

## Structural racism in neuroimaging: perspectives and solutions

Macroaggressions and microaggressions in academic settings are not the only contributors to systemic racism in science. The technology we use to do our research is inadvertently racist and biased. Functional near-infrared spectroscopy (fNIRS) and electroencephalography (EEG), for example, require adherence between the optode or electrode and scalp to measure brain activity. Contact with the scalp to optimise high-quality signals is disproportionately harder to achieve in Black participants, who tend to have coarse hair textures and protective hairstyles.<sup>1,2</sup> High-quality fNIRS and EEG data are highly dependent on hair texture, style, and length. MRI uses a head coil that restricts big, afro-textured hair. Further, sew-in hair extensions can have metal tracks that prevent an individual from entering an MRI bore.<sup>3</sup> Subsequently, the recruitment of Black participants in human neuroscience research is especially low.<sup>2,4</sup>

As Black women neuroscientists, our goal is to inform, educate, and raise awareness of scientific topics in our community. Yet, the very technologies that empower our work can also discriminate against ourselves and our communities. We have known friends and family who have been excluded from neuroimaging studies because they wear wigs, braids, or sew-in hair extensions, all of which are time consuming (eg, 3–8 h) and expensive. The technology we use inevitably excludes a large subset of the Black population, but there seems to be a collective apathy towards changing the design of these systems.<sup>5</sup> Here, we provide some actionable ways to move forward.

We strongly recommend the creation of novel neuroimaging systems that reliably record neural

signals from Black participants with protective hairstyles (eg, braids and twists) and coarse natural hair. Recent progress towards redesigning how electrophysiological measures are collected in participants with braids emphasises the need for technological improvements in neuroimaging methodology.<sup>2</sup> We urge engineers to work with hairstylists to redesign fNIRS and EEG caps to an adjustable, skeleton-like structure to accommodate more hair textures and styles. We also encourage scientists and engineers to acquire gold-cup EEG electrodes and to lengthen fNIRS probes for closer scalp contact for coarser hair. Although we cannot change the physics of MRI, acknowledging MRI recruitment issues is one step towards mitigating structural racism.

We urge investigators to report fully the participants who did not meet inclusion criteria in a sample and why, as this is crucial for reproducible research. Peer-reviewed journals must require authors to address racial gaps in recruitment in the limitations section of articles and to discuss possible improvements in inclusionary practices.

Research investigators and engineers involved in human neuroimaging research should receive proper institutional training on treating the hairstyles of individuals of African descent and should complete an annual compliance assessment on treating participants with diverse hairstyles and head coverings. Additionally, scientists should consider collaborating financially with local Black hairstylists and barbers to use neurotechnology in a way that appreciates the delicacy of Black hairstyles and hair types. These beauticians can help recruit Black participants in neuroscience research.

We cannot rely on young Black researchers to educate non-Black researchers about Black hair. Science is collaborative, and thus we need to address these systematic and explicit forms of racism within neuroimaging together.

We declare no competing interests.

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