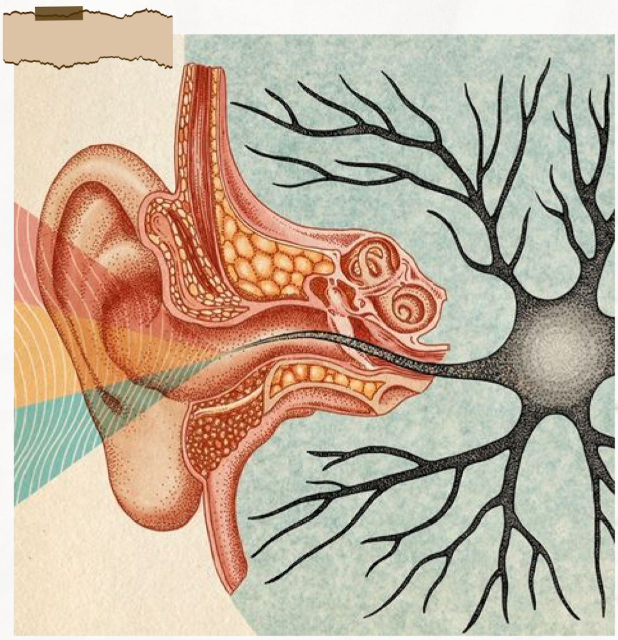
# A LUPA DE PANDORA

Em contraste com a sua matriz, a lupa de pandora pretende revelar inúmeros segredos que vagueiam por nós ocultos, quer por desconheceremos como os procurar, quer por sermos incapazes de decifrar o que eles abordam. Tentaremos potenciar a descoberta de um leque de projetos de investigação e trazer-vos respostas a qualquer indagação que poderá surgir no decorrer destes encontros.

## "CHARACTERIZING TOPOGRAPHIC ORGANIZATION PRINCIPLES OF CROSS-MODAL AND MULTISENSORY PLASTICITY IN THE AUDITORY CORTEX OF DEAF"

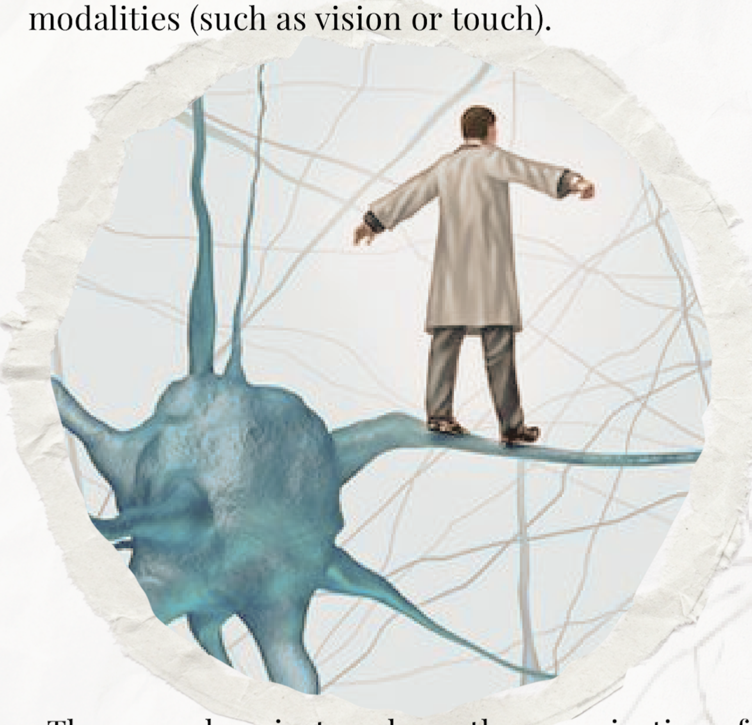
Exploration of neuroplasticity in the brains of deaf individuals stands at the forefront of cutting-edge research, offering profound insights into how the brain adapts and reorganizes itself in response to sensory deprivation. In a recent interview with Zohar Tal, a distinguished neuroscientist from Proaction Lab, University of Coimbra, Portugal, we learned that one of their major lines of research is related to neuroplasticity in special populations, which involves a collaboration with Heidelberg University, Germany, Institute for Brain Research, Beijing Normal University, China, and the School of Neuroscience and Psychology, University of Glasgow, Scotland. Before we dive into the project itself, let's clarify the definition of neuroplasticity.



According to Moheb Costandi (2016), neuroplasticity, also known as brain plasticity, is the ability that neural networks in the brain have to change through growth and reorganization. It is when the brain is rewired to function in some way that differs from how it previously functioned. These changes range from individual neuron pathways making new connections to systematic adjustments like cortical remapping or neural oscillation. Other forms of neuroplasticity include homologous area adaptation, cross-modal reassignment and map expansion (Grafman, 2000, p. 345–356).

To grasp the profound nature of neuroplasticity in deaf individuals, it is essential to understand the behavioral advantages observed in deaf individuals. These advantages are characterized by enhanced performance in tasks related to non-affected sensory modalities. The interviewee emphasized that the behavioral adaptations observed in deaf individuals go beyond mere compensation, indicating substantial restructuring at both the anatomical and functional levels of the brain.

This restructuring involves intricate alterations in cortical areas, encompassing gray and white matter changes. Such modifications create a neural landscape uniquely adapted to processing visual information without auditory input. This nuanced interplay of structural changes sets the stage for a profound exploration into the mechanisms and consequences of neuroplasticity in the deaf brain. A pivotal aspect of neuroplasticity in deaf individuals is the phenomenon known as cross-modal functional plasticity, the process in which deprived cortical areas (the auditory cortex, in the case of deafness) are recruited to process information from non affected sensory modalities (such as vision or touch).



The interview delved into the organization of cross-modal plasticity within the auditory cortex, raising fundamental questions about how visual information reaches this area. Two hypotheses were outlined, each providing a potential avenue for further investigation. The first suggests that visual information could reach the deprived auditory cortex through cortical connections with visual areas. The second proposes a more intricate top-down mechanism, involving visual information reaching the auditory cortex via subcortical connections with different rely nuclei of the visual system.

To unravel the mysteries surrounding these hypotheses, the researchers outlined ongoing projects aimed at delving deeper into the intricacies of neuroplasticity in deaf individuals. One such project focuses on changes in network connectivity within brain areas responsible for both auditory and visual processing. By examining differences in network connectivity during visual tasks, the researchers aim to unravel the complexities of information flow within the deaf brain.

The second project explores the organization of cross-modal responses in the auditory cortex, seeking to characterize visual responses and understand if the auditory cortex mirrors the topographic organization found in the visual cortex. These projects promise groundbreaking insights into the functional architecture of the brain in individuals with congenital deafness, shedding light on the interconnectedness of sensory processing areas. The application of advanced techniques, such as population receptive field modeling, provides a methodological backbone to the research. This enables researchers to decode neural activity patterns in response to visual stimuli, offering a detailed understanding of information processing in the auditory cortex of deaf individuals.

However, the results revealed unexpected findings. Contrary to conventional expectations, the auditory cortex in deaf individuals exhibited suppression of the fovea, the central visual field. This unexpected discovery challenges preconceived notions and underscores the complexity of neuroplastic changes occurring within the brain in response to sensory deprivation.

The suppression of the fovea challenges traditional assumptions about the relationship between visual processing and deafness. While behavioral studies have indicated enhanced performance in peripheral vision in deaf individuals, the neural mechanisms behind these adaptations were not fully understood.

Tal expressed optimism about future directions for this aspect of the research, suggesting that further exploration into more peripheral areas of the visual field might provide additional insights. The challenges associated with the limited scope of the MRI visual field were acknowledged, and the researcher highlighted the need for continued investigation to unravel the full extent of neural adaptations in response to sensory deprivation.

In conclusion, the ongoing research into neuroplasticity in deaf individuals unveils a captivating narrative of adaptability and reorganization within the brain. The unexpected findings challenge preconceived notions and open new avenues for understanding the profound impact of sensory deprivation on neural architecture. As the projects progress, the promise of unveiling the secrets of cross-modal plasticity and its implications for our understanding of neuroplasticity remains at the forefront of scientific inquiry.

Tal's advice to aspiring neuroscientists resonates, emphasizing the importance of a strong foundation in computational science and physics. In the ever-evolving landscape of neuroscience, these skills are key to navigating the complexities of data analysis and modeling, ensuring that future researchers can unravel the mysteries hidden within the folds of the brain.

As an ending note, we would like to thank Zohar Tal for the opportunity to interview her about this amazing project and her collaboration in writing this article.