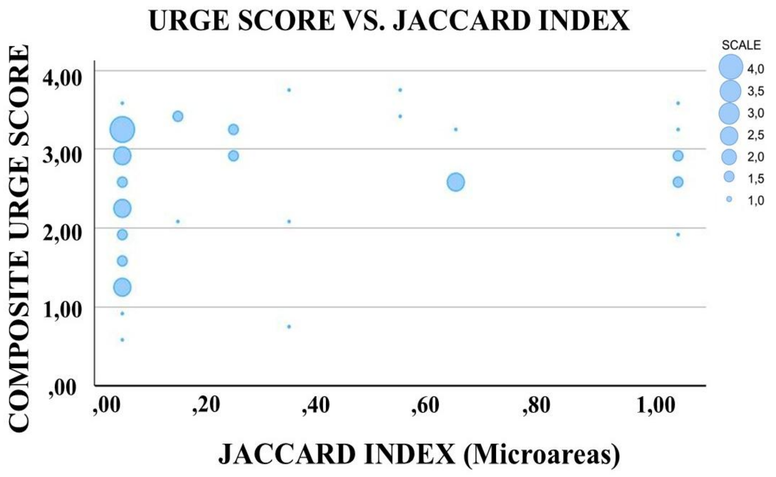

Fig. 7: The scatter plot evidences the moderate positive correlation between the composite urge score and the Jaccard index

- The necessity to perform a tic to reduce discomfort or calm a thought/sensation (Q20, Fig.8) is significantly associated with OCD co-morbidity (***p* = .039**).
- Binary logistic regression shows a strong trend towards higher "obligation" scores in the TS with OCD group (**OR = 1.72; 95% CI [0.93–3.15]**, *p* = .082), although it does not reach full statistical significance.
- Tic repetition until they feel "just right" (Q19, Fig. 9) is a well-documented phenomenon bridging TS.
- In this sample, the frequency of "Just Right" repetitions does not significantly differ between TS-only and TS with OCD groups (*p* = .837).

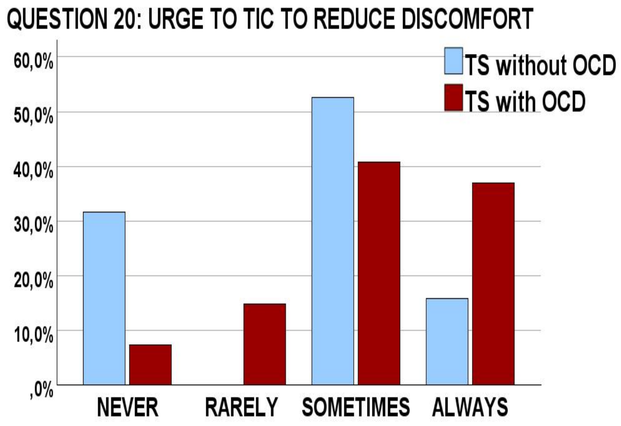

Fig. 8: 45.7% of the total sample report this feeling "sometimes", while 28.3% report it "always"

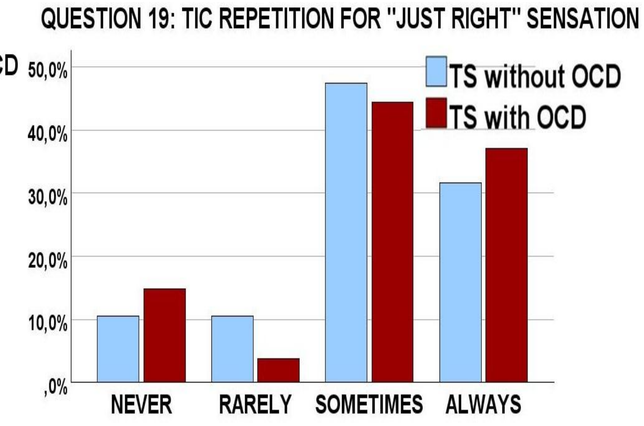

Fig. 9: 45.7% of the sample report it "sometimes" and 34.8% "always"

CONCLUSION

These findings provide a clear evidence of the association between PU and tics, supporting a spatially anchored sensorimotor model. The data suggest that the relation between PU and tics follows a specific topographical mapping rather than a diffuse activation, indicating the restricted activation of specific brain networks. In relation to tic inhibition, the role of anticipatory awareness implies that the subjective detection of these localized signals is a relevant factor in the individual's experience of symptoms control. In conclusion, this study provides a framework for future studies aimed at elucidating the relationship between the brain centres underlying premonitory urges and tics, within a sensory-motor perspective in Tic Disorders.

REFERENCES

[1] Leckman J .F., Walker D. E., & Cohen D. J. (1993). Premonitory urges in Tourette's syndrome. American Journal of Psychiatry, 150(1), 98–102.
[2]Wohlgemuth J. B., Watson K. H., Gill K. D., & Isaacs D. A. (2025). Premonitory urge in tic disorders – a scoping review. Frontiers in Psychiatry, 16, 1504442.
[3]Brandt V. C., Beck C., Sajin V., Baaske M. K., Bäumer T., Beste C., Anders S., & Münchau tA. (2016). Temporal relationship between premonitory urges and tics in Gilles de la Tourette syndrome.
[4]Cox J. H., Seri S., & Cavanna A. E. (2018). Sensory aspects of Tourette syndrome. Neuroscience & Biobehavioral Reviews, 88,170–176.