

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, Milano

⁴ AIST - Associazione Italiana S.Tourette

Background:

Premonitory urges (PU) are sensory phenomena that precede tic execution and tend to decrease following tic occurrence. Despite their clinical relevance, PU remain less explored than tics. Current literature emphasizes the importance of subjective PU sensations, PU anatomical localization and PU spatial overlap with tics. To date, clinical studies regarding the specific local overlap between PU and their corresponding tics remain limited.

Methods:

A cross-sectional observational study was conducted on a sample of 47 subjects (Mean age $\pm$ SD = 22.4 $\pm$ 18.14; 24 females, 23 males) with a confirmed TS diagnosis. Data collection followed an ad-hoc protocol, addressed to patients or their parents, for minors, in telemedicine or face-to-face with a psychologist. Spatial overlap was measured using a specialized digital body mapping tool. Participants were required to identify and select pre-defined anatomical regions corresponding to both their most subjective impairing tics and their perceived PU. This tool allowed for a precise one-to-one anatomical correlation between each specific tic and its preceding urge. Overlap was quantified through the Jaccard Index, calculated as the ratio of the intersection of areas activated by both PU and tics and their union. Subjective urge perception and subjective tic inhibition capacity were assessed, as well, through the protocol.

Results and Conclusions:

Results indicated that when considering tics and PU as two separate variables, tics were significantly more widespread and involved a higher number of activated anatomical regions than PU ($p = .043$). A distinct topographical distribution was observed, with PU showing a significantly higher concentration in the anterior versus posterior regions of the body ($p = .001$). The head and neck areas emerged as the primary "hotspots" of both PU and tics, showing the highest degree of their spatial convergence. On the contrary, other regions, such as the flanks, were identified as the sites of the lowest shared activation. The analysis of the subjective urge perception resulted in a significant internal consistency among three items ($\alpha = .803$): frequency, sensory intensity, and anticipatory awareness, pooled in a "composite urge score" by the study researchers. A moderately positive correlation emerged between the "composite urge score" and the Jaccard Index ($R_s = .363$, $p = .013$), suggesting that a stronger subjective perception of the urge is associated with a higher spatial intersection between the PU and the tics' sites. A further analysis of the three items characterised additional features of the PU structure. While the three items (pooled in the "composite urge score") are related to the degree of spatial overlap, only anticipatory awareness, i.e. the ability to perceive the urge before the tic, showed a significant association with the participants' perceived ability to inhibit tics.

These findings provide evidence of a spatial link 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. 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 aimed at elucidating the relationship between premonitory urges and tics, within a sensory-motor perspective in Tic Disorders.