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Racial biases in polygraphs and their legal implications

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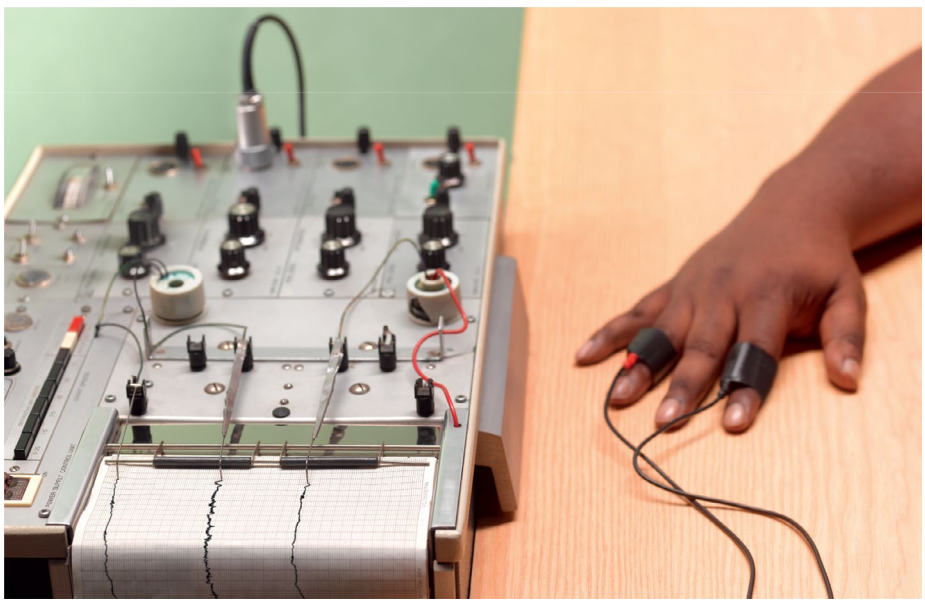
Since 2020, increased attention to racial inequities has catalysed a surge in publications that document racial biases in neuroscience[1,2]. The implications of these racial biases for the 'real world' beyond academia are just beginning to be discussed[3]. Here, we warn of a previously overlooked example of the applied consequences of neuroscientific bias: how technical features of skin conductance response (SCR) — a component of polygraph (lie detector) tests — exacerbate inequities in the criminal justice system. Notably, SCR is less reliable for individuals who are often socially coded as Black[1,2], which contributes to disparities in polygraph outcomes and raises critical concerns about its use in legal contexts.



Widely used in research since the 1800s, SCR (also known as the galvanic skin response or electrodermal activity) measures changes in the electrical conductivity of the skin due to sweat gland activity. SCR has historically been considered a 'gold standard' for the objective biological measurement of fear and anxiety. However, myriad emotional, cognitive and physical factors can influence sweating and thereby SCR magnitude, which demonstrates it indexes general arousal. Individuals may exhibit increased SCR when stressed (for example, being deceptive or simply attempting to understand a difficult question) or for reasons unrelated to stress (for example, positive emotions such as happiness or non-emotional processes such as focusing attention[4]). As such, SCR has inherently poor specificity and discriminant validity as a measure of anxiety[5].

Since the 1920s, SCR has been a major component of polygraph testing, which has entrenched it in the criminal legal system[4]. Currently, polygraph examinations remain controversial owing to concerns about reliability and validity. Although judges have substantial discretion over whether polygraph results can be presented to the jury[6], about half of US states still allow polygraph evidence with stipulated agreement by both the defence and prosecution before administering the test. Furthermore, polygraph examinations are also widely accepted as evidence in criminal cases across Europe, in civil cases in China and for all cases in Colombia[6]. Polygraphs are also used at earlier stages of law enforcement to verify witness statements and to justify further interrogation of suspects[6], and at later stages to track progress under court supervision (for example, monitoring of individuals convicted of a sexual offence).

The broader shortcomings of the SCR-based polygraph as a legal tool have been highlighted extensively in the academic literature and popular press[4,6], but less attention has been paid to the phenotypic biases of SCR technologies and how they may contribute to racial disparities in the criminal legal system. In the USA, Black men are incarcerated at rates 4 to 9 times more than white men across their lifetimes[7] and Black individuals represent over 30% of the prison population but less than 15% of the population[8]. Given these inequities, any tool used in the criminal legal system must be thoroughly evaluated for its potential to perpetuate and/or increase (versus lessen) racial disparities. Recent articles have effectively drawn attention to SCR-perpetuated inequity in the context of research and clinical applications[1,2], but there are additional implications to be considered in criminal legal settings. Owing to currently unquantified technological shortcomings, SCR is less reliably detected for Black individuals than white individuals[1,2]. Additionally, SCR inexplicably appears smaller, on average, among Black individuals[1,2]. The disproportionately limited reliability and validity of SCR-based polygraph data from Black individuals comes on top of existing problems in interpreting polygraphs for Black individuals, owing to increased police-related anxiety[9]. As results for Black individuals are more likely to be deemed 'inconclusive', polygraph results are also less likely to aid in their potential exoneration. Furthermore, SCR failures may lead to disproportionate weight assigned to other polygraph signals commonly coupled with SCR, such as respiration and heart rate, each of which have their own validity challenges. All of this ultimately presents problems for the admissibility of the polygraph under the Daubert standard of evidence[10].

As recent work has made clear, we must thoroughly assess and seek to mitigate racial biases in neuroscientific technologies. Until SCR technology evolves to overcome its biases against individuals socially coded as Black,

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SCR-based polygraph evidence will continue to perpetuate racial disparities in the criminal legal system. We join with others' calls to exclude polygraph evidence from the legal system entirely, which have focused on poor overall reliability and validity, and contend that these issues are likely to be amplified for Black individuals who are already systemically disadvantaged by the criminal legal system.

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Competing interests

The authors declare no competing interests.