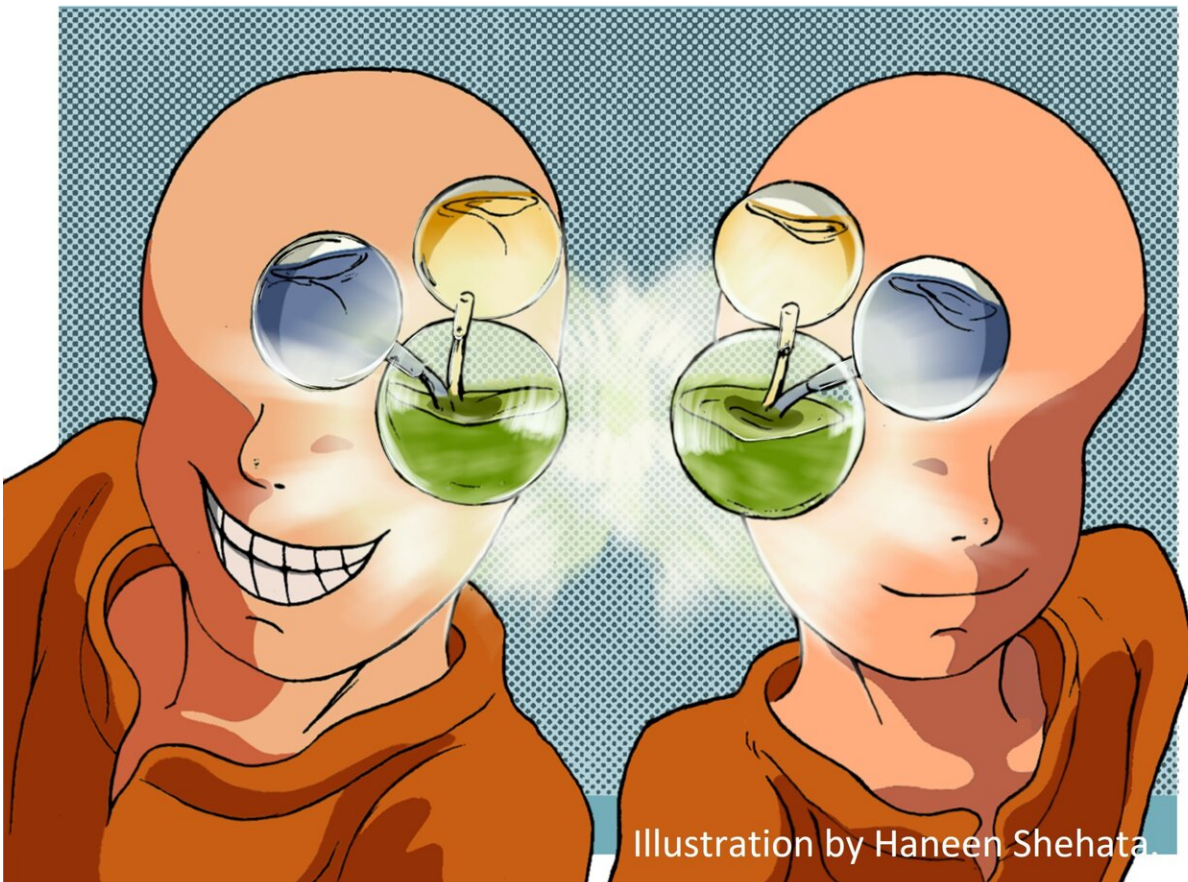


# The first neuroscience evidence of team flow as a unique brain state

October 4 2021



The left middle temporal cortex (the green region) is uniquely activated during the team flow state. During team flow, the left middle temporal cortex receives and integrates information from brain areas related to solo flow (blue region) and social interaction (the yellow region). The left middle temporal cortex is also involved in higher inter-brain neural synchrony during team flow. Credit: Toyohashi University of Technology.

A research team led by associate professor, Mohammad Shehata at Toyohashi University of Technology, in cooperation with researchers at the California Institute of Technology and Tohoku University have found the brain waves and regions sensitive to team flow compared to non-engaging teamwork or a solo flow. This study is the world's first attempt to study this psychological state objectively. These neural correlates not only can be used to understand and predict the team flow experience. The authors are working on utilizing the findings to monitor and predict team performance.

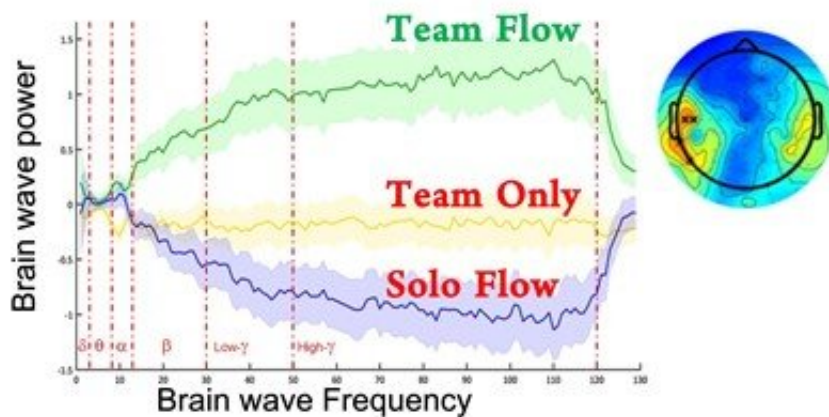
Team flow is experienced when team players get "in the zone" to accomplish a task together. Great teams experience this psychological phenomenon, from sports to music bands and even professional work teams. When teamwork reaches the team flow level, the team performs in harmony, often breaking their performance limits.

It is desirable to reproduce this state in the lab and objectively measure it to investigate neural processing of team flow state, which has been an enormous hurdle for decades.

Researchers at the Electronics-Inspired Interdisciplinary Research Institute (EIIRIS) at Toyohashi University of Technology and California Institute of Technology found lab techniques that provide the first neuroscience evidence of team flow. The researchers measured the [brain](#) activity from 10 teams using EEG of teams of two while they played a music video game together. In some trials, a partition separated the teammates so they couldn't see each other while they played, allowing a solo flow state but preventing team flow.

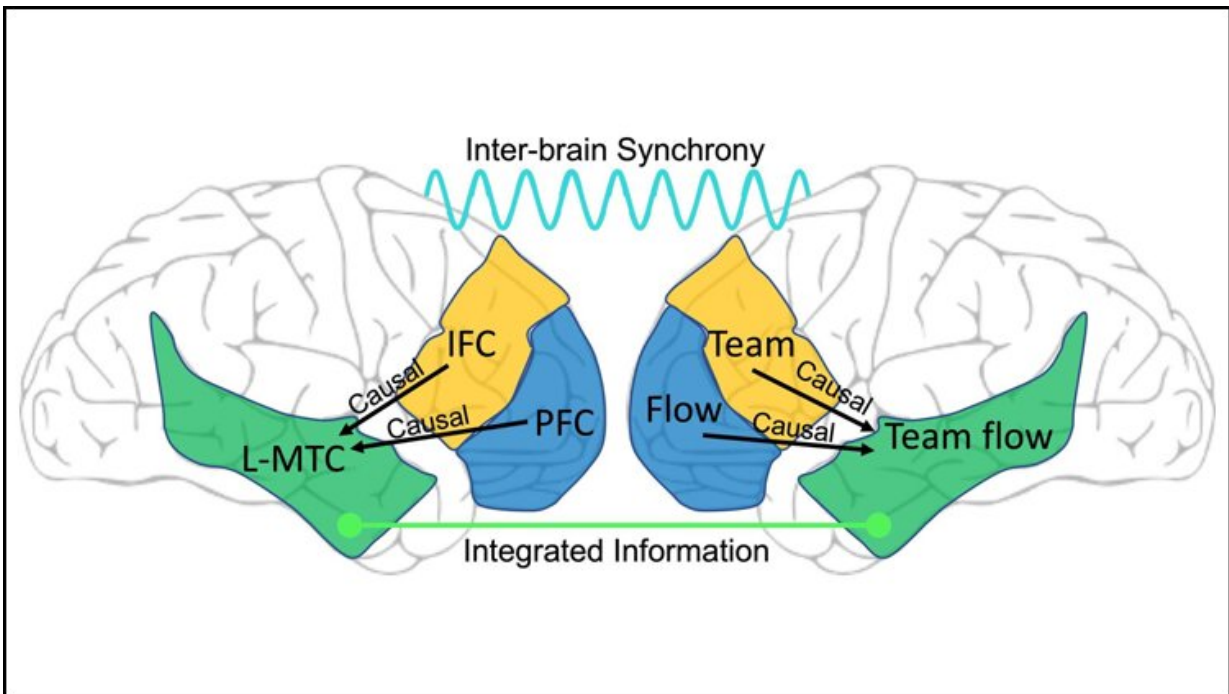
The research team scrambled the music in other trials, which prevented a flow state but still allowed teamwork. The participants answered

questions after each game to assess their level of flow. Moreover, the researchers invented an objective neural method to evaluate the depth of the team flow experience. Then, the researchers compared the brain activity of the participants during each condition. They found a unique signature of team flow: increased beta and gamma [brain waves](#) in the middle temporal cortex, a type of brain activity linked to information processing. Teammates also had more synchronized [brain activity](#) during the team flow state compared to the regular teamwork state.



Results of the EEG analyses, which shows that the left temporal cortex is activated specifically during team flow. Credit: Toyohashi University of Technology.

This study will provide a framework based on neural models that can be utilized toward more effective team-building strategies in areas where human performance and pleasure matters—business, sports, music, performing arts, video games, and entertainment. In partnership with governmental and industrial institutions, the researchers plan to use the neural signature of team flow to monitor and enhance team performance and, perhaps, build more effective teams.



The unique neural correlates of team flow. The left middle temporal cortex (L-MTC, green region) is uniquely activated during team flow state. The prefrontal frontal cortex (PFC, blue region) and the inferior frontal cortex (IFC, yellow region) are activated during the flow only (Flow) and team only (Team) states, respectively. During team flow, the L-MTC causally receives more information (black arrows) from the contralateral, shown here as ipsilateral for simplicity, PFC and IFC. The L-MTC is significantly involved in higher inter-brain integrated information (green line) and higher inter-brain neural synchrony (tan wavy line) during team flow. Credit: Shehata et al., *eNeuro* 2021

Enhancing performance while maintaining enjoyment has many implications towards a better quality of life, including lowering the rates of depression, panic attacks, and anxiety.

**More information:** Team Flow Is a Unique Brain State Associated With Enhanced Information Integration and Inter-Brain Synchrony,

*eNeuro*, [DOI: 10.1523/ENEURO.0133-21.2021](https://doi.org/10.1523/ENEURO.0133-21.2021)

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