

Melody Transposition Tolerance in the Human Cortex: An fMRI Adaptation and MVPA Investigation

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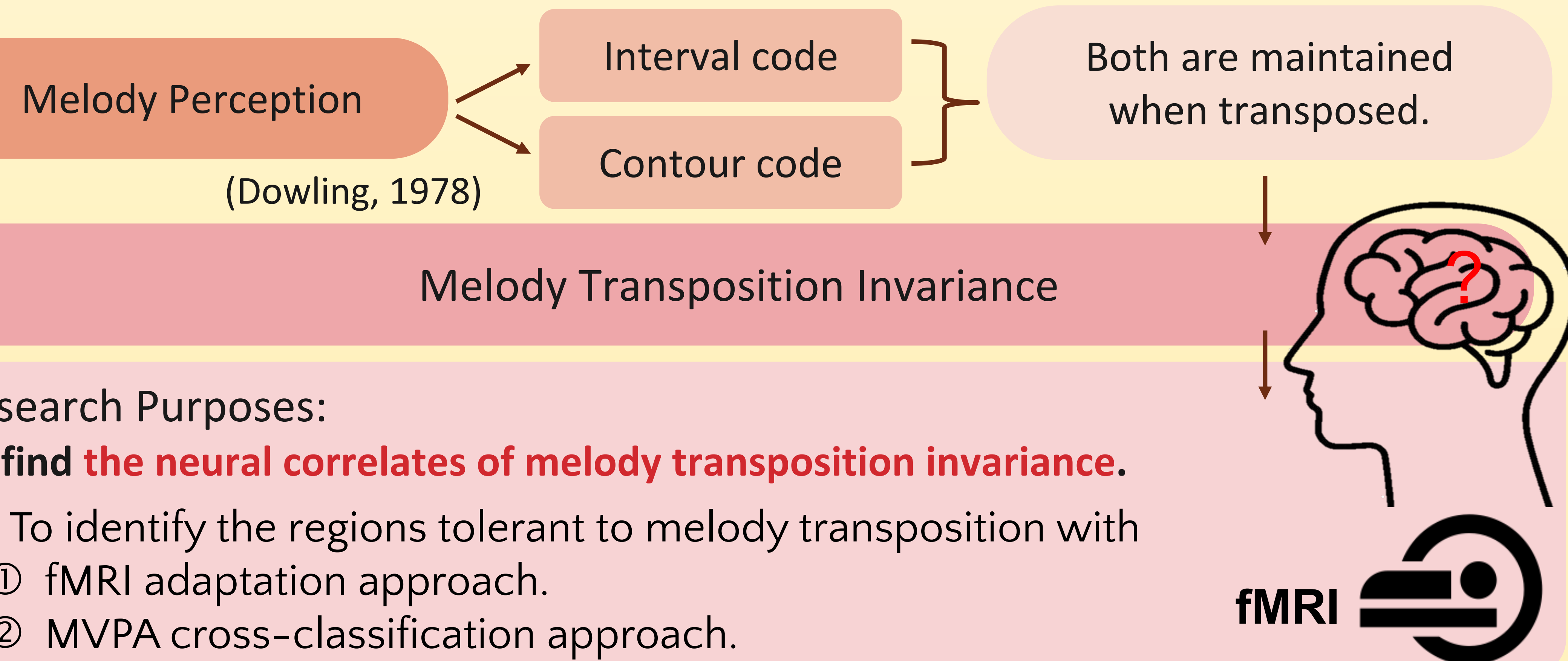
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Abstract

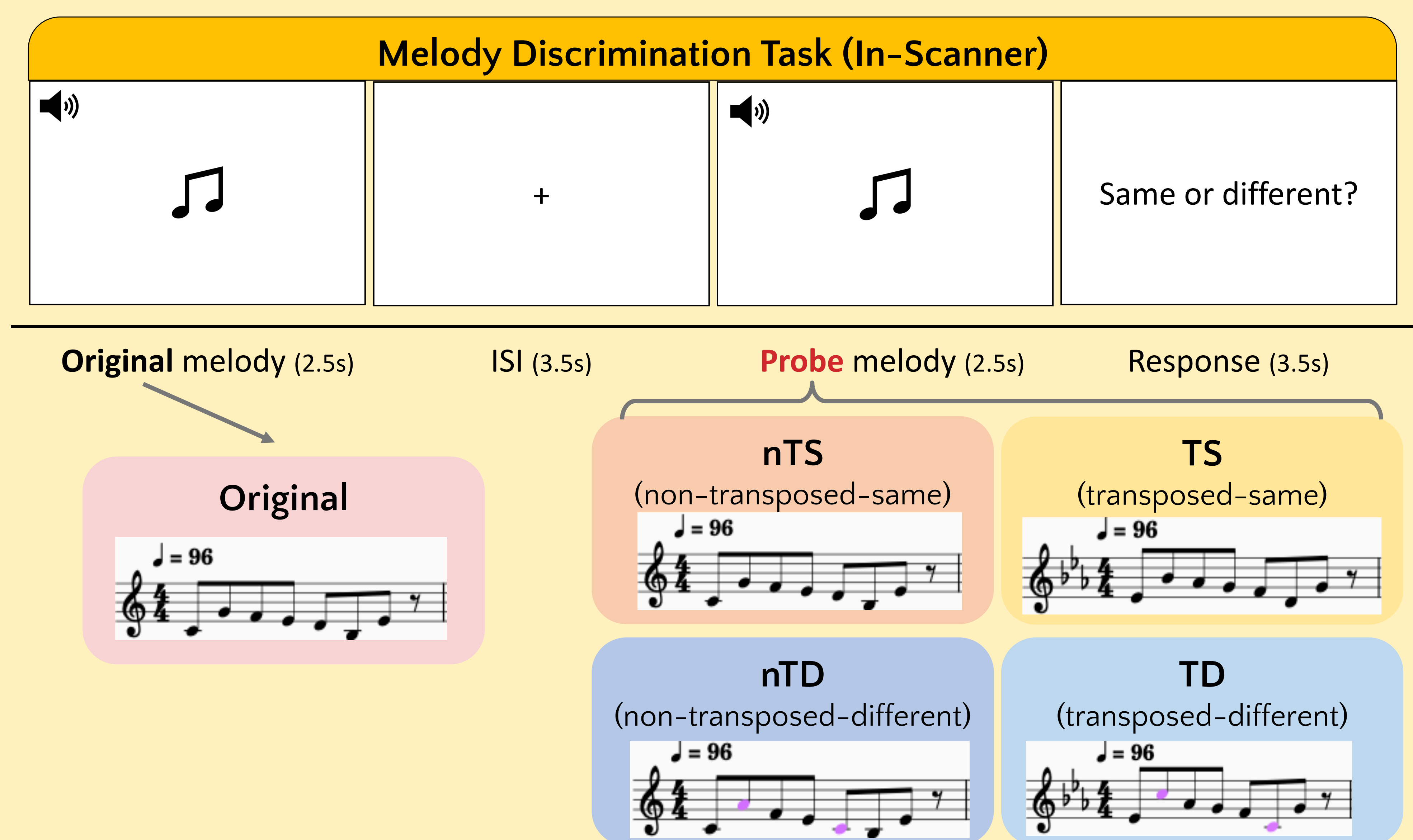
- Current study employed fMRI adaptation paradigm and multivariate pattern cross-classification (MVCC) analysis to pinpoint **the regions tolerant to melody transposition during melody processing**.
- Clusters in the right STG and the left MTG displayed melody-specific adaptation effect, while MVCC results unveiled that the BOLD patterns in the bilateral PreCG, the left IFG, IPL, the right AG and STG exhibited tolerance to melody transposition.
- These findings provided **evidence of the neural correlates of melody transposition invariance** and suggested that the tolerance to melody transposition permeates the entire melody processing pathway.

Introduction



Methods

- N = 22 (11 amateur musicians & 11 non-musicians)
- AP test (tone-naming test) → Most participants did not possess AP.



fMRI 1 st -level GLM design 8 task-related parameters	Original	Probe
Non-transposed same (nTS/OS)	$O_{(prePos)}$	Pos
Non-transposed different (nTD/OD)	$O_{(prePod)}$	Pod
Transposed same (TS)	$O_{(prePts)}$	Pts
Transposed different (TD)	$O_{(prePtd)}$	Ptd

Results

Adaptation Analysis

- **Melody-specific adaptation**

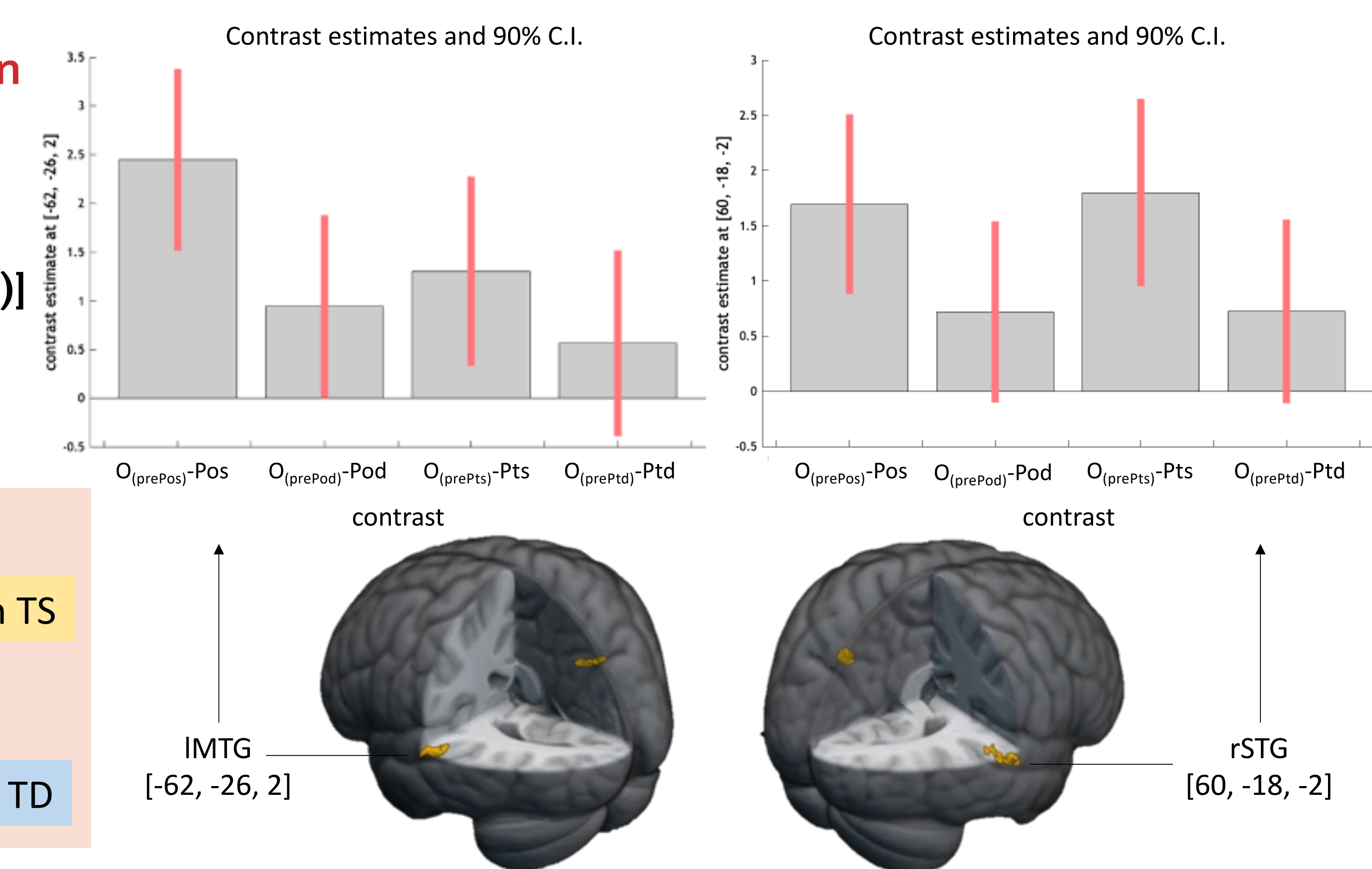
$$(O_{(prePos)} - Pos) + (O_{(prePts)} - Pts), \text{ exclusively masked by } [(O_{(prePod)} - Pod) + (O_{(prePtd)} - Ptd)]$$

Only

adaptation in nTS + adaptation in TS

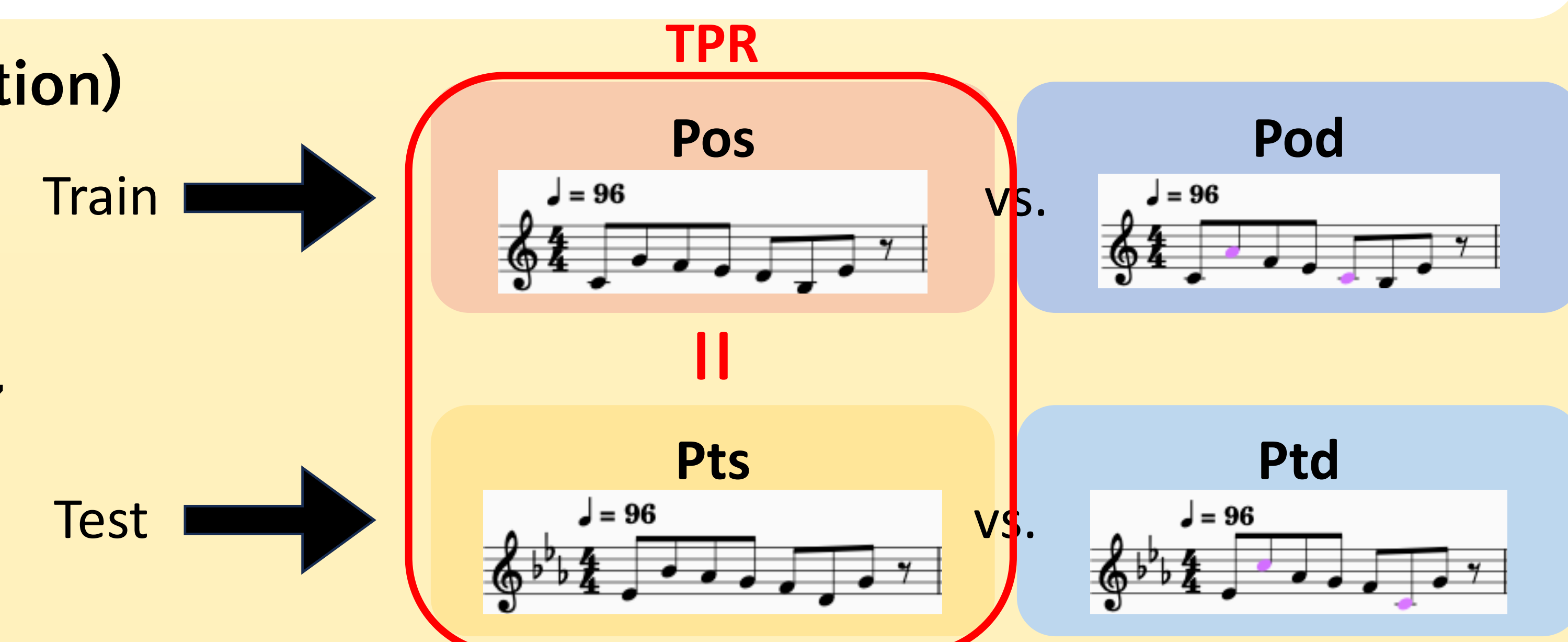
without

adaptation in nTD + adaptation in TD

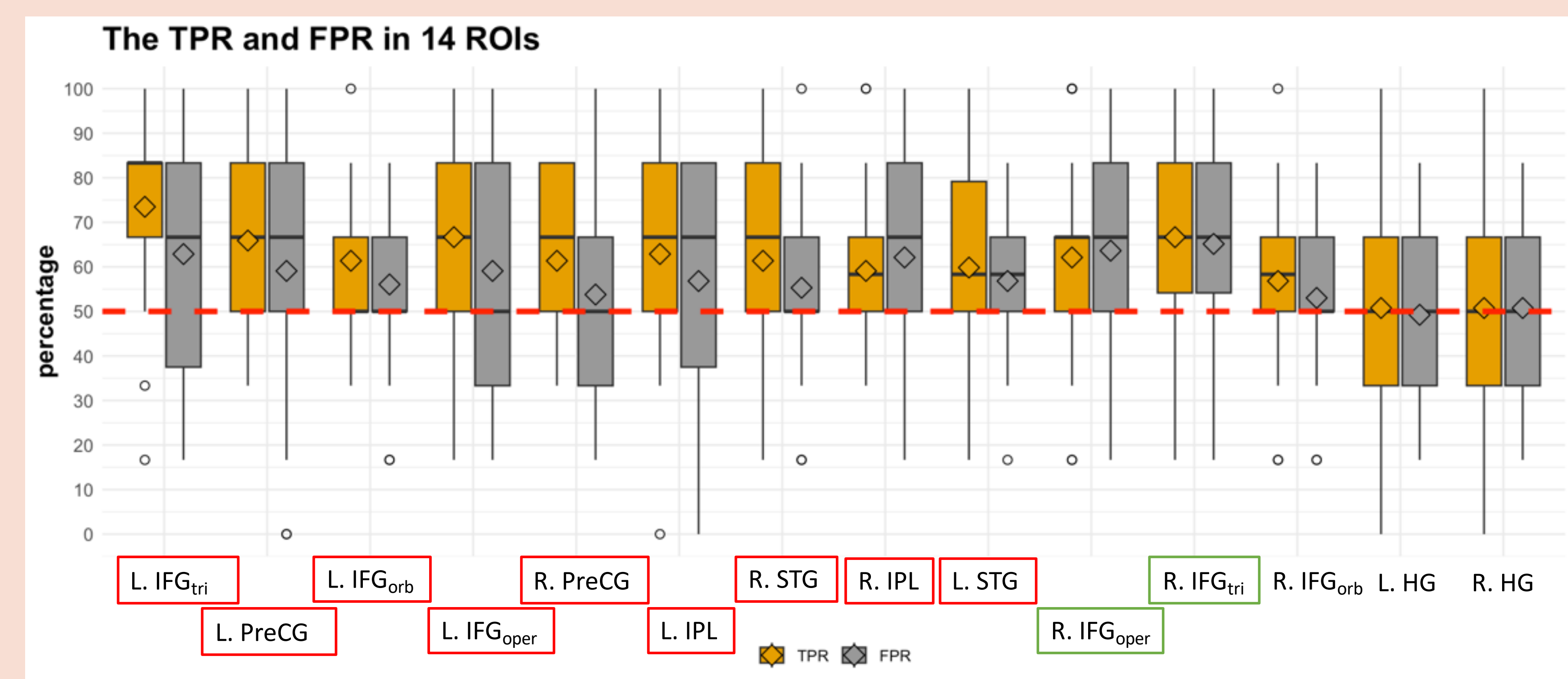


MVPA (Cross-Classification)

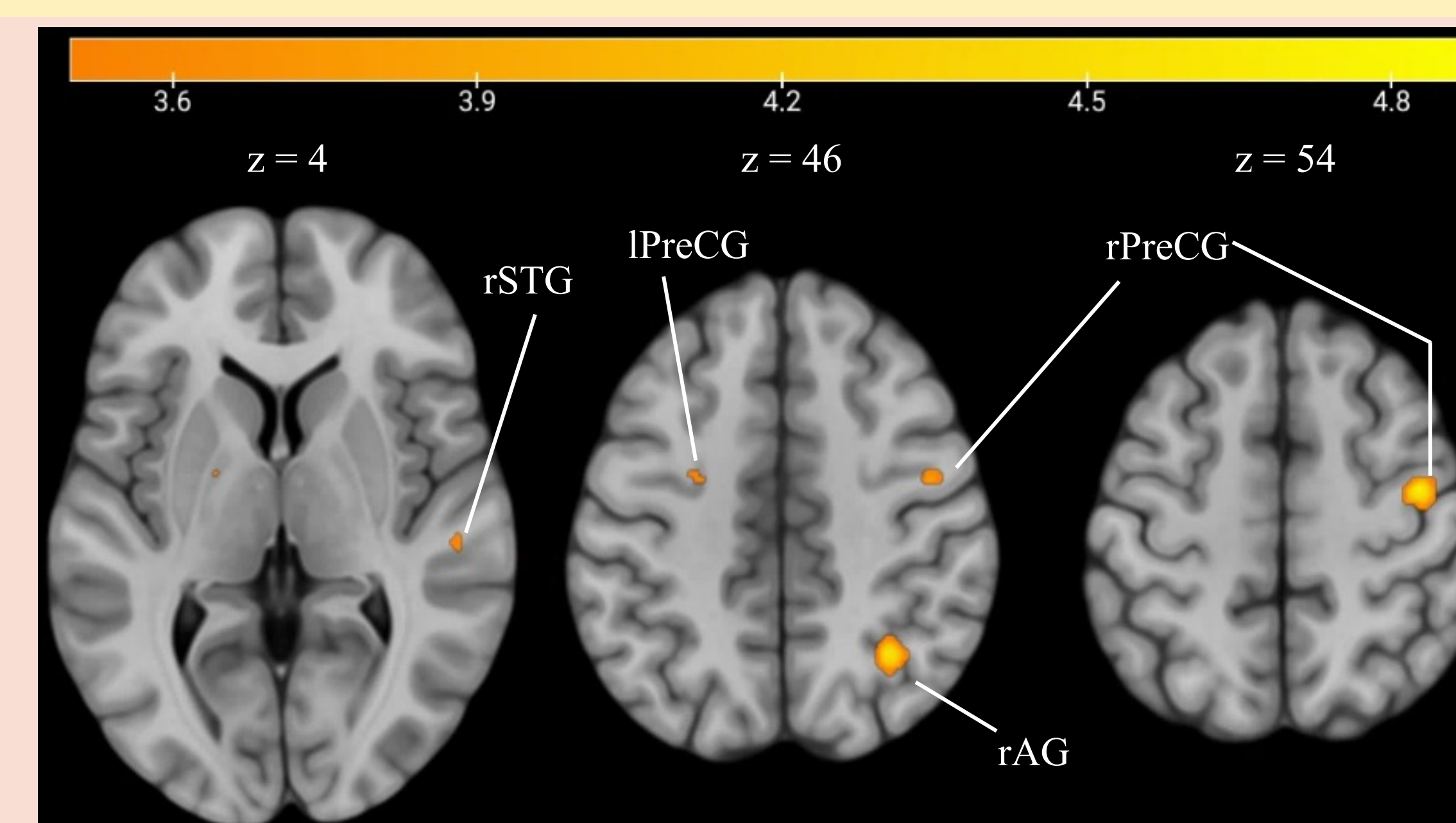
- Can a classifier, trained to distinguish between same and different probes in original keys (Pos vs. Pod), successfully identify the transposed-same (Pts) as the "same"?



ROI Analysis



Classify Pts as Pos → tolerant to melody transposition.



Searchlight Analysis

- Bilateral PreCG
- Right STG
- Right AG

→ tolerant to melody transposition.

Conclusion

Our findings propose a **neural basis for melody transposition invariance**, specifically indicating tolerance to transposition during melody processing throughout the music processing pathway from auditory to motor cortices.

Acknowledgments

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