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Teaching Cognitive / Behavioral Neuroscience Through a DEI Lens

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Abstract

Introduction: As higher education continues to prioritize diversity, equity, and inclusion (DEI), cognitive/behavioral neuroscience and other physiologically-based psychology courses may face challenges incorporating DEI issues into the curriculum relative to other subfields of psychology.

Statement of the Problem: Instructors of these courses may believe that their discipline is more objective than other psychology subfields, or may simply be unsure where to insert discussion of DEI issues into their course material.

Literature Review: There is a substantial evidence regarding both the fallacy of total scientific objectivity and how structural inequalities can impact brain structure and function in historically marginalized populations.

Teaching Implications: I discuss where and how in the neuroscience curriculum instructors can implement relevant discussion of DEI issues, as well as provide practical suggestions for how to increase belongingness for historically marginalized students, including open educational resource lecture slides and a critical thinking assignment.

Conclusion: Excluding DEI content from neuroscience courses harms our students and perpetuates the myth of total scientific objectivity, so it is imperative that faculty include DEI discussions in neuroscience-based courses.

Teaching Cognitive/Behavioral Neuroscience Through a DEI Lens

The importance of diversity, equity, and inclusion (DEI) issues is becoming increasingly apparent in the field of higher education. As a result, a greater amount of course content is being devoted to covering DEI-related topics in several scholarly disciplines. This is happening in disciplines outside those, such as ethnic and gender studies, traditionally tasked with presenting information from marginalized perspectives. This occurrence is being seen in psychology, as well; although DEI has long been one of the subjects covered under the umbrella of social psychology, it is becoming increasingly evident that attention needs to be paid to issues of equity and inclusion in other subfields of psychology. A particular challenge in this arena is the question of how DEI issues should be covered in courses that deal with the more explicitly brain-based aspects of psychology, such as cognitive and/or behavioral neuroscience courses.

This challenge arises in no small part because it can be difficult for instructors to understand 1) how DEI topics have impacted, and continue to impact, fields dealing with physiology and biology, as well as other “hard science” subfields, and 2) how to incorporate DEI topics into their courses in an authentic way. Despite widespread belief in the objectivity of science, the practices and methods that scientists use, as well as the ways in which we determine which phenomena are worthy of further investigation, have long been biased in favor of dominant societal groups, as they have been the ones with the power to make such decisions. For example, Washington provides ample documentation of this in her book *Medical Apartheid* (2007), which details the great debt that modern medical science owes to unethical experimentation on Black bodies, historically seen as expendable animal subjects rather than human beings in their own right. Tone and Koziol (2018) discuss the statistics indicating that the majority of lobotomies performed during that surgery’s heyday were performed on women, despite the fact that the majority of patients hospitalized for psychiatric reasons were men. Most of us in the field of psychology know homosexuality was classified as a mental disorder—at

least according to the Diagnostic and Statistical Manual of Mental Disorders (DSM)—until 1974, and the World Health Organization removed “transsexualism” as an illness from the International Classification of Diseases only in 2018.

These are but a few examples of how a white, cisgender, heterosexual male majority was able to set the parameters for what was considered “objectively” normal in medicine, psychiatry, and psychology, and, by so doing, ensured the continued pathologizing of the experiences of those who do not fit within those narrow demographic categories (for a more general discussion of the problem of “objectivity”, see, for example: Fee, 1982; Goldenberg, 2006). The ramifications of this echo throughout these fields to the present day, and herein lies the importance of addressing DEI issues in courses where they may not, at first glance, appear to belong. While human endeavors may never be fully free of bias, instructors in fields pertaining to human health—such as psychology—are ethically bound to imbue in, and model for, students the ability to question their own motives and assumptions when evaluating information. Exposing students to diverse perspectives early on in their careers sets the stage for future alleviation of some of the current DEI issues, such as minimizing differential treatment of white and racialized patients, seen in both psychology as a whole and in the subfield of cognitive/behavioral neuroscience specifically. Additionally, the scientific basis of harm done by discrimination is important research that must be communicated to students in the name of scientific accuracy. (Please note that although this paper’s focus is race/ethnicity and socioeconomic status due to article length limitations, sexual orientation, gender identity, neurodiversity, and disability status are also important DEI concerns the author hopes to discuss in future papers.)

While it may be unlikely that the majority of psychology students will become practicing clinicians or researchers, psychology students do enter the workforce in other capacities, such as management, K-12 education, or social work (Bureau of Labor Statistics, 2022). Therefore, a majority of our students will go on to careers where their unexamined biases can affect health

outcomes and influence policy. As a result, instructors have an ethical imperative to equip students the best we can to be aware of inequities in the treatment of people from historically marginalized populations. Not only is this the first step in helping future researchers and practitioners address inequality in outcomes that may be a result of implicit bias, but minimizing bias and prejudice in general has a beneficial effect on society as a whole.

As an example, Dictado and Torres-Harding (2022) found that therapists-in-training were more likely to overestimate the severity of Black clients' symptoms and to dismiss their reports of microaggressions from therapists when the therapist trainees espoused "colorblind attitudes" (i. e., downplayed the importance of racial identity in determining one's day-to-day experiences in a predominantly white culture). One can imagine the consequences this sort of treatment by a therapist could have on a client's well-being. In a similar vein, racially marginalized youth recently emancipated from the California foster care system were found to have higher self-esteem and increased social support if they had a positive ethnic and racial identity, while simultaneously being reported to have less opportunity to formulate a positive ethnic and racial identity than children not in the foster care system (Tyrell et al., 2019). Hunter (2019) thoroughly summarizes the history of how psychology and psychiatry have overpathologized women relative to men, and De La Hermosa and Agossou (2019) take a similar historical approach focusing specifically on trans women. LGBTQIA+-identifying youth in the U. S. child welfare system were significantly more likely to attempt suicide and/or report suicidal ideation than their cisgender, heterosexual peers (Scannapieco et al., 2018). These are but a few of the many publications that indicate the need for increased attention to DEI issues in the field of psychology as a whole; however, many of these are from clinical settings, rather than pertaining to cognitive/behavioral neuroscience per se. Thus, the question remains: how should instructors incorporate DEI issues into the material for their cognitive/behavioral neuroscience and/or neuropsychology courses? Fortunately, there are several topics typically covered in such courses that lend themselves well to discussion of DEI issues, including both pre- and postnatal

neural development and neurological effects of stress and trauma. Perhaps it makes the most chronological sense to begin by discussing the impact of DEI issues on the developing brain. It should be noted, however, that stress and trauma affect the human brain identically regardless of whether one belongs to a marginalized group, and marginalized groups are simply more likely to experience stress and trauma as a result of societal inequity.

Neural Consequences of Structural Inequality in the Fetus

People belonging to historically marginalized populations are exposed to several damaging influences on neural development while still in utero. Marginalized communities are more likely to be impoverished (Liu et al., 2018), and, as such, are more likely to live in areas where there is increased exposure to teratogens and environmental contaminants (Perry et al., 2021; Ruiz et al., 2018), which can have a particularly deleterious effect on the developing brain. In addition to increased teratogen exposure, marginalized communities often also face a lack of prenatal care, caused in part by barriers due to racial discrimination (Slaughter-Acey et al., 2019). As discussed at length by Washington (2007) and others (e.g., Conteh et al., 2022), historically marginalized populations, and especially Black Americans, are likely to have a high degree of medical mistrust due to a long history of mistreatment by the medical establishment. The higher incidence of poverty experienced by historically marginalized populations may also limit their access to medical care in general (Bekemeier et al., 2012; Gadson et al., 2017). Lack of prenatal care can mean that health issues affecting the childbearing person, and potentially the fetus, may go untreated, and necessary fetal health screenings to help ensure fetal viability throughout the birthing process may also be missed.

Epigenetic stress of parents can also be a contributing factor in fetal development; Phelan et al. (2015) found that women belonging to historically marginalized populations were more likely to report high levels of prenatal stress. Kim et al. (2015) gave a thorough review of the ways in which increased parental prenatal stress can negatively impact infants' psychiatric and neurological health, leading to increased incidence of such disorders as schizophrenia,

autism spectrum disorders (ASD), and/or attention deficit hyperactivity disorder (ADHD). Similarly, Monk et al. (2016) found that parental reporting of perceived stress was correlated with higher levels of fetal DNA methylation, indicating that increased parental distress does, in fact, affect genetic expression in the fetus.

Neural Consequences of Structural Inequality in Children

Because brain development continues into young adulthood, there are numerous opportunities post-birth for structural inequities to negatively impact neurophysiology and psychiatric health. This is reflected in much of the recent research surrounding Adverse Childhood Experiences (ACEs), which are likely to disproportionately affect children and youth from marginalized populations (Cole et al., 2022; Liu et al., 2018). Work with both animal models (Dandi et al., 2022; Sheridan & McLaughlin, 2014) and human populations (Park et al., 2021; Xie et al., 2022) has established that exposure of the developing brain to chronic stress can impact ongoing neural development and predispose individuals to developing psychiatric conditions. Xie et al. (2022) found that higher incidence of ACEs is correlated with loss of volume in thalamic areas of the brain, as well as the development of post-traumatic stress disorder in adulthood. Liu et al. (2018) found evidence that ACEs are positively correlated with the development of psychiatric illness in adolescence. People reporting higher levels of ACEs are also more likely to develop substance abuse disorders (Allen et al., 2021)—and when these people become pregnant, continued substance use can compound any epigenetic effects to which the developing fetus is already susceptible. Physiologically speaking, this predisposition toward substance use correlated with ACEs may relate to ACE effects on the neural circuitry underlying the dopamine reward system, which has been found to have impaired development in children with higher ACE scores (Park et al., 2021). Intersectionality is also important to keep in mind, as, of course, individuals may belong to more than one historically marginalized group simultaneously, which can also affect their experience of ACEs and, therefore, their neural development (Mersky et al., 2021). Mersky et al. (2021) found interactions between sex,

poverty, and race, with impoverished Native American women reporting the highest ACE scores of all participants.

In a similar vein, we also know that Hebbian learning can affect neural development in a more positive light, with children raised in enriched environments having significant differences in neural structure that can have a protective effect against stressors in adulthood (e. g., Dandi et al., 2022). Because children in historically marginalized communities are more likely to be impoverished and lack access to resources (Liu et al., 2018), they are often deprived of access to the kinds of enrichment their more privileged peers may take for granted, such as access to quality early childhood education. Thus, for children of marginalized populations, we see brain development impacted by the presence of negative factors and the absence of protective factors, as well—a sort of “double whammy” effect on neural development.

Neural Consequences of Structural Inequality in Adolescents and Adults

The chronic stress of discrimination can continue to affect brain structure and function throughout adolescence and adulthood in ways that can have severe mental health consequences. Glucocorticoids released in response to stress during adolescent development of the hypothalamic-pituitary-adrenal (HPA) axis impair learning and memory functions in adulthood, which may indicate that adolescence is a time of heightened vulnerability to the effects of stress on brain development (McCormick & Mathews, 2010). This is consistent with Sapolsky’s work on the effects of glucocorticoids on the HPA axis (reviewed in Sapolsky, 2021): increased exposure to glucocorticoids occurring because of chronic stress can damage the hippocampus, a prime location for many functions associated with learning and memory. De Miguel et al. (2019) have also found anatomical evidence in mice that chronic stress in adolescence may lead to further issues with learning and memory in adulthood by altering the characteristics of new neurons generated in the dentate gyrus, rendering those new neurons more highly reactive to future stressors. This may imply that chronic stress in childhood and

adolescence has a “snowball” effect, where trauma experienced in youth may “prime” the brain to be more susceptible to damage from trauma occurring later in life.

The neural changes that can be seen as a result of the chronic stress of discrimination and prejudice have important clinical implications. As previously acknowledged, it is unlikely that all of our students will go on to be clinicians, but discussing psychiatric conditions often falls under the purview of physiological psychology courses, reflecting the fact that mental health is directly connected to brain structure and/or function. Race-based discrimination has been found to increase suicide attempts and suicidal ideation even in preadolescent children (Argabright et al., 2022), as well as the incidence of psychotic-like experiences in childhood, with Black children faring worse than Latinx, Asian, and white children (Karcher et al., 2022). Stereotypes and cultural constraints not only increase the risk of developing psychiatric symptoms and worsen mental health outcomes, but may also prevent patients who do need psychiatric care from receiving it. For example, Wu et al. (2018) found that Asian American adults tend to be both underdiagnosed and undertreated for mental health conditions compared to white adults, and Morris et al. (2019) argue that documented health care disparities for LGBTQIA+ individuals exist in large part due to stigmatization and implicit bias on the part of clinicians.

Conclusion

Instructors have a responsibility to equip students not only with knowledge of the particular topic of the course at hand, but also with skills that will allow them to better function in the world outside of higher education. Research supports that discrimination and its associated stressors can have lifelong physiological effects on brain development, and can therefore put marginalized populations at a disadvantage relative to more privileged groups (e. g., Argabright et al., 2022; Hatzenbuehler et al., 2022, Scannapieco et al. 2018; Vargas et al., 2022). Teaching this scientifically accurate information can help instill students with a sense of compassion and the ability to think critically about DEI issues. This can be done as suggested throughout the paper: by discussing specific research findings pertinent to this fact while lecturing on the topics

above. Additionally, it can be helpful to assign students readings related to the course topic written from a DEI perspective, rather than relying solely on a textbook (see Table 1 for a sample reading list). In covering topics like research ethics and the history of neuropsychology, highlighting the disproportionate burden borne by disadvantaged groups can also help students understand the damage unexamined biases can do in a scientific context. Indeed, one could argue that giving a lecture on research ethics without discussing the Tuskegee Syphilis Experiment would be a gross oversight. I have provided a PowerPoint lecture highlighting DEI issues from a neuroscience perspective that includes a critical-thinking class discussion assignment, which can be found on OSF.io (Opper, 2023a).

Discussing DEI issues in the classroom can also help increase feelings of belongingness for students who belong to historically marginalized groups, which can help increase their chances of successfully navigating higher education and the working world once they graduate. Rincón (2020) found that just a 1% increase in the representation of Latinx people in STEM programs was enough to reduce Latinx student attrition, indicating that even minor attempts to be inclusive can make a difference. Similarly, Tyrell et al. (2019) found that positive interactions with in-group community members can help marginalized youth develop a more positive view of their identity, which can combat many of the disadvantages faced by marginalized populations discussed in this article. In practice, increasing inclusion for historically-marginalized students can be as simple as paying close attention to the words and images we use in our lecture slides. For example, when we need a generic last name for an example, do we default to names like “Smith” and “Jones”? When we want to depict a scientist, do we always choose an image of a white man? It can also be helpful to draw students’ attention to the existence of organizations that celebrate diversity and inclusion in the neurosciences, like Black in Neuro (https://blackinneuro.com/). This could be done by including a list of resources in the course syllabus, or including a slide at the beginning of some lectures that names the organization,

summarizes its mission, and directs students to where they can find more information about it (see Figure 1 for an example).

Exposing more privileged students to increased diversity can also help marginalized students. Fan et al. (2019) found that increased representation of minority groups is associated with less bias in the workplace against those minority groups. Additionally, for those students who do go on to pursue careers in cognitive/behavioral neuroscience, the field as a whole will benefit from greater representation of historically marginalized populations: the presence of more people belonging to historically marginalized groups in both research and clinical work can help reduce the impacts of implicit bias that both perpetuate and exacerbate the damage done by a lifetime of discrimination.

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Table 1

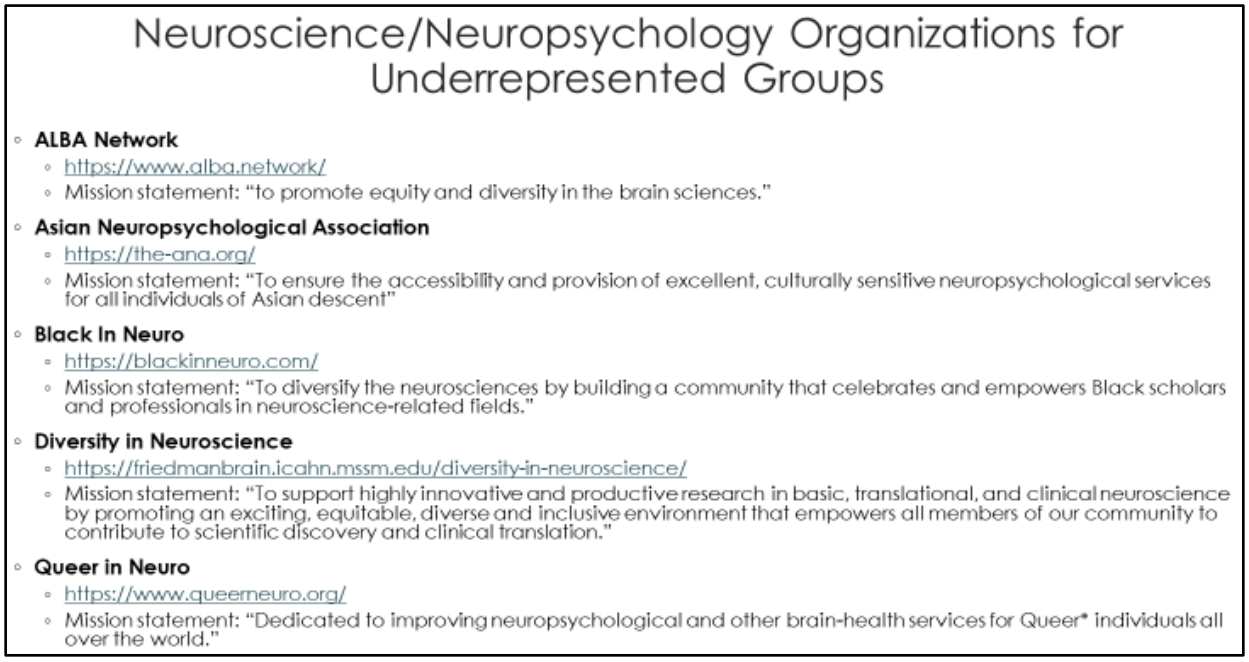
Sample DEI Reading List for Cognitive/Behavioral Neuroscience

Citation	Topic
De Miguel et al. (2019)	Effects of chronic stress in adulthood on neurogenesis.
Hatzenbuehler et al. (2022)	Effects of racial stress on hippocampal volume.
Kim et al. (2015)	Epigenetics of mental illness.
Park et al. (2021)	Neural effects of ACEs.
Radua (2022)	Neuroscientific perspective on reducing discrimination.
Steele (2010)	Physiology of stereotype threat.
Vargas (2022)	Environmental enrichment and neural development in adolescents.

Note. This list is intended to supplement a traditional textbook (Opper, 2023c).

Figure 1

Sample Lecture Slide Including a List of DEI-Aligned Neuroscience/Neuropsychology Organizations



Note. A sample list of DEI-focused neuroscience/neuropsychology organizations to be included in lecture slides for students (Opper, 2023b).