ARTICLE
Opportunities to Discuss Diversity-Related Topics in Neuroscience Courses

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Diversity is a foundational topic in psychology, and APA recommends that diversity is covered across the psychology curriculum. Neuroscience courses face challenges with incorporating diversity-related topics owing to the historical lack of neuroscience research that focuses on diversity and the restricted range of diversity-related topics that neuroscience is typically associated with (i.e., health and disability status). This may limit students' learning of neuroscience's contributions towards understanding diversity. We review some specific examples of diversity-related topics that can be incorporated into neuroscience courses. These examples have been selected to include topics across the three major content domains of neuroscience (cellular/molecular, neuroanatomy/systems, and cognitive/behavioral), as well as across multiple diversity-related topics. Neuroscience instructors can use these examples to incorporate greater coverage of diversity-related topics within their courses and/or as points of inspiration for their own curricular additions. Providing systematic coverage of diversity-related topics in neuroscience courses highlights the ways neuroscience advances our understanding of human diversity and contributes to the educational objectives of psychology and neuroscience programs.

Key words: diversity education, diversity neuroscience, diversity biological psychology, diversity psychology, neuroscience education, biological psychology education

Diversity is conceptually rooted in the expression of differences, including those that might exist on the human, sociocultural, sociohistorical, and sociopolitical levels (American Psychological Association, 2013). This definition can also be expanded into more specific diversity-related topics such as "race, ethnicity, gender identity/expression, sexual orientation, age, religious affiliation, health and disability status, national identity and immigration status, and social class, among other sociocultural differences and distinctions" (APA, 2013, p. 12). The APA Principles for Quality Undergraduate Education in Psychology includes among its recommendations that "faculty ensure that diversity issues are carefully considered and infused throughout the curriculum" (American Psychological Association, 2011, p. 10), even in programs that have a stand-alone course on diversity (APA, 2013). Coverage of diversity-related topics in all courses, including biological psychology and neuroscience courses, is thus an essential feature of an education in psychology and/or neuroscience.

As a subfield of psychology (as well as other academic disciplines), neuroscience has historically faced challenges associated with diversity (along with psychology curriculums in general; Stoloff et al., 2010). Until recently, neuroscience research has rarely had a direct focus on topics of diversity, and this has influenced which people have become neuroscience researchers. In Lauer (2020)'s report on R01 award rates from 2011-2015, research assigned to the National Institute on Minority Health and Health Disparities had the lowest overall award rate (9.1%) of the 23 institutes/centers identified (the National Institute on Aging was ranked 8th lowest with an award rate below 15%). In a study of the 2011-2015 fiscal year Type 1 (New) and Type 2 (Renewal) R01 applications, those from African American/Black scientists were skewed towards topics that were usually funded at a significantly lower rate than the National Institutes of Health (NIH) average, including topics connected with health disparities and patient-focused interventions (Hoppe et al., 2019). Taken together, these reports suggest that research on diversity-related topics (especially those with connections to minority health and aging) is less often funded, which can marginalize the careers of researchers who have specific interests in these topics. This may be one of many factors that accounts for previously reported NIH racial funding gaps in which African American/Black scientists receive lower rates of funding than White scientists (Ginther et al., 2011; Hoppe et al., 2019; Erosheva et al., 2020).

Additionally, Dworkin et al. (2020) examined authorship in top neuroscience journals and observed a gender imbalance until approximately 2015 in which papers with men listed as first and last authors appeared higher than those that included women in first and/or last authorship positions. Leaders in our field have expressed a commitment towards promoting and expanding diversity of researchers, boards, and reviewers to confront these challenges (Cell Editorial Team, 2020; Jones-London, 2020; Society for Neuroscience, 2020).

The diversity-related topics of race, ethnicity, gender identity/expression, sexual orientation, age, religious affiliation, health and disability status, national identity and immigration status, and social class (APA, 2013) and sex are rarely given priority when provisioning content in neuroscience courses (see Kerchner et al., 2012 for a listing of representative core competencies and basic knowledge topics in neuroscience). Instructional choices might reflect teachers' desires to promote a sense of belonging or basic competency in their students by emphasizing the acquisition of basic content knowledge. Similarly, when diversity-

related topics are covered in neuroscience, there may be a bias in which the most common or directly relatable diversity-related topics are selected, such as "health and disability status" (which is closely related because of neuroscience's focus on neurological disorders and psychopathologies) and "age" (which is closely related because of neuroscience's focus on development and dementia). In APA's 2014 report aimed at strengthening the core of introductory psychology courses, diversity-associated topics within the biological domain are most commonly aligned with "health and disability status" (p. 34), which supports this topic's close relation with neuroscience. While it may be true that some courses align with some diversity-related topics especially well, we suggest that the same principles motivating the APA recommendations for a distribution of diversity coverage across courses in the curriculum might also apply to covering diversity-related topics throughout each course. Neuroscience should contribute to an understanding of human diversity that includes health and disability status, but also moves beyond that specific topic area, extending the literature that has emerged in recent years on diversity and neuroscience education (Linden and Wright, 2017; Linden et al., 2020; Neuwirth et al., 2021; Penner et al., 2021; Roth and Gavin, 2021).

The purpose of this manuscript is to present instructors with examples of topics that can be covered across neuroscience courses that have connections with the many diversity-related topics identified by the APA (2013): race, ethnicity, gender identity/expression, sexual orientation, age, religious affiliation, health and disability status, national identity and immigration status, and social class. We also include sex as an additional diversity-related topic when selecting examples. We focus here on content rather than methods because previous reports (e.g., Kite and Littleford, 2015) have detailed recommendations on effective teaching practices for diversity education. Our objective is not to overview all potential diversity connections appropriate for neuroscience courses, but rather to underscore some choice examples specifically distributed across the three major content areas of neuroscience (cellular/molecular, neuroanatomy/systems, and cognitive/behavioral) and the different diversity-related topics identified in APA (2013).

CELLULAR/MOLECULAR NEUROSCIENCE EXAMPLES

Cellular Reproduction, Telomeres, and Biomolecular Diversity

Telomerase is an enzyme implicated in preserving healthy cellular reproduction by maintaining chromosomal telomere (protective end caps on DNA) length during cell replication (Vaiserman and Krasnienkov, 2021). The embryonic brain contains high telomerase levels that becomes restricted only to stem cells and neuronal progenitors by adulthood, with changes in telomerase levels associated with shortened telomere length, cellular senescence, and degenerative aging disorders (Zhang et al., 2014; Liu et al., 2018).

This topic connects with the diversity-related topics of age and race, emphasizing the contribution of diverse psychosocial and environmental experiences to psychobiological development at the molecular level. In both humans and non-human animals, life-time psychosocial and environmental stressors may accelerate biological aging through changes in telomerase activity and alteration of telomere length, as measured in peripheral samples (e.g., buccal swabs) and in the brain (Asok et al., 2014; Starkweather et al., 2014; Rentscher et al., 2020). Among African Americans, increases in experiences of racial discrimination are associated with more rapid shortening of telomere length, suggesting that the psychosocial stress associated with discrimination contributes to more rapid biological aging (Lee et al., 2017; Chae et al., 2020). Furthermore, even though many racial/ethnic mental health disparities identified in young and middle-aged adults do not dissipate in old age, research examining life course epidemiology (i.e., how experiences earlier in life scaffold later life health) often neglects racial diversity as a moderating factor (Ferraro et al., 2017) and subsequently disregards its impact on healthy cellular aging. Observed differences in cellular/molecular processes could be used to frame discussion surrounding the implications of neglecting diversity-related factors in research on accelerated biological aging and racial health disparities.

See Supplemental Materials for an example exercise on cellular reproduction, telomeres, and biomolecular diversity.

Eugenics

Eugenics expanded the scope of genetics beyond the nucleus and to the level of societies. Francis Galton, a historical figure and proponent of eugenics, described the term as, "the science which deals with all influences that improve the inborn qualities of a race; also with those that develop them to the utmost advantage" (Galton, 1904, p. 1). During the 20th century, the scope of eugenics extended beyond the so-called "scientific" foundations of Galton into a movement that endorsed practices of sterilization and even euthanization of individuals with undesirable characteristics under the aim of enhancing human heritability (Pernick, 1997). This movement's impact was especially strong in the United States, and later in Nazi Germany: over 400,000 individuals suffered eugenic sterilization across these two countries alone, and if we consider eugenics as a precursor to the Holocaust the toll in human lives surpasses six million (for a review, see Liscum and Garcia, 2022).

Covering the topic of eugenics provides an opportunity to examine how the extrapolation of basic scientific knowledge (genes and heritability) can lead to racial discrimination, mistreatment, and oppression of individuals of certain ethnic identities or religious affiliations. It can also be expanded further into the diversity-related topic of health and disability status, as per its connections with genetic screening and in-vitro fertilization. A foundational paper by Galton (1904) can be first examined for the purpose of defining and framing the misguided aims of the eugenics movement. Critical review of this manuscript might be followed by Glass and Stern (1986), a history on the scientific community's response to eugenic propaganda in the early 20th century, Billings et al. (1992), who describe the impacts of genetic discrimination, and Resnik (1997), who discusses genetic inequalities and identifies human genetic engineering as a form of eugenics.

The learning objectives associated with such a review might include a better understanding of the role of genes in cell biology (as it applies to cognitive/behavioral development), as well as the importance of challenging theories and the way science is applied outside of the laboratory. The fact that genetics' role in characterizing diversity across some dimensions (e.g., health and disability status) presents as less socially charged than the history of genetics in the sociocultural domain may also represent a point of discussion.

Eugenics can be connected more specifically with neuroscience through the genetic basis of brain development, an important area of evolutionary, comparative, and developmental psychobiology that explores the various genetic mechanisms that may contribute to neurological development (Gómez-Robles et al., 2015; Franchini, 2021). Changes in typical gene activity can result in various intellectual disorders like Down's syndrome, Fragile X syndrome, or Rett syndrome. Due to advancements in genetic screening technology, atypical psychobiological development associated with common genetic disabilities can be screened for during the preimplantation stage of invitro fertilization and/or prenatal periods of fetal development (Vermeesch et al., 2016; Sousa and Monteiro, 2022). These advancements have led to renewed discussion regarding the ethics of targeting and eliminating a population based on their genetic background or subsequent phenotypical characteristics (McCabe and McCabe, 2011; Thomas and Rothman, 2016). The culture and identity associated with intellectually disabled groups has a history of oppression and mistreatment from the government, scientific, and medical communities with eugenic efforts justified as a mechanism of advancing humanity's genetic fitness (Grenon and Merrick, 2014; Yakushko, 2019; Ilyes, 2020). Genetic sequencing and evaluation of the phenotypic variations observed within genetic disorders like Fragile X syndrome can inform our understanding of typical development as well as other disabilities that present high phenotypic variations such as autism spectrum disorder (ASD), with research efforts aimed at developing gene therapies (Hampson et al., 2019; Shitik et al., 2020; Weuring et al., 2021). However, better understanding the genetic foundations of brain disorders might also increase the frequency of encountering ethical dilemmas associated with screening: for example, over the last two decades, specific genes have been linked to cerebral palsy (Fahey et al., 2017), a congenital disorder first characterized in the late 19th century (Panteliadis et al., 2013). These continuing challenges can be identified to promote discussion of the implications of screening for disabilities on the suppression of disadvantaged communities and cultures, potentially perpetuating discriminatory perinatal practices and impeding advancements in neurotherapeutic technologies.

Dendritic Morphology, Health, and Aging

Student instruction on cellular morphology may include an overview of the basic components of multipolar neurons, including the soma, dendrites, and axon. As students begin to understand the properties of the neuron and to draw connections between structure and function, there are opportunities to explore how differences in dendritic morphology might correspond with differences in cellular activity and individual health outcomes, especially at the intersection of the diversity-related topics of age and health and disability status.

Psychopharmacology is an area of neuroscience that incorporates both clinical and molecular approaches to understanding and ultimately treating psychological disorders. There is evidence to suggest that anti-depressive medication contributes to adaptive changes in dendritic morphology as a neurohistochemical mechanism of the treatment (Andrade and Rao, 2010; Pillai et al., 2012; Åmellem et al., 2017). However, as patients age, these types of structural contributors to neuroplasticity show decline in their form and function (relative to younger subjects) in regions like the hippocampus, prefrontal cortex, and amygdala—regions implicated in depressive disorders (Leuba, 1983; Jacobs et al., 1997; Dickstein et al., 2013). Overall, dendritic spine density and size are reduced with aging which may lead to a general reduction in excitatory synaptic signaling in older neurons (Huang et al., 2020). Aging, however, may also result in cortical patterns of dendritic morphology similar to that observed in depression, such as dendritic regression in the hippocampus and prefrontal cortex but dendritic expansion in the amygdala (Dickstein et al., 2013; Sotoudeh et al., 2020; Gramuntell et al., 2021). Collectively, these studies highlight how aging, depression, and pharmacological treatment may be associated with changes in dendritic morphology.

This topic also lends itself well to introducing discussion regarding the effects of ageism in medical research and treatment. The molecular contributions to successful treatment of mood disorders are still poorly understood and most clinical drug trials exclude elderly/geriatric patients (Parikh, 2000; Zulman et al., 2011; Kuchel, 2019). Excluding older patients from clinical studies perpetuates a failure to account for age-related differences in neurological structure that may be important in determining a drug's clinical effectiveness and may contribute to the slower/lower effectiveness of many antidepressants in older populations (Reynolds et al., 1996; Grigoriadis et al., 2003; Calati et al., 2013).

See Table 1 for more example topics and source materials in the cellular/molecular content domain.

NEUROANATOMY/SYSTEMS NEUROSCIENCE EXAMPLES

Historical Foundations of Neuroanatomy and Racism

The history of studying neuroanatomy is characterized by using comparative studies to establish links between physiology and psychology. This has been marked with significant misinformation including racist, classist, and sexist interpretations of anatomical findings, thus connecting with the diversity-related topics of race, social class, and sex (as well as age).

J. W. Papez (most famous for his early characterization of the limbic circuits) attempted to correlate brain size and cortical gyrification with general intelligence, suggesting that

Content Topic	Diversity-Related Topics	Example Source Materials
Cellular reproduction, telomeres, and biomolecular diversity	Age, Race	Asok et al. (2014); Starkweather et al. (2014); Zhang et al. (2014); Geronimus et al. (2015); Lee et al. (2017); Liu et al. (2018); Chae et al. (2020); Rentscher et al. (2020); Vaiserman and Krasnienkov (2021)
Eugenics and genetic screening	Ethnicity, Health and disability status, National identity, Race, Religious affiliation, Sexual orientation	Galton (1904); Glass and Stern (1986); Billings et al. (1992); Pernick (1997); Resnik (1997); McCabe and McCabe (2011); Grenon and Merrick (2014); Thomas and Rothman (2016); Vermeesch et al. (2016); Yakushko (2019); Ilyes (2020); Liscum and Garcia (2022); Sousa and Monteiro (2022)
Dendritic morphology, health, and aging	Age, Health and disability status	Leuba (1983); Jacobs et al. (1997); Andrade and Rao (2010); Pillai et al. (2012); Dickstein et al. (2013); Åmellem et al. (2017); Huang et al. (2020); Sotoudeh et al. (2020); Gramuntell et al. (2021)
Geography and population genetics	Ethnicity, National identity	Lewontin (1972); Edwards (2003); Jorde and Wooding (2004); Serre and Pääbo (2004)
Myelination and multiple sclerosis	Health and disability status	Kutzelnigg et al. (2005); Lubetzki and Stankoff (2014)
Action potentials, stress, and aging	Age	Kerr et al. (1989); Kerr et al. (1992)
Epigenetics and early-life stress	Ethnicity, National identity, Race, Religious affiliation	Roth et al. (2009); Franklin et al. (2010); McRory et al. (2010); Labonté et al. (2012)

Table 1. Examples of diversity-related topic connections in cellular/molecular neuroscience. Diversity-related topics selected from: race, ethnicity, gender identity/expression, sexual orientation, age, religious affiliation, health and disability status, national identity, and social class (adapted from APA, 2013), as well as sex.

increased gyrification of specific subregions was positively associated with intelligence (Sabin, 2020). Papez's conclusions were published and provided "experimental" evidence to support claims of intellectual inferiority based on socioeconomic status, race, and ethnicity (as reported in Sabin, 2020). His reports lacked any causal relationships to support his claims, with subsequent reports suggesting that although positively correlated, local gyrification accounts for little intellectual variance (Gregory et al., 2016), and relative gyrification actually decreases with age (Gregory et al., 2016; Cao et al., 2017).

Gyrification can be both positively and negatively associated with several of Papez's social-cultural factors, depending on mediating factors like the stage of development when the brain is measured. In low socioeconomic groups, fetal gyrification is increased while juvenile gyrification is decreased (Jednoróg et al., 2012; Lu et al., 2021); however, growing up with high socioeconomic stress (i.e., urban vs. suburban) is not associated with levels of adult gyrification (Besteher et al., 2017). This comparison of historical and modern literature emphasizes how bigotry can influence scientific reporting and emphasizes the importance of proper hypothesis testing and ethical interpretation of data.

Neuroplasticity

The brain is shaped by experience (especially during development) and remains sensitive to the environment

throughout an animal's lifetime. A large body of research has examined plasticity and "remapping" of the cortex following monocular deprivation (visual cortex; Hubel et al., 1977), stimulation of the nucleus basalis (auditory cortex; Kilgard and Merzenich, 1998), and finger amputation (somatosensory cortex; Weiss et al., 2000). Cortical remapping is thought to be the mechanism of recovery following treatments that involve visual perception of non-existent limbs, such as mirror box therapy (Tsao et al., 2016). These studies highlight that the brain is shaped by experience, and our diversity of experiences must lead to cortical maps that are themselves diverse and specific to individuals. In this respect, neuroplasticity connects with diversity in the broadest sense in that it describes differences among people.

Neuroplasticity is also associated with the more specific diversity-related topics outlined in APA (2013). Neuroplasticity can connect with health and disability status when exploring remapping of the cortex in, for example, amputees (e.g., Elbert et al., 1994), the visually impaired (e.g., Ferreira et al., 2017), and the hearing impaired (e.g., Retter et al., 2019). It can also be used to highlight the importance of early-life experiences (e.g., Wiesel and Hubel, 1965) on the organization of the nervous system, as well as critical periods of development (e.g., Fox, 1992) connecting with the diversity-related topic of age. Neuroplasticity can also be used to explore some less-frequently addressed diversity-related topics in neuroscience, such as national identity and ethnicity, on the mapping of the cortex by looking at functional outcomes in bilinguals. For example, if early-life acoustic environments alter the primary auditory cortex of rats (Zhang et al., 2001), it raises the question of whether similar mechanisms underlie, for example, enhanced grammatical inferencing abilities in Spanish-English bilinguals with balanced proficiency (Cox et al., 2019) or enhanced perception of violin pitch contrast observed in bilingual infants (Liu and Kager, 2017).

See Supplemental Materials for an example exercise on divergent spatial acuity using the two-point discrimination.

The Stress Response

Stress is a foundational topic in neuroscience and has generated a substantial literature that includes the effects of glucocorticoids on memory (e.g., Roozendaal, 2002) and associations with personality/societal experience (Sapolsky, 1994), as well as the impacts of the stress response in the development of metabolic syndrome (Rosmond, 2005), hippocampal neuron structure and function (Joels and De Kloet, 1989; Fuchs and Flügge, 1998), and cellular structural changes associated with the expression of mental illness (McEwen, 2005). Stress presents opportunities for direct and broad engagement with diversity-related topics.

Stress has direct connections with the diversity-related topics of age and health. Aging is associated with changes in the glucocorticoid system. Excessive glucocorticoid release is a characteristic of the aging process and may be associated with degeneration of the stress response feedback system (for reviews, see Sapolsky, 1999; Nichols et al., 2001). Stress is also associated with health-related changes: instructors can emphasize connections between stress and mental health both in terms of its generative potential (i.e., exposure to high levels of stress can lead to the expression of mental illness, such as post-traumatic stress disorder) and also how elevated activation of the stress response characterizes mental illness (i.e., many types of mental illness are associated with prolonged activation of the stress response system). A topic in this area might include, for example, discussing the amygdala's role in triggering cortisol secretion while also examining abnormal amygdala activity in the context of anxiety (Nitschke et al., 2009; Klumpp and Fitzgerald, 2018) and depression (Siegle et al., 2002). In these examples, diversity-related topics can enhance students' understanding of the hormonal stress response (aging) and characterization of stress-associated psychopathologies (health and disability status).

Stress can also function as a foundation for broad engagement with a large range of diversity-related topics, including opportunities to engage with some of the rarer topics in neuroscience research such as race, culture, gender identity, sexual orientation, national identity, social class, and religious affiliation. With each of these topics, individuals with marginalized identities have historically undergone exposure to real (or perceived) threat, unpredictability, discrimination, inequity, and/or social isolation. Some examples of discussion topics include the effects of stress on aging-related cognitive decline in lesbian, gay, bisexual, and transgender (LGBT) older adults (Correro and Nielson, 2020), physical health in LGB individuals (Lick et al., 2013), cognitive impairment among racial minorities (Forrester et al., 2019; Stinchcombe and Hammond, 2021), and mental health in individuals with autism (Botha and Frost, 2020). Early-life adversity can lead to long-standing epigenetic changes in the BDNF gene, as well as others (for a review, see Roth and Sweatt, 2011). This establishes another downstream consequence of environmental stress applicable to chronically oppressed populations, and it may be worth discussing whether there is a genetic dimension to the cycle of poverty. In general, establishing a connection between the perception of environmental stressors and activation of the hypothalamic-pituitary-adrenal axis grants opportunities to explore the immediate biological changes and long-term physiological outcomes experienced by people who have been disproportionately subjected to stress throughout history.

See Table 2 for more example topics and source materials in the neuroanatomy/systems neuroscience content domain.

COGNITIVE/BEHAVIORAL NEUROSCIENCE EXAMPLES

Social Neuroscience

At the intersection between neuroscience and social psychology, researchers are interested in examining the biological mechanisms of topics such as theory of mind, empathy, and social decisions (for a review, see Singer, 2012). Findings in this field have expanded our

Content Topic	Diversity-Related Topics	Example Source Materials
Brain structure	Age, Health and disability status, Sex, Social Class	Pfefferbaum et al. (1994); Bishop and Wahlsten (1997); Salat et al. (2004); Raz and Rodrigue (2006); Leonard et al. (2008); Jednoróg et al. (2012); Luby et al. (2013); Brito and Noble (2014); Ruigrok et al. (2014); Noble et al. (2015); Gregory et al. (2016); Besteher et al. (2017); Cao et al. (2017); Farah (2017); Rezzani et al. (2019); Spreng and Turner (2019); Lu et al. (2021)
Neuroplasticity, development, and injury	Age, Ethnicity, Health and disability status, Race	Wiesel and Hubel (1965); Hubel et al. (1977); Fox (1992); Elbert et al. (1994); Flor et al. (1995); Weiss et al. (2000); Zhang et al. (2001); Arango-Lasprilla and Kreutzer (2010); Wittenberg (2010); Tsao et al. (2016); Ferreira et al. (2017); Retter et al. (2019); Makin and Flor (2020)
The stress response	Age, Gender identity/expression, Health and disability status, Race, Religious affiliation, Sex, Sexual orientation, Social class	Sapolsky (1999); Nichols et al. (2001); McEwen (2005); Rosmond (2005); Lick et al. (2013); Lehrner et al. (2014); McEwen (2017); Forrester et al. (2019); Correro and Nielson (2020); Flentje et al. (2020)

Table 2. Examples of diversity-related topic connections in neuroanatomy/systems neuroscience. Diversity-related topics selected from: race, ethnicity, gender identity/expression, sexual orientation, age, religious affiliation, health and disability status, national identity, and social class (adapted from APA, 2013), as well as sex.

understanding of social behaviors by highlighting some of the biological mechanisms that correspond with prejudices, biases, and how we view people who are different from us. Social neuroscience connects with the diversity-related topics of race, ethnicity, and age.

Exposure to other-race individuals impacts the organization of the brain and affects our perception of non-familiar people. Like other systems, social recognition systems can be altered with experience and change over the course of the lifespan. During infancy, facial recognition accuracy and activity in fusiform face area (FFA) is similar between own- and other-race faces, however by adulthood both recognition accuracy and FFA response is increased for own-race faces (Lei et al., 2020; Golarai et al., 2021). Childhood exposure to other races can eliminate cross-race effects (i.e., changes in recognition ability based on viewer-subject race) on facial recognition, but there is a sensitive period that closes during adolescence (about 12 years old; McKone et al., 2019) during which this exposure is beneficial.

There are significant social outcomes associated with the development of this system; theoretical explanations of the cross-race effect suggest that impoverished cognitive processing of other races stem from lack of significant social contact with those groups (Brigham et al., 2007; McKone et al., 2019), connecting with the topic of neuroplasticity. Understanding how early experiences influence the maturation of social recognition systems can inform discussions regarding the impact of previous interracial experiences on implicit racial/ethnic biases in adulthood.

Neuroscience and the Legal System

Jones (2013) highlights a newly emerging applied domain of neuroscience within the legal system, where an understanding of the brain both resolves old issues (e.g., using fMRI to facilitate diagnosis of criminals entering an insanity plea) and poses new ones (e.g., if a participant in a crime takes a drug that has been shown to impair memory). Understanding brain function has direct relevance in appraising legal topics, such as decision-making and memory, as well as the operations of the judicial system.

Decision-making can be altered under threatening conditions, and activity in emotion-associated brain regions and systems can influence decision-making (Bechara et al., 1999; Bechara and Damasio, 2005; Ohira et al., 2013). This has special relevance when considered in the context of appraising individuals, such as law enforcement officers or soldiers, who are forced to respond under uncertain conditions and when facing either real or perceived threats.

Memory is also an important topic area in the legal domain because of retention and retrieval processes that are invoked during questioning and examination of witnesses. Consolidation and reconsolidation require protein synthesis, and memories that have been recently retrieved may be especially vulnerable to disruption for several hours (Nader et al., 2000; Schafe and LeDoux,

2000). Additionally, stress has different effects on memory consolidation (enhancement) and retrieval (impairment; Roozendaal, 2002), which has direct implications for eyewitnesses who are subjected to stress immediately after witnessing a crime or prior to retrieval. Additionally, memory processes may interact with social cognition effects previously described; cross-race effects and racial biases further diminish reliability of eyewitness testimony and increase racial inequities in criminal justice (Brigham et al., 2007; Vitriol et al., 2019). This topic is thus connected with diversity-related topics such as race and ethnicity, and when considering broader applications of law (such as appraising the decision-making abilities of individuals under the influence of drugs or suffering from drug addiction) there are further connections with the diversity-related topic of health and disability status.

Course topics might explore how the cross-race effect and variations in lineup protocols (e.g., single vs. multiple retrieval/consolidation sessions) alter declarative eyewitness recognition memory using research involving subject lineups (e.g., Wells et al., 2015; Vitriol et al., 2019).

See Supplemental Materials for an example exercise on declarative memory and eyewitness testimony.

Neurotypicals, Neurominorities, and Neurodiversity

Neuroscience aims to both describe the normal function of the brain and characterize the nature of brain dysfunction giving rise to disorders such as Parkinson's, Alzheimer's, epilepsy, and schizophrenia. These disorders are often introduced as variations of normal activity: for example, the dopamine hypothesis of schizophrenia suggests that the illness is caused by overactivation of some dopamine receptors, suggesting that there is a level of dopamine activity that is effective for brain function and that level is exceeded in schizophrenics. While it may be common to explain divergences in this way, neuroscience instructors are presented with the unique opportunity to discuss and challenge the concept of "neurotypical" vs. "neurodivergent" brains.

Walker (2013) addressed the categorization of "normal" vs. "non-normal" brains, claiming that this characterization is scientifically unsound and socially destructive in much the same way that a contrast between "transgender" vs. "normal" might be perceived different than "transgender" vs. "cisgender". Challenging the pathology paradigm, Walker recommends the use of "neurotypical", "neurodiversity", and "neurominority" as part of a new vocabulary to avoid automatic judgments of abnormality that emerge in the common vernacular.

"Neurotypical" is a term with foundations in the literature on ASD that has been used to identify individuals who are "typically developing" (e.g., Sasson et al., 2017) or "nonclinical" (e.g., Di Martino et al., 2009), which is to say, individuals that have not been diagnosed with ASD. Walker (2013) identifies that this term refers to members of the "dominant neurological group" without calling those group members "normal" (which reinforces privilege associated with membership in that group). In this sense, using the term "neurotypical" can be similarly useful for offering comparisons between dominant and nondominant neurological groups without imparting the privilege inherent in the term "normal". For example, if discussion of an experiment was introduced as a comparison of neural activity in dyslexic patients vs. neurotypical individuals, this framing identifies the relevant comparison groups without further marginalizing those suffering from dyslexia.

The term "neurominority" can simply refer to people who are not neurotypical without pathologizing those individuals (Walker, 2013). Examples of neurominorities include individuals with dyslexia, ASD, developmental coordination disorder, neurological illness, and brain injury (Doyle, 2020), which demonstrates how this term can be applied across developmental and non-developmental dimensions. The term "neurominorities" has the benefit of being neutral and statistically grounded (Doyle, 2020), as well as non-pathologizing (Walker, 2013).

"Neurodiversity" could be interpreted in the most literal sense as differences in brains/nervous systems. Walker (2013) defines it as "the diversity among minds", which aligns with this definition while also emphasizing the cognitive functions of the nervous system. The range of conditions that have been used under the umbrella term of neurodiversity ranges from depression to Tourettes Syndrome (see Doyle, 2020), which demonstrates how the term has been applied broadly. Importantly, like the other terms discussed in this section, it is non-pathologizing and avoids the generation of prejudice that comes from identifying something as "flawed" (Krcek, 2013). in the context of the ASD literature, however, this term's meaning must be considered and is essential for its proper usage.

Neurodiversity as a term has its roots in the neurodiversity movement. This movement emphasizes acceptance of the differences among individuals' brains and an appreciation and respect for neurological diversity on the same level as other forms of diversity, such as sex, sexual orientation, and race (Ortega, 2009; Krcek, 2013). The term itself implicitly acknowledges how neurodiversity provides benefits to societies in the same sense that biodiversity provides benefits to ecosystems (Doyle, 2020). For these reasons, the term neurodiversity is beneficial when contextualizing differences in peoples' neurology or abilities but should not be used simply as a substitute for the word "neuropathology".

Where does neurodiversity fall among our more specific diversity-related topics? We propose that the closest alignment is with health and disability status specifically because the use of the term has been expanded beyond the ASD community to describe differences in mental health (Doyle, 2020). Using this term only to identify brain differences as sources of disability, however, would be incomplete and contrary to its origins. The very need for a term such as neurodiversity raises questions about the stigmatization of dysfunction within the nervous system (including discussion of whether "dysfunction" is an appropriate term in all cases, or when/where the term "disability" is appropriate vs. marginalizing). This subject thus invites opportunities for critical thinking about the utility of labels in biology, neuroscience, and psychology, especially when it comes to characterizing differences associated with health and disability status.

As highlighted in this section, some of the commonly used descriptors in our field, including “abnormal”, “normal”, “better”, and “worse” are worth revisiting for the sake of reducing the further marginalization of minority groups, and for the sake of accuracy. “Normal” carries privilege, and the outcome of the continued use of the term is the legitimization and reinforcement of that privilege. As a matter of accuracy, what may be “normal” in one specific situation, national context, or ethnic culture may not be “normal” in another. The same applies when using terms such as “better” or “worse” to describe elements of the nervous system, thoughts, or behaviors, which may vary a great deal across sociocultural environments without conferring universal benefits or harms. Increasing the use of the terms “typical” and “minority” and empirically accurate and non-privileged descriptors for performance and physiology such as “high” and “low”, will help scientists and educators to support student development towards understanding the necessity of diversity in the global neuroscientific enterprise.

See Table 3 for more example topics and source materials in the cognitive/behavioral neuroscience content domain.

EXPERIENCES WITH INCORPORATION OF DIVERSITY-RELATED TOPICS AND STUDENT FEEDBACK

The purpose of this manuscript has been to identify some choice examples of connections between neuroscience and the diversity-related topics identified in the APA (2013): race, ethnicity, gender identity/expression, sexual orientation, age, religious affiliation, health and disability status, national identity and immigration status, and social class, in addition to the diversity-related topic of sex. Enhancing the incorporation of diversity-related topics will be an ongoing process that will be unique for each instructor in accordance with their own instructional models, classroom environments, and institutional support. The following is a summary of experiences with/student feedback regarding the incorporation of diversity-related topics in neuroscience courses, offered with the hope that it may provide guidance for those engaged in course adaptations and development.

In terms of course planning, it has been beneficial to emphasize connections with diversity-related topics throughout the term, compared with planning coverage of diversity-related topics within a single day or week. This design philosophy is theoretically grounded in the recommendations of APA (2011), as well as Kite and Littleford (2015), who identify that diversity should be incorporated as a topic throughout the curriculum. The reasons for doing so, which include better understanding human behaviors and normalizing education about marginalized groups (Kite and Littleford, 2015), are also valid when considering content coverage in a single course (see Supplemental Materials for an example 12-week schedule for an introductory neuroscience course).

Major integrative assignments (e.g., end-of-the-semester term papers, group projects) that offer opportunities to explore neuroscience’s contributions towards understanding diversity have proven effective. The weight of these assignments can emphasize the significance of understanding diversity and diversity-related topics as a major aim in neuroscience and might further motivate students to be attentive towards those connections throughout the term. An example of an assignment that could accomplish this would be a term paper that allows students to identify and explain connections among various concepts throughout the course and some of the diversity-related topics identified in APA (2013).

There are clear benefits to offering opportunities for students to engage with diversity-related topics in a way that respects their individual interests and motivations. Students might be hesitant to publicly identify or contribute their perspectives on diversity-related topics for a variety of reasons, including personal privacy. Additionally, it is important to recognize how the changes in the educational landscape during the COVID-19 pandemic might influence students’ willingness to contribute publicly, especially in online courses and/or recorded classrooms because of the visibility and permanency of those contributions. Even as instructors work towards normalizing and building classroom environments that support effective conversations about diversity-related topics, it can be beneficial to offer student-focused opportunities for engagement in non-public venues. Perhaps this will make discussion in public settings more common; it is essential, however, to maintain respect for student privacy and growth throughout this process. It is our hope that greater incorporation of diversity-related topics as core content in the curriculum will continue to make space for these public and private contributions.

Student feedback to these implementations has been positive. One of the authors includes, in their introductory neuroscience course, an opportunity for students to watch a pre-recorded interview with a neuroscientist from a historically underrepresented demographic describing her experience in the field. This has received favorable responses from students, who have used this as an opportunity to reflect upon their own identities and experiences with diversity-related challenges. Student feedback can also be interpreted through their behaviors, such as voluntary assignment selections and the substance of their written submissions. When examining these responses broadly, it appears that students in the introductory neuroscience course less frequently selected assignments specifically framed as focusing on diversity-related topics (e.g., an essay on racial justice, which accounted for 21% of essay topic selections in a retroactive examination of the fall 2020, spring 2021, and fall 2021 semesters). Students still often touched on diversity-related topics in the context of the assignments they more frequently chose to complete (e.g., an essay on the COVID-19 pandemic, which accounted for 50% of essay topic selections across the same three semesters). This suggests that students have an interest in examining diversity-related topics in neuroscience courses, even when they are not identifying diversity as the specific focus of their All domains of psychology and neuroscience should contribute to student education on diversity. Across the

Content Topic	Diversity-Related Topics	Example Source Materials
Social neuroscience	Ethnicity, Race	Singer (2012); Tetlock et al. (2013); McCutcheon et al. (2018); Influs et al. (2019); McKone et al. (2019); Golarai et al. (2021)
Neuroscience and the legal system	Health and disability status	Jones (2013); Jones et al. (2013); Meynen (2013); Jones et al. (2014); Meixner (2015); Petoft (2015); Aono et al. (2019)
Neurotypicals, neurominorities, and neurodiversity	Gender identity/expression, Health and disability status, Sexual orientation	Ortega (2009); Krcek (2013); Walker (2013); Egner et al. (2019); Doyle (2020); Doyle and McDowall (2021); Walker and Raymaker (2021)
Physiology and health disparities	Ethnicity, Health and disability status, Race	Brosschot et al. (2006); Freedenthal (2007); Williams and Mohammed (2009); Jackson et al. (2010)
Socioeconomic status and developmental neuroscience	Social class	Noble et al. (2005); Farah et al. (2006); Noble et al. (2007); Raizada et al. (2008); Hackman and Farah (2009); Hackman et al. (2010); Lipina and Posner (2012)
Aging, memory, and cognition	Age	Cabeza et al. (1997); Cabeza et al. (2002); Cappell et al. (2010); Stemmer (2010); Metzler-Baddeley et al. (2011); Pascual-Leone et al. (2011); Tomasi and Volkow (2012); Mander et al. (2013); Gutchess (2014)
Sex and gender in cognitive neuroscience	Age, Ethnicity, Gender identity/expression, Health and disability status, Sex, Social class	Hausmann and Güntürkün (2000); Parsons et al. (2005); Hausmann et al. (2009); Miller and Cronin-Golomb (2010); Lei et al. (2012); Christov-Moore et al. (2014); Levine et al. (2016); Jäncke (2018)

Table 3. Examples of diversity-related topic connections in cognitive/behavioral neuroscience. Diversity-related topics selected from: race, ethnicity, gender identity/expression, sexual orientation, age, religious affiliation, health and disability status, national identity, and social class (adapted from APA, 2013), as well as sex.

three major content domains of neuroscience (cellular/molecular, neuroanatomy/systems, and cognitive/behavioral), there are many opportunities to provide course content that addresses the spectrum of diversity-related topics identified by the APA (2013). Distributing coverage of diversity-related topics in this manner both enhances the quality of neuroscience education and helps students recognize the depth of neuroscience's contributions to the understanding of human diversity.

REFERENCES

Åmellem I, Suresh S, Chang CC, Tok SSL, Tashiro A (2017) A critical period for antidepressant-induced acceleration of neuronal maturation in adult dentate gyrus. Transl Psychiatry 7(9):e1235. doi: 10.1038/tp.2017.208

American Psychological Association (2011) Principles for quality undergraduate education in psychology. Washington, DC: American Psychological Association. Available at: https://www.apa.org/education-career/undergrad/principles-undergrad.pdf.

American Psychological Association (2013) APA guidelines for the undergraduate psychology major: Version 2.0. Washington, DC: American Psychological Association. Available at: https://www.apa.org/ed/precollege/about/psymajor-guidelines.pdf.

American Psychological Association (2014) Strengthening the common core of the introductory psychology course. Washington, DC: American Psychological Association. Available at: https://www.apa.org/ed/governance/bea/intro-psych-report.pdf.

Andrade C, Rao NS (2010) How antidepressant drugs act: A primer on neuroplasticity as the eventual mediator of antidepressant efficacy. Indian J Psychiatry 52(4):378-386. doi: 10.4103/0019-5545.74318

Aono D, Yaffe G, Kober H (2019) Neuroscientific evidence in the courtroom: a review. Cogn Res Princ Implic 4(1). doi: 10.1186/s41235-019-0179-y

Arango-Lasprilla JC, Kreutzer JS (2010) Racial and ethnic disparities in functional, psychosocial, and neurobehavioral outcomes after brain injury. J Head Trauma Rehabil 25(2):128-136. doi: 10.1097/HTR.0b013e3181d36ca3

Asok A, Bernard K, Rosen JB, Dozier M, Roth TL (2014) Infant-caregiver experiences alter telomere length in the brain. PLoS One 9(7). doi: 10.1371/journal.pone.0101437

Bechara A, Damasio AR (2005) The somatic marker hypothesis: a neural theory of economic decision. Games Econ Behav 52(2):336-372. doi: 10.1016/j.geb.2004.06.010

Bechara A, Damasio H, Damasio AR, Lee GP (1999) Different contributions of the human amygdala and ventromedial prefrontal cortex to decision-making. J Neurosci 19(13):5473-5481. doi: 10.1523/JNEUROSCI.19-13-05473.1999

Besteher B, Gaser C, Spalthoff R, Nenadić I (2017) Associations between urban upbringing and cortical thickness and gyrification. J Psychiatr Res 95:114-120. doi: 10.1016/j.jpsychires.2017.08.012

Billings PR, Kohn MA, De Cuevas M, Beckwith J, Alper JS, Natowicz MR (1992) Discrimination as a consequence of genetic testing. Am J Hum Genet 50(3):476-482. Available at https://pubmed.ncbi.nlm.nih.gov/1539589/.

Bishop KM, Wahlsten D (1997) Sex differences in the human corpus callosum: myth or reality? Neurosci Biobehav Rev 21(5):581-601. doi: 10.1016/s0149-7634(96)00049-8

Botha M, Frost DM (2020) Extending the minority stress model to understand mental health problems experienced by the autistic population. Soc Ment Health 10(1):20-34. doi: 10.1177/2156869318804297

Brigham JC, Bennett LB, Meissner CA, Mitchell TL (2007) The influence of race on eyewitness memory. In: The handbook of eyewitness psychology, Vol. 2. Memory for people (Lindsay RCL, Ross DF, Read JD, Toglia MP, eds) pp 257–281. Mahwah, NJ: Lawrence Erlbaum Associates Publishers. Available at https://psycnet.apa.org/record/2007-04817-011.

Brito NH, Noble KG (2014) Socioeconomic status and structural brain development. Front Neurosci 8:276. doi: 10.3389/fnins.2014.00276

Brosschot JF, Gerin W, Thayer JF (2006) The perseverative cognition hypothesis: a review of worry, prolonged stress-related physiological activation, and health. J Psychosom Res 60(2):113-24. doi: 10.1016/j.jpsychores.2005.06.074

Cabeza R, Anderson ND, Locantore JK, McIntosh AR (2002) Aging gracefully: compensatory brain activity in high-performing older adults. Neuroimage 17(3):1394-1402. doi: 10.1006/nimg.2002.1280

Cabeza R, Grady CL, Nyberg L, McIntosh AR, Tulving E, Kapur S, Jennings JM, Houle S, Craik FIM (1997) Age-related differences in neural activity during memory encoding and retrieval: a positron emission tomography study. J Neurosci 17(1):391-400. doi: 10.1523/JNEUROSCI.17-01-00391.1997

Calati R, Salvina Signorelli M, Balestri M, Marsano A, De Ronchi D, Aguglia E, Serretti A (2013) Antidepressants in elderly: metaregression of double-blind, randomized clinical trials. J Affect Disord 147:1-8. doi: 10.1016/j.jad.2012.11.053

Cao B, Mwangi B, Passos IC, Wu M-J, Keser Z, Zunta-Soares GB, Xu D, Hasan KM, Soares JC (2017) Lifespan gyrification trajectories of human brain in healthy individuals and patients with major psychiatric disorders. Sci Rep 7(1). doi: 10.1038/s41598-017-00582-1

Cappell KA, Gmeindl L, Reuter-Lorenz PA (2010) Age differences in prefontal recruitment during verbal working memory maintenance depend on memory load. Cortex 46(4):462-473. doi: 10.1016/j.cortex.2009.11.009

Cell Editorial Team (2020) Science has a racism problem. Cell 181(7):1443-1444. doi: 10.1016/j.cell.2020.06.009

Chae DH, Wang Y, Martz CD, Slopen N, Yip T, Adler NE, Fuller-Rowell TE, Lin J, Matthews KA, Brody GH, Spears EC, Puterman E, Epel ES (2020) Racial discrimination and telomere shortening among African Americans: the Coronary Artery Risk Development in Young Adults (CARDIA) study. Health Psychol 39(3):209-219. doi: 10.1037/hea0000832

Christov-Moore L, Simpson EA, Coudé G, Grigaityte K, Iacoboni M, Ferrari PF (2014) Empathy: gender effects in brain and behavior. Neurosci Biobehav Rev 46:604-627. doi: 10.1016/j.neubiorev.2014.09.001

Correro AN, Nielson KA (2020) A review of minority stress as a risk factor for cognitive decline in lesbian, gay, bisexual, and transgender (LGBT) elders. J Gay Lesbian Ment Health 24(1):2-19. doi: 10.1080/19359705.2019.1644570

Cox JG, Lynch JM, Mendes N, Zhai C (2019) On bilingual aptitude for learning new languages: the roles of linguistic and nonlinguistic individual differences. Lang Learn 69(2):478-514. doi: 10.1111/lang.12341

Di Martino A, Shehzad Z, Kelly C, Roy AK, Gee DG, Uddin LQ, Gotimer K, Klein DF, Castellanos FX, Milham MP (2009) Relationship between cingulo-insular functional connectivity and autistic traits in neurotypical adults. Am J Psychiatry 166(8):891-899. doi: 10.1176/appi.ajp.2009.08121894

Dickstein DL, Weaver CM, Luebke JI, Hof PR (2013) Dendritic spine changes associated with normal aging. Neuroscience 251:21-32. doi10.1016/j.neuroscience.2012.09.077

Doyle N (2020) Neurodiversity at work: a biopsychosocial model and the impact on working adults. Br Med Bull 135:108-125. doi: 10.1093/bmb/ldaa021

Doyle N, McDowell A (2022) Diamond in the rough? An “empty review” of research into “neurodiversity” and a road map for developing the inclusion agenda. Equal Divers 41(3):352-382. doi: 10.1108/edi-06-2020-0172

Dworkin JD, Linn KA, Teich EG, Zurn P, Shinohara RT, Bassett DS (2020) The extent and drivers of gender imbalance in neuroscience reference lists. Nat Neurosci 23(8):918-926. doi: 10.1038/s41593-020-0658-y

Edwards AW (2003) Human genetic diversity: Lewontin's fallacy. Bioessays 25(8):798-801. doi: 10.1002/bies.10315

Egner JE (2019) “The disability rights community was never mine”: neuroqueer disidentification. Gend 33(1):123–147. doi: 10.1177/0891243218803284

Elbert T, Flor H, Birbaumer N, Knecht S, Hampson S, Larbig W, Taub E (1994) Extensive reorganization of the somatosensory cortex in adult humans after nervous system injury. Neuroreport 5(18):2593-2597. doi: 10.1097/00001756-199412000-00047

Erosheva EA, Grant S, Chen MC, Lindner MD, Nakamura RK, Lee CJ (2020) NIH peer review: criterion scores completely account for racial disparities in overall impact scores. Sci Adv 6(23). doi: 10.1126/sciadv.aaz4868

Fahey MC, Maclennan AH, Kretzschmar D, Gecz J, Kruer MC (2017) The genetic basis of cerebral palsy. Dev Med Child Neurol 59(5):462-469. doi: 10.1111/dmcn.13363

Farah MJ (2017) The neuroscience of socioeconomic status: correlates, causes, and consequences. Neuron 96(1):56-71. doi: 10.1016/j.neuron.2017.08.034

Farah MJ, Shera DM, Savage JH, Betancourt L, Giannetta JM, Brodsky NL, Malmud EK, Hurt H (2006) Childhood poverty: specific associations with neurocognitive development. Brain Res 1110(1):166-174. doi: 10.1016/j.brainres.2006.06.072

Ferraro KF, Kemp BR, Williams MM (2017) Diverse aging and health inequality by race and ethnicity. Innov Aging 1(1):1-11. doi: 10.1093/geroni/igx002

Ferreira S, Pereira AC, Quendera B, Reis A, Silva ED, Castelo-Branco M (2017) Primary visual cortical remapping in patients with inherited peripheral retinal degeneration. Neuroimage Clin 13:428-438. doi: 10.1016/j.nicl.2016.12.013

Flentje A, Heck NC, Brennan JM, Meyer IH (2020) The relationship between minority stress and biological outcomes: a systematic review. J Behav Med 43:673-694. doi: 10.1007/s10865-019-00120-6

Flor H, Elbert T, Knecht S, Wienbruch C, Pantev C, Birbaumer N, Larbig W, Taub E (1995) Phantom-limb pain as a perceptual correlate of cortical reorganization following arm amputation. Nature 375(6531):482-484. doi: 10.1038/375482a0

Forrester SN, Gallo JJ, Whitfield KE, Thorpe Jr RJ (2019) A framework of minority stress: from physiological manifestations to cognitive outcomes. Gerontologist 59(6):1017-1023. doi: 10.1093/geront/gny104

Fox K (1992) A critical period for experience-dependent synaptic plasticity in rat barrel cortex. J Neurosci 12(5):1826-1838. doi: 10.1523/JNEUROSCI.12-05-01826.1992

Franchini LF (2021) Genetic mechanisms underlying cortical evolution in mammals. Front Cell Dev Biol 9:591017. doi: 10.3389/fcell.2021.591017

Franklin TB, Russig H, Weiss IC, Gräff J, Linder N, Michalon A, Vizi S, Mansuy IM (2010) Epigenetic transmission of the impact of early stress across generations. Biol Psychiatry 68(5):408-415. doi: 10.1016/j.biopsych.2010.05.036

Freedenthal S (2007) Racial disparities in mental health service use by adolescents who thought about or attempted suicide. Suicide Life Threat Behav 37(1):22-34. doi: 10.1521/suli.2007.37.1.22

Fuchs E, Flügge G (1998) Stress, glucocorticoids and structural plasticity of the hippocampus. Neurosci Biobehav Rev 23(2):295-300. doi: 10.1016/s0149-7634(98)00031-1

Galton F (1904) Eugenics: its definition, scope, and aims. American Journal of Sociology 10(1):1-25. Available at https://www.journals.uchicago.edu/doi/pdf/10.1086/211280.

Geronimus AT, Pearson JA, Linnenbringer E, Schulz AJ, Reyes AG, Epel ES, Lin J, Blackburn EH (2015) Race-ethnicity, poverty, urban stressors, and telomere length in a Detroit community-based sample. J Health Soc Behav 56(2):199-224. doi: 10.1177/0022146515582100

Ginther DK, Schaffer WT, Schnell J, Masimore B, Liu F, Haak LL, Kington R (2011) Race, ethnicity, and NIH research awards. Science 333(6045):1015-1019. doi: 10.1126/science.1196783

Glass B, Stern C (1986) Geneticists embattled: their stand against rampant eugenics and racism in America during the 1920s and 1930s. Proc Am Philos Soc 130(1):130-154. Available at https://www.jstor.org/stable/987094.

Golarai G, Ghahremani DG, Greenwood AC, Gabrieli JD, Eberhardt JL (2021) The development of race effects in face processing from childhood through adulthood: neural and behavioral evidence. Dev Sci 24(3). doi: 10.1111/desc.13058

Gómez-Robles A, Hopkins WD, Schapiro SJ, Sherwood CC (2015) Relaxed genetic control of cortical organization in human brains compared with chimpanzees. Proc Natl Acad Sci USA 112(48):14799-14804. doi: 10.1073/pnas.1512646112

Gramuntell Y, Klimczak P, Coviello S, Perez-Rando M, Nacher J (2021) Effects of aging on the structure and expression of NMDA receptors of somatostatin expressing neurons in the mouse hippocampus. Front Aging Neurosci 13:782737. doi: 10.3389/fnagi.2021.782737

Gregory MD, Kippenhan JS, Dickinson D, Carrasco J, Mattay VS, Weinberger DR, Berman KF (2016) Regional variations in brain gyrification are associated with general cognitive ability in humans. Curr Biol 26(10):1301-1305. doi: 10.1016/j.cub.2016.03.021

Grenon I, Merrick J (2014) Intellectual and developmental disabilities: eugenics. Front Public Health 2:201. doi: 10.3389/fpubh.2014.00201

Grigoriadis S, Kennedy SH, Bagby RM (2003) A comparison of antidepressant response in younger and older women. J Clin Psychopharmacol 23(4):405-407. doi: 10.1097/01.jcp.0000085415.08426.c6

Gutchess A (2014) Plasticity of the aging brain: new directions in cognitive neuroscience. Science 346(6209):579-582. doi: 10.1126/science.1254604

Hackman DA, Farah MJ (2009) Socioeconomic status and the developing brain. Trends Cogn Sci 13(2):65-73. doi: 10.1016/j.tics.2008.11.003

Hackman DA, Farah MJ, Meaney MJ (2010) Socioeconomic status and the brain: mechanistic insights from human and animal research. Nat Rev Neurosci 11(9):651-659. doi: 10.1038/nrn2897

Hampson DR, Hooper AWM, Niibori Y (2019) The application of adeno-associated viral vector gene therapy to the treatment of Fragile X syndrome. Brain Sci 9(2):32. doi: 10.3390/brainsci9020032

Hausmann M, Güntürkün O (2000) Steroid fluctuations modify functional cerebral asymmetries: the hypothesis of progesterone-mediated interhemispheric decoupling. Neuropsychologia 38(10):1362-1374. doi: 10.1016/s0028-3932(00)00045-2

Hausmann M, Schoofs D, Rosenthal HE, Jordan K (2009) Interactive effects of sex hormones and gender stereotypes on cognitive sex differences—A psychobiosocial approach. Psychoneuroendocrinology 34(3):389-401. doi: 10.1016/j.psyneuen.2008.09.019

Hoppe TA, Litovitz A, Willis KA, Meseroll RA, Perkins MJ, Hutchins BI, Davis AF, Lauer MS, Valantine HA, Anderson JM, Santangelo GM (2019) Topic choice contributes to the lower rate of NIH awards to African-American/black scientists. Sci Adv 5(10). doi: 10.1126/sciadv.aaw7238

Huang L, Zhou H, Chen K, Chen X, Yang G (2020) Learning-dependent dendritic spine plasticity is reduced in the aged mouse cortex. Front Neural Circuits 14:581435. doi: 10.3389/fncir.2020.581435

Hubel DH, Wiesel TN, LeVay S, Barlow HB, Gaze RM (1977) Plasticity of ocular dominance columns in monkey striate cortex. Philos Trans R Soc Lond B Biol Sci 278(961):377-409. doi: 10.1098/rstb.1977.0050

Ilyes E (2020) Psychology's eugenic history and the invention of intellectual disability. Soc Personal Psychol Compass 14(7):e12537. doi: 10.1111/spc3.12537

Influs M, Pratt M, Masalha S, Zagoory-Sharon O, Feldman R (2019) A social neuroscience approach to conflict resolution: dialogue intervention to Israeli and Palestinian youth impact oxytocin and empathy. Soc Neurosci 14(4):378-389. doi: 10.1080/17470919.2018.1479983

Jackson JS, Knight KM, Rafferty JA (2010) Race and unhealthy behaviors: chronic stress, the HPA axis, and physical and mental health disparities over the life course. Am J Public Health

100(5):933-939. DOI: 10.2105/AJPH.2008.143446
Jacobs B, Driscoll L, Schall M (1997) Life-span dendritic and spine changes in areas 10 and 18 of human cortex: a quantitative Golgi study. J Comp Neurol 386(4):661-680. doi:10.1002/(SICI)1096-9861(19971006)386:4<661::AID-CNE11>3.0.CO;2-N
Jäncke L (2018) Sex/gender differences in cognition, neurophysiology, and neuroanatomy. F1000Res 7:805. doi: 10.12688/f1000research.13917.1
Jednoróg K, Altarelli I, Monzalvo K, Fluss J, Dubois J, Billard C, Dehaene-Lambertz G, Ramus F (2012) The influence of socioeconomic status on children's brain structure. PLoS One 7(8). doi: 10.1371/journal.pone.0042486
Joels M, De Kloet ER (1989) Effects of glucocorticoids and norepinephrine on the excitability in the hippocampus. Science 245(4925):1502-1505. doi: 10.1126/science.2781292
Jones OD (2013) Seven ways neuroscience aids law. In: Neurosciences and the human person: new perspectives on human activities (Battro A, Dehaene S, Singer W eds), pp 181-194. Vatican City, Europe: Pontifical Academy of Sciences. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2280500.
Jones OD, Bonnie RJ, Casey BJ, Davis A, Faigman DL, Hoffman M, Montague R, Morse SJ, Raichle ME, Richeson JA, Scott E, Steinberg L, Taylor-Thompson K, Wagner A, Yaffe G (2014) Law and neuroscience: recommendations submitted to the President's Bioethics Commission. J Law Biosci 1(2):224-236. doi: 10.1093/jlb/lsu012
Jones OD, Marois R, Farah MJ, Greely HT (2013) Law and neuroscience. J Neurosci 33(45):17624-17630. doi: 10.1523/JNEUROSCI.3254-13.2013
Jones-London M (2020) NINDS strategies for enhancing the diversity of neuroscience researchers. Neuron 107(2):212-214. doi: 10.1016/j.neuron.2020.06.033
Jorde LB, Wooding SP (2004) Genetic variation, classification and 'race'. Nat Genet 36(11):S2833. doi: 10.1038/ng1435
Kerchner M, Hardwick JC, Thornton JE (2012) Identifying and using 'core competencies' to help design and assess undergraduate neuroscience curricula. J Undergrad Neurosci Educ 11(1):A27-A37. Available at https://pubmed.ncbi.nlm.nih.gov/23494749/.
Kerr DS, Campbell LW, Hao SY, Landfield PW (1989) Corticosteroid modulation of hippocampal potentials: increased effect with aging. Science 245(4925):1505-1509. doi: 10.1126/science.2781293
Kerr DS, Campbell LW, Thibault O, Landfield PW (1992) Hippocampal glucocorticoid receptor activation enhances voltage-dependent Ca2+ conductances: relevance to brain aging. Proc Natl Acad Sci U S A 89(18):8527-8531. doi: 10.1073/pnas.89.18.8527
Kilgard MP, Merzenich MM (1998) Cortical map reorganization enabled by nucleus basalis activity. Science 279(5357):1714-1718. doi: 10.1126/science.279.5357.1714
Kite ME, Littleford LN (2015) Teaching about diversity across the undergraduate psychology curriculum. In: The Oxford handbook of undergraduate psychology education (Dunn DS, ed) pp 129–141. New York, NY: Oxford University Press.
Klumpp H, Fitzgerald JM (2018) Neuroimaging predictors and mechanisms of treatment response in social anxiety disorder: an overview of the amygdala. Curr Psychiatry Rep 20(10):89. doi: 10.1007/s11920-018-0948-1
Krcek TE (2013) Deconstructing disability and neurodiversity: controversial issues for autism and implications for social work. J Progress Hum Serv 24(1):4-22. doi: 10.1080/10428232.2013.740406
Kuchel GA (2019). Inclusion of older adults in research: ensuring relevance, feasibility, and rigor. J Am Geriatr Soc 67(2):203-204. doi: 10.1111/jgs.15802
Kutzelnigg A, Lucchinetti CF, Stadelmann C, Brück W, Rauschka H, Bergmann M, Schmidbauer M, Parisi JE, Lassmann H (2005) Cortical demyelination and diffuse white matter injury in multiple sclerosis. Brain 128(11):2705-2712. doi: 10.1093/brain/awh641
Labonté B, Suderman M, Maussion G, Navaro L, Yerko V, Mahar I, Bureau A, Mechawar N, Szyf M, Meaney MJ, Turecki G (2012) Genome-wide epigenetic regulation by early-life trauma. Arch Gen Psychiatry 69(7):722-731. doi: 10.1001/archgenpsychiatry.2011.2287
Lauer M (2020) Institute and center award rates and funding disparities. National Institutes of Health, August 12. Available at https://nexus.od.nih.gov/all/2020/08/12/institute-and-center-award-rates-and-funding-disparities/.
Lee DB, Kim ES, Neblett Jr EW (2017) The link between discrimination and telomere length in African American adults. Health Psychol 36(5):458-467. doi: 10.1037/hea0000450
Lehrner A, Bierer LM, Passarelli V, Pratchett LC, Flory JD, Bader HN, Harris IR, Bedi A, Daskalakis NP, Makotkine I, Yehuda R (2014) Maternal PTSD associates with greater glucocorticoid sensitivity in offspring of Holocaust survivors. Psychoneuroendocrinology 40:213-220. doi: 10.1016/j.psyneuen.2013.11.019
Lei RF, Leshin RA, Rhodes M (2020) The development of intersectional social prototypes. Psychol Sci 31(8):911-926. doi: 10.1177/0956797620920360
Lei X, Hu Y, McArdle JJ, Smith JP, Zhao Y (2012) Gender differences in cognition among older adults in China. J Hum Resour 47(4):951-971. doi: 10.3368/jhr.47.4.951
Leonard CM, Towler S, Welcome S, Halderman LK, Otto R, Eckert MA, Chiarello C (2008) Size matters: cerebral volume influences sex differences in neuroanatomy. Cereb Cortex 18(12):2920-2931. doi: 10.1093/cercor/bhn052
Leuba G (1983) Aging of dendrites in the cerebral cortex of the mouse. Neuropathol Appl Neurobiol 9(6):467-75. doi: 10.1111/j.1365-2990.1983.tb00130.x
Levine SC, Foley A, Lourenco S, Ehrlich S, Ratliff K (2016) Sex differences in spatial cognition: advancing the conversation. Wiley Interdiscip Rev Cogn Sci 7(2):127-155. doi: 10.1002/wcs.1380
Lewontin RC (1972) The apportionment of human diversity. In: Evolutionary biology, Vol. 6 (Dobzhansky T, Hecht MK, Steere WC, eds) pp 381-398. New York, NY: Springer. doi: 10.1002/ajpa.22899
Lick DJ, Durso LE, Johnson KL (2013) Minority stress and physical health among sexual minorities. Perspect Psychol Sci 8(5):521-548. doi: 10.1177/1745691613497965
Linden ML, Kruskop J, Kitlen E (2020) Highlighting diversity in neuroscience through course content. J Undergrad Neurosci Educ 19(1):A113-A117. Available at https://pubmed.ncbi.nlm.nih.gov/33880098/.
Linden ML, Wright M (2017) Diversity and inclusion - Put it in the syllabus! Tomorrow's Professor. Stanford, CA: Stanford University Center for Teaching and Learning. Available at https://web.archive.org/web/20220106081222/https://tomprof.stanford.edu/posting/1625.
Lipina SJ, Posner MI (2012) The impact of poverty on the development of brain networks. Front Hum Neurosci 6. doi: 10.3389/fnhum.2012.00238
Liscum M, Garcia ML (2022) You can't keep a bad idea down: dark history, death, and potential rebirth of eugenics. Anat Rec (Hoboken) 305(4):902-937. doi: 10.1002/ar.24849
Liu L, Kager R (2017) Enhanced music sensitivity in 9-month-old bilingual infants. Cogn Process 18(1):55-65. doi: 10.1007/s10339-016-0780-7
Liu MY, Nemes A, Zhou QG (2018) The emerging roles for

telomerase in the central nervous system. Front Mol Neurosci 11:160. doi: 10.3389/fnmol.2018.00160

Lu YC, Kapse K, Andersen N, Quistorff J, Lopez C, Fry A, Cheng J, Andescavage N, Wu Y, Espinosa K, Vezina G, du Plessis A, Limperopoulos C (2021) Association between socioeconomic status and in utero fetal brain development. JAMA Netw Open 4(3):e213526. DOIdoi10.1001/jamanetworkopen.2021.3526

Lubetzki C, Stankoff B (2014) Demyelination in multiple sclerosis. In: Handbook of clinical neurology, Vol. 122 (Goodin DS, ed) pp 89-99. Amsterdam, Netherlands: Elsevier. doi: 10.1016/B978-0-444-52001-2.00004-2

Luby J, Belden A, Botteron K, Marrus N, Harms MP, Babb C, Nishino T, Barch D (2013) The effects of poverty on childhood brain development: the mediating effect of caregiving and stressful life events. JAMA Pediatr 167(12):1135-1142. doi: 10.1001/jamapediatrics.2013.3139

Makin TR, Flor H (2020) Brain (re) organisation following amputation: implications for phantom limb pain. Neuroimage 218. doi: 10.1016/j.neuroimage.2020.116943

Mander BA, Rao V, Lu B, Saletin JM, Lindquist JR, Ancoli-Israel S, Jagust W, Walker MP (2013) Prefrontal atrophy, disrupted NREM slow waves and impaired hippocampal-dependent memory in aging. Nat Neurosci 16(3):357-364. doi: 10.1038/nn.3324

McCabe LL, McCabe ER (2011) Down syndrome: coercion and eugenics. Genet Med 13(8):708-710. doi: 10.1097/GIM.0b013e318216db64

McCutcheon R, Bloomfield MAP, Dahoun T, Quinlan M, Terbeck S, Mehta M, Howes O (2018) Amygdala reactivity in ethnic minorities and its relationship to the social environment: an fMRI study. Psychol Med 48(12):1985-1992. doi: 10.1017/S0033291717003506

McEwen BS (2005) Glucocorticoids, depression, and mood disorders: structural remodeling in the brain. Metabolism 54(5):20-23. doi: 10.1016/j.metabol.2005.01.008

McEwen BS (2017) Neurobiological and systemic effects of chronic stress. Chronic Stress (Thousand Oaks) 1:1-11. doi: 10.1177/2470547017692328

McKone E, Wan L, Pidcock M, Crookes K, Reynolds K, Dawel A, Kidd E, Fiorentini C (2019) A critical period for faces: other-race face recognition is improved by childhood but not adult social contact. Sci Rep 9(1):12820. doi: 10.1038/s41598-019-49202-0

McRory E, De Brito SA, Viding E (2010) Research review: the neurobiology and genetics of maltreatment and adversity. J Child Psychol Psychiatry 51(10):1079-1095. doi: 10.1111/j.1469-7610.2010.02271.x

Meixner JB (2015) Applications of neuroscience in criminal law: legal and methodological issues. Curr Neurol Neurosci Rep 15(2). doi: 10.1007/s11910-014-0513-1

Metzler-Baddeley C, Jones DK, Belaroussi B, Aggleton JP, O'Sullivan MJ (2011) Frontotemporal connections in episodic memory and aging: a diffusion MRI tractography study. J Neurosci 31(37):13236-13245. doi: 10.1523/JNEUROSCI.2317-11.2011

Meynen G (2013) A neurolaw perspective on psychiatric assessments of criminal responsibility: decision-making, mental disorder, and the brain. Int J Law Psychiatry 36(2):93-99. doi: 10.1016/j.ijlp.2013.01.001

Miller IN, Cronin-Golomb A (2010) Gender differences in Parkinson's disease: clinical characteristics and cognition. Mov Disord 25(16):2695-2703. doi: 10.1002/mds.23388

Nader K, Schafe GE, Le Doux JE (2000) Fear memories require protein synthesis in the amygdala for reconsolidation after retrieval. Nature 406(6797):722-726. doi: 10.1038/35021052

Neuwirth LS, Quadros-Mennella PS, Kang YY, Linden ML, Nahmani M, Abrams M, Leussis MP, Illig KR (2021) Revisiting diversity, equity, and inclusion commitments and instituting lasting actionable changes in the Faculty for Undergraduate Neuroscience. J Undergrad Neurosci Educ 19(2):E1-E3. Available at https://pubmed.ncbi.nlm.nih.gov/35540951/.

Nichols NR, Zieba M, Bye N (2001) Do glucocorticoids contribute to brain aging?. Brain Res Brain Res Rev 37:273-286. doi: 10.1016/s0165-0173(01)00131-x

Nitschke JB, Sarinopoulos I, Oathes DJ, Johnstone T, Whalen PJ, Davidson RJ, Kalin NH (2009) Anticipatory activation in the amygdala and anterior cingulate in generalized anxiety disorder and prediction of treatment response. Am J Psychiatry 166(3):302-310. doi: 10.1176/appi.ajp.2008.07101682

Noble KG et al. (2015) Family income, parental education and brain structure in children and adolescents. Nat Neurosci 18(5):773-778. doi: 10.1038/nn.3983

Noble KG, McCandliss BD, Farah MJ (2007) Socioeconomic gradients predict individual differences in neurocognitive abilities. Dev Sci 10(4):464-480. doi: 10.1111/j.1467-7687.2007.00600.x

Noble KG, Norman MF, Farah MJ (2005) Neurocognitive correlates of socioeconomic status in kindergarten children. Dev Sci 8(1):74-87. doi: 10.1111/j.1467-7687.2005.00394.x

Ohira H, Matsunaga M, Murakami H, Osumi T, Fukuyama S, Shinoda J, Yamada J (2013) Neural mechanisms mediating association of sympathetic activity and exploration in decision-making. Neuroscience 246:362-374. doi: 10.1016/j.neuroscience.2013.04.050

Ortega F (2009) The cerebral subject and the challenge of neurodiversity. BioSocieties, 4(4):425-445. doi:10.1017/S1745855209990287

Panteliadis C, Panteliadis P, Vassilyadi F (2013) Hallmarks in the history of cerebral palsy: from antiquity to mid-20th century. Brain Dev 35(4):285-292. doi: 10.1016/j.braindev.2012.05.003

Parikh C (2000) Antidepressants in the elderly: challenges for study design and their interpretation. Br J Clin Pharmacol 49(6):539-547. doi: 10.1046/j.1365-2125.2000.00201.x

Parsons TD, Rizzo AR, Zaag CVD, McGee JS, Buckwalter JG (2005) Gender differences and cognition among older adults. Neuropsychol Dev Cogn B Aging Neuropsychol Cogn 12(1):78-88. doi: 10.3368/jhr.47.4.951

Pascual-Leone A, Freitas C, Oberman L, Horvath JC, Halko M, Eldaief M, Bashir S, Vernet M, Shafi M, Westover B, Vahabzadeh-Hagh AM, Rotenberg A (2011) Characterizing brain cortical plasticity and network dynamics across the age-span in health and disease with TMS-EEG and TMS-fMRI. Brain Topogr 24:302-315. doi: 10.1007/s10548-011-0196-8

Penner MR, Sathy V, Hogan KA (2021) Inclusion in neuroscience through high impact courses. Neurosci Lett 750:135740. doi: 10.1016/j.neulet.2021.135740

Pernick MS (1997) Eugenics and public health in American history. Am J Public Health 87(11):1767-1772. doi: 10.2105/ajph.87.11.1767

Petoft A (2015) Neurolaw: a brief introduction. Iran J Neurol 14(1):53-58. Available at https://pubmed.ncbi.nlm.nih.gov/25874060/.

Pfefferbaum A, Mathalon DH, Sullivan EV, Rawles JM, Zipursky RB, Lim KO (1994) A quantitative magnetic resonance imaging study of changes in brain morphology from infancy to late adulthood. Arch Neurol 51(9):874-887. doi: 10.1001/archneur.1994.00540210046012

Pillai AG, Anilkumar S, Chattarji S (2012) The same antidepressant elicits contrasting patterns of synaptic changes in the amygdala vs hippocampus. Neuropsychopharmacology 37(12):2702-2711. doi: 10.1038/npp.2012.135

Raizada RD, Richards TL, Meltzoff A, Kuhl PK (2008) Socioeconomic status predicts hemispheric specialisation of the left inferior frontal gyrus in young children. Neuroimage

40(3):1392-1401. doi: 10.1016/j.neuroimage.2008.01.021
Raz N, Rodrigue KM (2006) Differential aging of the brain: patterns, cognitive correlates and modifiers. Neurosci Biobehav Rev 30(6):730-748. doi: 10.1016/j.neubiorev.2006.07.001
Rentscher KE, Carroll JE, Mitchell C (2020) Psychosocial stressors and telomere length: a current review of the science. Annu Rev Public Health 41:223-245. doi: 10.1146/annurev-publhealth-040119-094239
Resnik DB (1997) Genetic engineering and social justice: a Rawlsian approach. Soc Theory Pract 23(3):427-448. doi: 10.5840/soctheorpract199723316
Retter TL, Webster MA, Jiang F (2019) Directional visual motion is represented in the auditory and association cortices of early deaf individuals. J Cogn Neurosci 31(8):1126-1140. doi: 10.1162/jocn_a_01378
Reynolds CF 3rd, Frank E, Kupfer DJ, Thase ME, Perel JM, Mazumdar S, Houck PR (1996) Treatment outcome in recurrent major depression: a post hoc comparison of elderly ("young old") and midlife patients. Am J Psychiatry 153(10):1288-1292. doi: 10.1176/ajp.153.10.1288
Rezzani R, Franco C, Rodella LF (2019) Sex differences of brain and their implications for personalized therapy. Pharmacol Res 141:429-442. doi: 10.1016/j.phrs.2019.01.030
Roozendaal B (2002) Stress and memory: opposing effects of glucocorticoids on memory consolidation and memory retrieval. Neurobiol Learn Mem 78(3):578-595. doi: 10.1006/nlme.2002.4080
Rosmond R (2005) Role of stress in the pathogenesis of the metabolic syndrome. Psychoneuroendocrinology 30:1-10. doi: 10.1016/j.psyneuen.2004.05.007
Roth JR, Gavin CF (2021) Race and the Ivory Tower: an antiracism exercise for an undergraduate neuroscience classroom. J Undergrad Neurosci Educ 19(2):A40-A48. Available at https://pubmed.ncbi.nlm.nih.gov/35540943/.
Roth TL, Lubin FD, Funk AJ, Sweatt JD (2009) Lasting epigenetic influence of early-life adversity on the BDNF gene. Biol Psychiatry 65(9):760-769. doi: 10.1016/j.biopsych.2008.11.028
Roth TL, Sweatt JD (2011) Epigenetic marking of the BDNF gene by early-life adverse experiences. Horm Behav 59(3):315-320. doi: 10.1016/j.yhbeh.2010.05.005
Ruigrok AN, Salimi-Khorshidi G, Lai MC, Baron-Cohen S, Lombardo MV, Tait RJ, Suckling J (2014) A meta-analysis of sex differences in human brain structure. Neurosci Biobehav Rev 39:34-50. doi: 10.1016/j.neubiorev.2013.12.004
Sabin TD (2020) James Wenceslas Papez's journey into eugenics. Ir J Med Sci (1971 -) 189(2):633-638. doi: 10.1007/s11845-019-02093-6
Salat DH, Buckner RL, Snyder AZ, Greve DN, Desikan RS, Busa E, Morris JC, Dale AM, Fischl B (2004) Thinning of the cerebral cortex in aging. Cereb Cortex 14(7):721-730. doi: 10.1093/cercor/bhh032
Sapolsky R (1994) Individual differences and the stress response. Seminars in Neuroscience 6:261-269. doi: 10.1006/smns.1994.1033
Sapolsky RM (1999) Glucocorticoids, stress, and their adverse neurological effects: relevance to aging. Exp Gerontol 34(6):721-732. doi: 10.1016/s0531-5565(99)00047-9
Sasson NJ, Faso DJ, Nugent J, Lovell S, Kennedy DP, Grossman RB (2017) Neurotypical peers are less willing to interact with those with autism based on thin slice judgments. Sci Rep 7:40700. doi: 10.1038/srep40700
Schafe GE, LeDoux JE (2000) Memory consolidation of auditory Pavlovian fear conditioning requires protein synthesis and protein kinase A in the amygdala. J Neurosci 20(18). doi: 10.1523/JNEUROSCI.20-18-j0003.2000
Serre D, Pääbo S (2004) Evidence for gradients of human genetic diversity within and among continents. Genome Res 14(9):1679-1685. doi: 10.1101/gr.2529604
Shitik EM, Velmiskina AA, Dolskiy AA, Yudkin DV (2020) Reactivation of FMR1 gene expression is a promising strategy for fragile X syndrome therapy. Gene Ther 27(6):247-253. doi: 10.1038/s41434-020-0141-0
Siegle GJ, Steinhauer SR, Thase ME, Stenger VA, Carter CS (2002) Can't shake that feeling: event-related fMRI assessment of sustained amygdala activity in response to emotional information in depressed individuals. Biol Psychiatry 51(9):693-707. doi: 10.1016/s0006-3223(02)01314-8
Singer T (2012) The past, present and future of social neuroscience: a European perspective. Neuroimage 61(2):437-449. doi: 10.1016/j.neuroimage.2012.01.109
Society for Neuroscience (2020) SfN statement on diversity, inclusion, and equity. Society for Neuroscience, June 2, Available at https://www.sfn.org/publications/latest-news/2020/06/02/sfn-statement-on-diversity,-inclusion,-and-equity.
Sotoudeh N, Namavar MR, Zarifkar A, Heidarzadegan AR (2020) Age-dependent changes in the medial prefrontal cortex and medial amygdala structure, and elevated plus-maze performance in the healthy male Wistar rats. IBRO Rep 9:183-194. doi: 10.1016/j.ibror.2020.08.002
Sousa LN, Monteiro PB (2022) Non-invasive preimplantation genetic testing: a literature review. JBRA Assist Reprod. Available at https://pubmed.ncbi.nlm.nih.gov/35238503/.
Spreng RN, Turner GR (2019) Structure and function of the aging brain. In: The aging brain: functional adaptation across adulthood (Samanez-Larkin GR, ed) pp 9-43. Washington, DC: American Psychological Association. doi: 10.1037/0000143-002
Starkweather AR, Alhaeeri AA, Montpetit A, Brumelle J, Filler K, Montpetit M, Jackson-Cook CK (2014) An integrative review of factors associated with telomere length and implications for biobehavioral research. Nurs Res 63(1):36-50. doi: 10.1097/NNR.0000000000000009
Stemmer B (2010) A cognitive neuroscience perspective on learning and memory in aging. Z interkult Ger 15(1):7-25. Available at https://www.semanticscholar.org/paper/A-cognitive-neuroscience-perspective-on-learning-in-Stemmer/f89cd7877e94d409956db2d6bbd0aba34e71a099.
Stinchcombe A, Hammond NG (2021) Correlates of memory and executive function in middle-aged and older adults in the CLSA: a minority stress approach. J Gerontol B Psychol Sci Soc Sci. doi: 10.1093/geronb/gbab084
Stoloff M, McCarthy M, Keller L, Varfolomeeva V, Lynch J, Makara K, Simmons S, Smiley W (2010) The undergraduate psychology major: an examination of structure and sequence. Teach Psychol 37(1):4-15. doi: 10.1080/00986280903426274
Tetlock PE, Mitchell G, Anastasopoulos LJ (2013) Detecting and punishing unconscious bias. J Legal Stud (42):83-110. doi:10.1086/668403
Thomas GM, Rothman BK (2016) Keeping the backdoor to eugenics ajar?: disability and the future of prenatal screening. AMA J Ethics 18(4):406-415. doi: 10.1001/journalofethics.2016.18.4.stas1-1604
Tomasi D, Volkow ND (2012) Aging and functional brain networks. Mol Psychiatry 17(5):549-558. doi: 10.1016/j.neuroimage.2017.01.077
Tsao JW, Finn SB, Miller ME (2016) Reversal of phantom pain and hand-to-face remapping after brachial plexus avulsion. Ann Clin Transl Neurol 3(6):463-464. doi: 10.1002/acn3.316
Vaiserman A, Krasnienkov D (2021) Telomere length as a marker of biological age: state-of-the-art, open issues, and future perspectives. Front Genet 11. doi: 10.3389/fgene.2020.630186
Vermeesch JR, Voet T, Devriendt K (2016) Prenatal and pre-implantation genetic diagnosis. Nat Rev Genet 17(10):643-656. doi: 10.1038/nrg.2016.97

Vitriol JA, Appleby J, Borgida E (2019) Racial bias increases false identification of Black suspects in simultaneous lineups. Soc Psychol Personal Sci 10(6):722-734. doi: 10.1177/1948550618784889

Walker N (2022) Throw away the master's tools: liberating ourselves from the pathology paradigm. Neuroqueer: The writings of Dr. Nick Walker. Available at https://neuroqueer.com/throw-away-the-masters-tools/.

Walker N, Raymaker DM (2021) Toward a neuroqueer future: an interview with Nick Walker. Autism Adulthood 3(1):5-10. doi: 10.1089/aut.2020.29014.njw

Weiss T, Miltner WH, Huonker R, Friedel R, Schmidt I, Taub E (2000) Rapid functional plasticity of the somatosensory cortex after finger amputation. Exp Brain Res 134(2):199-203. doi: 10.1007/s002210000456

Wells GL, Steblay NK, Dysart JE (2015) Double-blind photo lineups using actual eyewitnesses: an experimental test of a sequential versus simultaneous lineup procedure. Law Hum Behav 39(1):1–14. doi: 10.1037/lhb0000096

Weuring W, Geerligs J, Koeleman BPC (2021) Gene therapies for monogenic autism spectrum disorders. Genes (Basel) 12(11):1667. doi: 10.3390/genes12111667

Wiesel TN, Hubel DH (1965) Comparison of the effects of unilateral and bilateral eye closure on cortical unit responses in kittens. J Neurophysiol 28(6):1029-1040. doi: 10.1152/jn.1965.28.6.1029

Williams DR, Mohammed SA (2009) Discrimination and racial disparities in health: evidence and needed research. J Behav Med 32(1):20-47. doi: 10.1007/s10865-008-9185-0

Wittenberg GF (2010) Experience, cortical remapping, and recovery in brain disease. Neurobiol Dis 37(2):252-258. doi: 10.1016/j.nbd.2009.09.007

Yakushko O (2019) Eugenics and its evolution in the history of western psychology: a critical archival review. Psychother Politics Int 17(2):e1495. doi: 10.1002/ppi.1495

Zhang L, Hu X-Z, Li X, Li H, Smerin S, Russell D, Ursano RJ (2014) Telomere length – A cellular aging marker for depression and Post-traumatic Stress Disorder. Med Hypotheses 83(2):182-185. doi: 10.1016/j.mehy.2014.04.033

Zhang LI, Bao S, Merzenich MM (2001) Persistent and specific influences of early acoustic environments on primary auditory cortex. Nat Neurosci 4(11):1123-1130. doi: 10.1038/nn745

Zulman DM, Sussman JB, Chen X, Cigolle CT, Blaum CS, Hayward RA (2011) Examining the evidence: a systematic review of the inclusion and analysis of older adults in randomized controlled trials. J Gen Intern Med 26(7):783-790. doi: 10.1007/s11606-010-1629-x

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