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A Call for Greater Attention to Culture in the Study of Brain and Development

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Abstract
Despite growing research on neurobiological development, little attention has been paid to cultural and ethnic variation in neurodevelopmental processes. We present an overview of the current state of developmental cognitive neuroscience with respect to its attention to cultural issues. Analyses based on 80 publications represented in five recent meta-analyses related to adolescent developmental neuroscience show that 99% of the publications used samples in Western countries. Only 22% of studies provided a detailed description of participants' racial/ethnic background, and only 18% provided for socioeconomic status. Results reveal a trend in developmental cognitive neuroscience research: The body of research is derived not only mostly from Western samples but also from participants whose race/ethnicity is unknown. To achieve a holistic perspective on brain development in different cultural contexts, we propose and highlight an emerging interdisciplinary approach—developmental cultural neuroscience—the intersection of developmental psychology, cultural psychology, and cognitive neuroscience. Developmental cultural neuroscience aims to elucidate cultural similarities and differences in neural processing across the life span. We call attention to the importance of incorporating culture into the empirical investigation of neurodevelopment.

Keywords
adolescence, brain development, culture, neuroscience

The advent of MRI has provided unprecedented opportunities for the study of human brain structure and function in vivo. Since the very first MRI scans of the developing human brain in the 1990s (Casey et al., 1995; Giedd et al., 1996, 1999; Reiss, Abrams, Singer, Ross, & Denckla, 1996), we have made tremendous progress in understanding the neural processes supporting youths' development (for reviews, see Blakemore & Mills, 2014; Crone & Dahl, 2012; Dahl, Allen, Wilbrecht, & Suleiman, 2018; Decety & Meyer, 2008; Goldsmith, Pollak, & Davidson, 2008; Lee et al., 2014; Somerville & Casey, 2010; Steinberg, 2008). In parallel, decades of research from developmental psychology, anthropology, and sociology underscore how youths' developmental trajectories are shaped, in large part, by sociocultural contexts (e.g., X. Chen, 2018; Greenfield & Suzuki, 1998; Mead, 1928; Rogoff, 2003; Schlegel & Barry, 1991). Yet culture is largely absent in the field of developmental cognitive neuroscience, resulting in a biased understanding of what constitutes normative developmental trajectories. We call attention to the importance of incorporating culture into the empirical investigation of neurodevelopment.

Culture in Development

Culture is a system of values, beliefs, and practices that constitute one's environment, which is shared by a certain group (geographical, social) and transmitted across generations via repetitive engagement (Causadias, Telzer, & Gonzales, 2017; Kitayama & Salvador, 2017; Kitayama, Varnum, & Salvador, 2018; Markus & Kitayama, 2010). Therefore, culture provides a framework in which individual cognitions and behaviors are understood, realized, and made meaningful. In the psychological sciences, culture is frequently conceptualized and operationalized at different levels, such as nationality, race/

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ethnicity, socioeconomic status (SES), and beliefs (e.g., collectivist values; e.g., Markus & Kitayama, 1991; Stephens, Markus, & Phillips, 2014; Triandis, 1995). Culture plays a powerful role in child development, shaping developmental trajectories in academic, cognitive, social, and emotional functioning via social contexts in which development occurs, such as parent–child relationships, teacher–child interactions, and peer relations (e.g., X. Chen, 2018; Greenfield & Suzuki, 1998; Mead, 1928; Qu, Pomerantz, & Deng, 2016; Rogoff, 2003; Schlegel & Barry, 1991; Stevenson & Lee, 1990).

Indeed, scholars argue that the single most important determinant for the development of a neurologically healthy newborn is the cultural context in which the child lives because every aspect of development is influenced by culture (Weisner, 2002, 2013). Culture determines economic security, access to resources for providing nutrition, norms and practices regarding nursing, sleeping arrangements, infant-directed speech, and daily routines (Weisner, 2002). For example, youths in low-SES families encounter more obstacles for school achievement, cognitive development, and physical and mental health resources (e.g., Bradley & Corwyn, 2002; Brooks-Gunn & Duncan, 1997; McLoyd, 1998; Sirin, 2005). Transitional periods in development, for example, from childhood to adolescence, may also vary across cultures. For instance, the so-called storm and stress of adolescence, which includes heightened parent–child conflict, mood disruptions, and risk-taking behavior, is less evident in non-Western cultures than Western cultures (Arnett, 1999; Mead, 1928; Schlegel & Barry, 1991). Together, past research on culture and development consistently underscores that child development is shaped, in large part, by cultural contexts.

The Importance of Integrating Culture Into the Study of Brain and Development

Despite a long history of incorporating culture into the study of youths' behavioral and psychological development and more recent cultural neuroscience research incorporating culture into the study of brain function, little is known about the role of culture in youths' brain development. Recent advances in cultural neuroscience demonstrate important differences in neural function and structure among adults across cultures (see Chiao, 2009; Han & Ma, 2015; Han et al., 2013). For instance, cultural differences emerge in social domains such as theory of mind (Frank & Temple, 2009), social comparison (Kang, Lee, Choi, & Kim, 2013), and social-reward sensitivity (Varnum, Shi, Chen, Qiu, & Han, 2014), as well as self-construal (Han & Humphreys, 2016), emotion generation and regulation (Chiao, 2015, Qu & Telzer, 2017; Tsai & Qu, 2018), face perception (Freeman, Rule, & Ambady, 2009), and working memory (for reviews, see Chiao & Ambady, 2007; Han & Ma, 2014; Han & Northoff, 2008; Han et al., 2013; H. S. Kim & Sasaki, 2014; Kitayama & Uskul, 2011). Although such evidence suggests the possibility that cultural experience can lead to changes in the function and structure of the human brain, most of this research has been done in adults, leaving open the question of when and how the brain becomes tuned to process the world differently on the basis of cultural experiences.

Thus, it is essential to incorporate development in cultural neuroscience research (Chiao, 2018). A comprehensive understanding of how culture shapes the brain requires research from a developmental perspective. It remains unclear *when* cultural differences in neurobiological processes emerge across development, *why* culture plays a role in the developing brain, and *how* culture is wired into the brain via socialization processes conveying cultural values and beliefs. Instead of treating cultural influence as static, adding a developmental angle can address these issues and capture the dynamic manner in which the developing brain is shaped by culture over time. Understanding developmental processes helps researchers move from simply documenting cultural differences to unpacking how culture exerts its influence (e.g., Bond, 2002; Bukowski & Sippola, 1998; Heine & Norenzayan, 2006). Moreover, empirical investigations of how cultural inputs affect the developing brain will provide new insights into the brain's plasticity and malleability from childhood to adulthood. Therefore, it is important to integrate culture, brain, and development to achieve a holistic and integrative perspective on how diverse cultural environments influence child development and to broaden our understanding of cultural transmission and neural plasticity. This article seeks to give a more comprehensive review of related literature and propose a framework to help inspire and organize future research in this area.

The Current Representation of Culture in the Study of the Developing Brain

Although culture has a long history of consideration in psychology, it has been largely overlooked in research using cognitive neuroscience tools to study the developing brain. In particular, culture is absent in terms of (a) including diverse and representative samples of youth, (b) comparing cultural groups to better understand differences and similarities in neural processes at the group level, and (c) examining individual-level cultural systems and values. It is important to note that the oversight of culture in the field of psychology in general has been widely identified and acknowledged by scholars (e.g., Arnett, 2008; Henrich, Heine, &

Norenzayan, 2010). To understand the current representation of culture in developmental cognitive neuroscience research, we conducted a review of recent influential publications (see Table S1 in the Supplemental Material available online) to examine the presence of diverse samples, including regional diversity, ethnic/racial diversity, and socioeconomic diversity. We identified these studies from recent meta-analyses on topics related to adolescent developmental neuroscience, including reward processing (Silverman, Jedd, & Luciana, 2015), decision-making in social contexts (van Hoorn, Shablack, Lindquist, & Telzer, 2019), social exclusion (Vijayakumar, Cheng, & Pfeifer, 2017), risky decision-making (Defoe, Dubas, Figner, & van Aken, 2015), and a review article on real-world risk taking (Sherman, Steinberg, & Chein, 2018). Although not comprehensive of all developmental cognitive neuroscience research, these studies provide a snapshot of recent influential publications in the field.

From these meta-analyses, we identified 80 studies, which included a total of 3,704 adolescent participants. We examined the participant demographics for each study in terms of regional location, racial/ethnic background, and SES (i.e., parental education, income, employment status, occupational prestige). Regional location was coded as Western (i.e., Western Europe or the United States) or non-Western (i.e., Asia, South America), and U.S. or non-U.S. Reports of race/ethnicity and SES were categorized as being detailed (i.e., provided full description, including specific numbers for each race and at least one measure of SES), incomplete (e.g., "majority of participants were White" or "participants were from middle- to upper-middle-class families"), or not reported.

Table 1 presents percentages based on the total number of studies ($N = 80$). Most studies used samples from Western countries (99%), particularly from the United States (65%). Only 22% of studies provided a detailed description of participants' racial/ethnic background, and only 18% provided such a description for SES. Of the detailed reports of SES, two studies reported parental education and income, two reported parental income only, two reported parental education only, one reported parental income and employment status, and seven used a composite measure of social class that assesses parental marital status, employment status, education, and occupational prestige. The diversity of SES measures precludes our ability to synthesize the representation of SES across studies. For the studies that reported detailed information on race/ethnicity, we examined the representation of each racial/ethnic group. Figure 1 presents the percentages for participants' racial/ethnic groups across all 80 studies ($N = 3{,}704$). No racial/ethnic information was reported for 2,933 (79.2%) participants. Of

Table 1. Summary of Reported Demographics in Reviewed Studies

Reported demographic	Number of studies (% of studies)
Geographic location	
Western samples	79 (99%)
U.S. samples	52 (65%)
Race/ethnicity	
Detailed report	18 (22%)
Incomplete report	4 (5%)
No report	58 (73%)
Socioeconomic status	
Detailed report	14 (18%)
Incomplete report	5 (6%)
No report	61 (76%)

Note: Percentages are based on 80 studies.

the 771 participants with detailed racial/ethnic information, 458 (59.4%) were White/European American, 55 (7.1%) were Black/African American, 122 (15.8%) were Latinx/Hispanic, 59 (7.7%) were Asian/Asian American, and 77 (10%) were mixed race or "other." Of the 2,933 participants for whom no information was reported, 932 (31.8%) came from U.S. samples and 2,001 (68.2%) came from Western European samples (i.e., the Netherlands, United Kingdom, Spain, Germany, and Finland). More than half of the studies (51%) also reported sample demographic information relating to intelligence (see Table S1 in the Supplemental Material).

Results from this review reveal a trend in developmental cognitive neuroscience research: Not only is this body of research mostly derived from Western samples, but also the race/ethnicity and SES of the majority of participants is unknown. Although individual differences

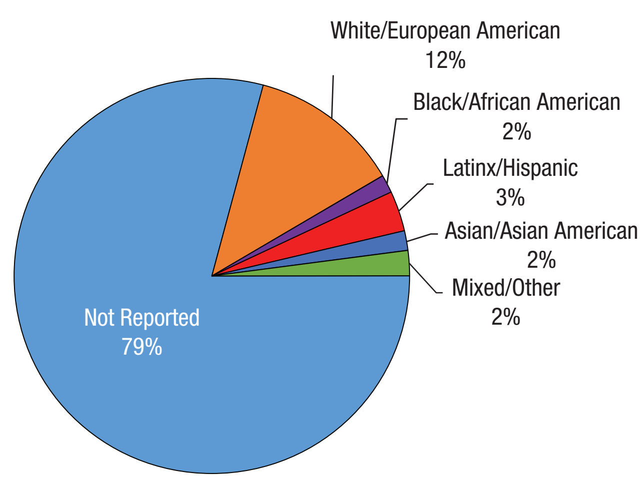

Fig. 1. Racial/ethnic background of research participants, including those not reported. Percentages are based on a total of 3,704 participants.

in some important individualized demographic information, including participants' intelligence, tend to be reported more frequently, demographic information that might indicate cultural variation is more rare, making it difficult to draw conclusions about cultural similarities and differences in adolescent brain development. Although understanding sample characteristics with regard to intelligence is important for measuring normative developmental processes, this focus may have led to an underestimation/underappreciation of the effects of social-cultural factors. It is understandable that many neuroimaging studies cannot directly compare cultural groups because of small sample sizes and lack of statistical power. However, this review raises the importance of collecting and reporting culture-related information.

The oversight of culture in developmental cognitive neuroscience research makes bare two shortcomings. First, at the group level of culture, it remains an open question whether the patterns of neurodevelopment found in these studies are representative of normative developmental processes. It is clear that the sample composition (e.g., ethnicity, age, sex, parental education, and income) can greatly influence developmental trajectories of brain development (LeWinn, Sheridan, Keyes, Hamilton, & McLaughlin, 2017). For example, although the age at peak total cortical surface area is 12.1 years without taking into account sample demographics, such age peaks shift to 9.7 years (i.e., 2.4 years earlier) when weighting the sample with the approximate distribution of SES, race/ethnicity, and sex in the U.S. Census. Meanwhile, the developmental patterns for cortical surface area and subcortical volume change from U-shaped to S-shaped when applying a sample weighting method that makes the sample more representative. Thus, our fundamental understanding of normative brain development is biased by the sampling methods used, and the current review suggests that much of the literature aimed at understanding the adolescent brain is largely based on Western samples of unknown racial/ethnic makeup.

Second, there is little to no understanding of the processes by which culture at the individual level (i.e., beliefs, values) influences and is influenced by the brain across development. Past research on adults suggests that individual-level cultural beliefs may modulate neural function and structure (e.g., Kitayama et al., 2017; Ray et al., 2010; Wang, Peng, Chechlacz, Humphreys, & Sui, 2017). Because subjective cultural beliefs may serve as an important source for individual differences in neural and psychological adjustment, more research is needed to incorporate culture into the understanding of individual differences in youths' brain development. To gain an understanding of these issues and establish the foundation for interventions that foster healthy brain and psychological development across cultures, research must address the role of culture in brain development. To this end, we propose the conceptual approach of developmental cultural neuroscience.

Developmental Cultural Neuroscience: A Blending of Three Fields

To fully understand brain development in sociocultural contexts, we propose developmental cultural neuroscience, an emerging interdisciplinary approach that combines developmental psychology, cultural psychology, and cognitive neuroscience (Fig. 2). Developmental cultural neuroscience aims to examine cultural similarities and differences in brain, psychological, and behavioral development across the life span. Past research has made tremendous progress by investigating the intersection of two of these fields, including developmental cognitive neuroscience (intersection of developmental psychology and cognitive neuroscience), developmental cultural psychology (intersection of developmental psychology and cultural psychology), and cultural neuroscience (intersection of cultural psychology and cognitive neuroscience). However, the intersection of all three of these fields is largely unexplored. Drawing on valuable approaches and insights from these three fields, developmental cultural neuroscience provides a framework that can address a variety of issues related to culture, development, and the brain that have not been examined previously.

To better understand the complex relationships between culture, brain, and development, we propose an overarching framework of developmental cultural neuroscience (Fig. 3). Particularly important to this framework is the idea that culture shapes youths' neurodevelopment via social practices and that these culturally shaped brain processes underlie differences in youths' adjustment. In addition, this framework considers the reciprocal links between culture, social practices, neurodevelopment, and youths' outcomes, elucidating how cultural and neurobiological factors interact in the process of development. Given the state of current research, this theoretical framework is only an exploratory speculation. It is still an open question to test how culture plays a role in core developmental and neurobiological processes.

Culture, social practices, and neurodevelopment

Decades of neuroscience research have demonstrated neuroplasticity and brain malleability—the ability of the brain to change across the life span. The developmental cultural neuroscience framework highlights the role of culture in this process because cultural values and

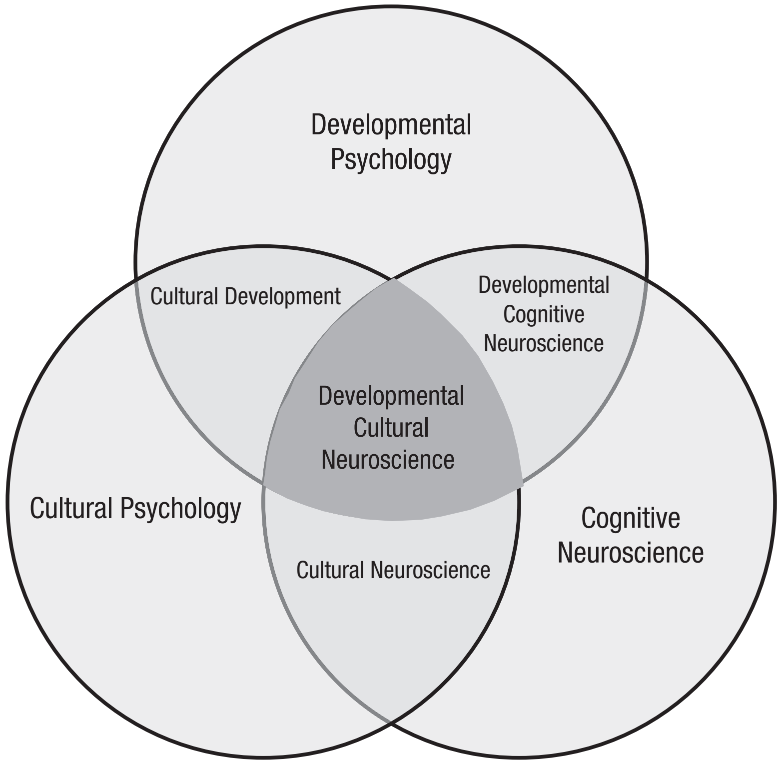

Fig. 2. Developmental cultural neuroscience as an emerging interdisciplinary approach that combines methods from developmental psychology, cultural psychology, and cognitive neuroscience.

beliefs are embedded in a rich array of social practices, such as parent-child interactions, peer communication, and school activities (Kitayama & Uskul, 2011). For example, one key dimension of collectivistic beliefs shared in East Asian and Latin American families is family obligation, which entails children's and adolescents' belief in the importance of supporting their family, assisting their parents, and making sacrifices for the sake of family (e.g., Chao & Tseng, 2002; Ho, 1996; Qu & Pomerantz, 2015; Suárez-Orozco & Suárez-Orozco, 1995). This cultural belief guides many East Asian and Latin American youths' social practices in the family. Indeed, Latin American adolescents spend almost twice as much time helping their family each day compared with their European American counterparts, suggesting that family assistance is a meaningful daily routine for these adolescents in fulfilling family obligation (Telzer & Fuligni, 2009).

Culture plays a key role in shaping youths' neurodevelopment via social practices. For example, Latin American adolescents—who endorse fulfilling family obligation more because of the cultural emphasis in their social environments—show more neural activation in the mesolimbic reward system when making decisions to contribute to their family that involve self-sacrifice compared with European American adolescents, who show more mesolimbic reward activation when gaining for themselves and not their family (Telzer, Masten, Berkman, Lieberman, & Fuligni, 2010). Thus, cultural differences in family-obligation values and daily practices may contribute to divergent neural patterns in Latin American and European American adolescents. Indeed, adolescents with stronger family-obligation values and who gain more happiness on a daily basis from helping their family show greater mesolimbic activation when making decisions to contribute to their family (Telzer, Fuligni, & Gálvan, 2016; Telzer et al., 2010). A developmental cultural neuroscience approach provides initial evidence about how culturally rooted beliefs shape social practices, which in turn shape youths' neural processes.

Culturally shaped brain processes and youths' adjustment

Youths' neurodevelopment (e.g., neural function and structure), which is shaped by culturally rooted practices, plays a further role in their behavioral and psychological adjustment. Such processes are important because the

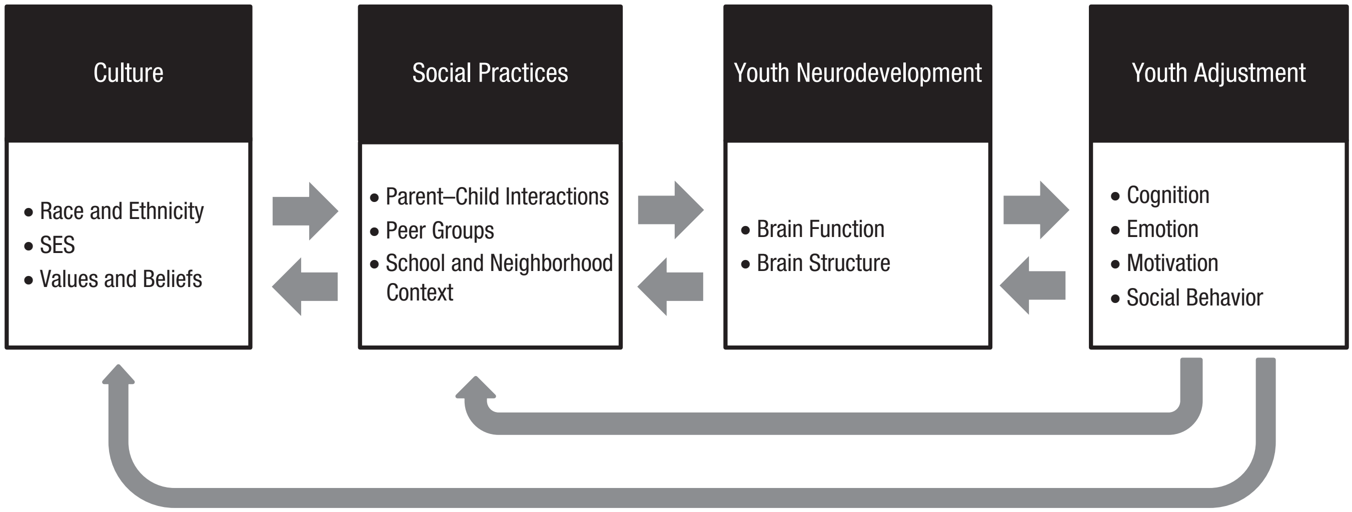

Fig. 3. A developmental cultural neuroscience framework.

purpose of studying youths' brain development in cross-cultural settings is not only to document how brain development varies in different cultures but also to examine how the neural underpinnings serve as a mechanism that subsequently contributes to differences in youths' adjustment. Without understanding brain-behavior associations, the mean differences in neural activation between cultural groups is less meaningful. Therefore, it is critical to link culturally shaped neural activity with youths' real-life functioning, such as learning, school engagement, risk-taking behavior, and emotional well-being.

Guided by this framework, prior research investigated how culturally shaped neural processes among Latin American adolescents plays a role in their adjustment. For example, Latin American adolescents who report greater family-obligation values show decreased activation in reward-related regions during risk taking and increased activation in cognitive-control-related regions during behavioral inhibition (Telzer et al., 2013a). Notably, the decreased reward activation is related to less real-life risk-taking behavior, and increased cognitive-control activation is related to better decision-making skills. Moreover, longitudinal research suggests that Latin American adolescents' mesolimbic reward activation when contributing to their family predicts longitudinal changes in their risk-taking behavior (Telzer et al., 2013b). Taken together, these findings suggest that family obligation—one key aspect of collectivistic values—guides adolescents to put the needs of their family before their own, influencing activation in neural regions involved in reward sensitivity and cognitive control, and such culturally shaped neural processes may help adolescents make optimal decisions and avoid engagement in risk taking in their everyday lives.

Such endeavors in identifying cultural differences in youths' neural processes and real-life adjustment will not only help us understand why cultural differences in youths' adjustment occur but also provide insights into how to narrow the gap across cultures and promote optimal development. For example, there is much evidence that compared with their East Asian counterparts, American children and adolescents tend to show poorer performance in a variety of academic subjects, especially math and science (e.g., Programme for International Student Assessment, 2012; Stevenson, Chen, & Lee, 1993; Trends in International Mathematics and Science Study, 2011). Such differences in achievement are due, in part, to East Asian individuals' cultural emphasis on motivation and persistence in the face of difficult tasks compared with their Western counterparts (Heine et al., 2001). A recent neuroimaging study compared the neural processes of American and Chinese late adolescents during cognitive persistence. The greater persistence in Chinese (vs. American) youths was paralleled by increasing activation and functional coupling between the inferior frontal gyrus and ventral striatum across the task among Chinese but not American youths (Telzer, Qu, & Lin, 2017). These findings suggest that affective and cognitive systems may serve as key mechanisms underlying differences in cognitive persistence across cultures and, ultimately, contributing to cultural differences in youths' learning and academic achievement.

Reciprocal relations between culture, brain development, and adjustment

The developmental cultural neuroscience framework also highlights the reciprocal relations between culture, the brain, and adjustment. This is in line with the idea that culture and individual's adjustment are mutually constituted (Markus & Kitayama, 2010), as well as empirical evidence that youths are not only shaped by but also shape their social environment (for reviews, see Belsky, 1984; Sanson & Rothbart, 1995). The essence of this reciprocal perspective is that culture, the brain, and youths' adjustment are not static but dynamically changing over time (Choudhury, 2010). Examining the reciprocal relations will therefore provide insights into how change in culture may shape the brain and how the brain may shape the maintenance and transmission of culture across development and across generations. For example, cultural change can occur at either the individual or societal level. As youths move into a new culture, there is a shift in cultural values and beliefs in the process of acculturation (Berry, 1997; Berry, Phinney, Sam, & Vedder, 2006; Sam & Berry, 2010). This provides an empirical opportunity to study how youths' brain development is attuned to the new cultural values and beliefs over time and how brain development may predict changes in their adjustment (P.-H. A. Chen, Heatherton, & Freeman, 2015). Moreover, cultural change may also occur at the societal level. For example, the cultural meaning of shyness has been changing over the past three decades in China: Whereas shyness was related to better social and emotional adjustment in the early 1990s, it became a risk factor for such adjustment in the late 2000s (X. Chen et al., 2005). Youths' brain development is sensitive to the sociocultural environment (e.g., Blakemore & Mills, 2014) and may serve as a key mechanism underlying the change in the association between cultural values and youths' adjustment.

Current Advances in Developmental Cultural Neuroscience

Guided by the framework of developmental cultural neuroscience, research has begun to synthesize previously disconnected fields and take a first step toward a comprehensive understanding of brain development in cultural contexts. These lines of research explore a wide range of topics, including face perception, inhibitory control, risk taking, and family relationships. In the following sections, we summarize emerging research using a developmental cultural neuroscience framework in which culture is conceptualized as (a) race and ethnicity, (b) SES, and (c) beliefs, which increases our understanding of the processes connecting culture, social practices, neural development, and adjustment.

Culture as race/ethnicity

A common way to characterize culture is race and ethnicity. A number of studies document differences in cognition, emotion, and behavior both across different ethnic groups within the United States and across countries in the world (for reviews, see Betancourt & López, 1993; García Coll et al., 1996; Hill, 2001; Markus & Kitayama, 1991; Mistry et al., 2016; Suárez-Orozco & Suárez-Orozco, 1995; Triandis, 1995). Race and ethnicity, in many cases, can be identified via facial features, such as skin color. Therefore, one topic that has been examined using the developmental cultural neuroscience approach is race perception. It has been well documented that individuals can differentiate between faces of their own versus other cultures: People are better at perceiving and recognizing facial expressions of individuals from their own culture relative to other cultures, a phenomenon called the other-race effect or in-group advantage (Elfenbein & Ambady, 2002; Kelly et al., 2007; Scott & Monesson, 2009; Vogel, Monesson, & Scott, 2012). Research in adults examining the other-race effect has shown that the amygdala demonstrates greater activation to racial out-groups and unfamiliar faces versus racial in-groups and familiar faces (Dubois et al., 1999; Hart et al., 2000; Rule et al., 2010). For example, both American and Japanese adults show a stronger amygdala response to cultural out-group faces than cultural in-group faces (Rule et al., 2010). The amygdala is consistently involved in face perception and emotion processing (e.g., Anderson & Phelps, 2001; Santos, Mier, Kirsch, & Meyer-Lindenberg, 2011; Todd, Evans, Morris, Lewis, & Taylor, 2011) and is a key neural region in detecting emotional salience (e.g., Cunningham & Brosch, 2012; Liberzon, Phan, Decker, & Taylor, 2003), suggesting that the role of the amygdala in detecting facial expressions is evolutionarily important (Hariri, Tessitore, Mattay, Fera, & Weinberger, 2002; Sergerie, Chochol, & Armony, 2008).

The developmental process underlying the other-race effect, however, has remained elusive. Experimental research suggests that infants less than 1 year old can already categorize faces by race and are sensitive to in-group versus out-group faces in their environment (for a review, see Shutts, 2015). However, it is unclear when and how culture exerts its influences on youths' neurodevelopment of race perception. Using an international adoption design, in which youths who were raised in orphanage care in either East Asia or Eastern Europe as infants and later adopted by families in the United States, provides a unique, natural experiment for measuring early deprivation to faces of other cultures (e.g., exclusive exposure to Asian faces or European faces). This method also provides a natural way to quantify the length of early deprivation (i.e., age of adoption), and the timing of exposure to other-race faces is known. Deprivation of other-race faces in infancy disrupts the recognition of emotion and increases the amygdala response to other-race faces (Telzer, Flannery, et al., 2013). A greater length of deprivation (i.e., later age of adoption) is associated with greater amygdala response to other-race faces. This research not only elucidates how changes in cultural environments (e.g., deprivation of other-race faces) influence youths' neural function over time but also suggests that early postnatal development may represent a sensitive period for the neural development of race perception.

In addition to examining differentiation between own- versus other-race faces, research also investigates developmental changes in youths' neural responses to specific races. Notably, culture conveys knowledge and biases about different racial and ethnic groups (e.g., stereotypes of these races). For example, implicit negative stereotypes about African Americans are still evident in American society. Neuroimaging research in American adults has shown that such stereotypes and biases are also reflected in neural activation. For example, both European American and African American adults show greater amygdala response while viewing Black relative to White faces (Lieberman, Hariri, Jarcho, Eisenberger, & Bookheimer, 2005). Taking a developmental cultural neuroscience approach, research has sought to examine when this pattern emerges. Whereas children do not show heightened amygdala response to Black related to White faces, by adolescence, youths show differential amygdala sensitivity to Black faces (Telzer, Humphreys, et al., 2013). Thus, neural biases to race emerge during adolescence, reflecting children's increasing internalization of cultural biases. Echoing findings in adults (Lieberman et al., 2005), both White and Black youths show similar developmental trajectories (i.e., increases in adolescence) in amygdala response to Black faces, suggesting that the salience of race and the learned associations about Black versus White may be shared across racial groups (Telzer, Humphreys, et al., 2013). It is noteworthy that youths' social environment modulates the amygdala response to race, such that youths with greater peer diversity (Telzer, Humphreys, et al., 2013) or who are part of a mixed-race team (Guassi Moreira, Van Bavel, & Telzer, 2017) show an attenuated amygdala response to Black faces, suggesting that greater contact with individuals from diverse backgrounds can reduce the neural salience of race.

Culture as SES

SES or social class is also considered a key form of culture (Cohen & Varnum, 2016; Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012). SES can be defined in many ways, including objective measures such as family income and parental education (Kachmar, Connolly, Wolf, & Curley, 2019), as well as subjective measures that define how individuals see themselves in relation to others' status (Adler, Epel, Castellazzo, & Ickovics, 2000). Social class and hierarchy create cultural identities among upper- and lower-class individuals that lead to different patterns of thoughts, feelings, and behavior (e.g., Kraus et al., 2012; Snibbe & Markus, 2005; Stephens et al., 2014). For example, working-class families often guide children to perceive the world as relatively materially constrained, and children need to develop interdependent selves to help them adjust to the social context and receive material assistance and support from others. In contrast, upper-class families often guide their children to perceive the world as relatively materially unconstrained, and children need to develop independent selves that focus on one's own internal states, goals, motivations, and emotions (Stephens et al., 2014). Indeed, decades of research in developmental psychology highlight that SES influences children and adolescents' academic, cognitive, social, and emotional adjustment (for reviews, see Duncan & Brooks-Gunn, 1997; Evans, 2004; McLoyd, 1998; Sirin, 2005).

Association between objective measures of SES and brain function. Attention has been paid to how objective measures of SES (e.g., family income, parents' educational attainment, occupational prestige) influence brain development (for reviews, see Hackman & Farah, 2009; Farah, 2017). Accumulating evidence consistently suggests that objective SES plays a profound role in youths' structural brain development in regions supporting language, reading, memory, executive function, social cognition, and emotional processing (e.g., Hanson et al., 2015; P. Kim et al., 2013; Noble, Wolmetz, Ochs, Farah, & McCandliss, 2006; Stevens, Lauinger, & Neville, 2009; Tomalski et al., 2013). In addition, objective SES is related to developmental changes in youths' neural function, including differences in brain activity, connectivity, and neural networks (e.g., Duval et al., 2017; Raizada, Richards, Meltzoff, & Kuhl, 2008; Sheridan, Sarsour, Jutte, D'Esposito, & Boyce, 2012).

For example, family income and parents' educational attainment predicts adolescents' neural activity during the processing of threatening faces (Muscatell et al., 2012). Specifically, lower SES is associated with greater activity in regions involved in thinking about the minds of others (e.g., dorsomedial prefrontal cortex) as well as regions involved in emotion and threat processing (e.g., amygdala). Likewise, childhood poverty, such as low family income, predicts increased activity in the amygdala and reduced activity in cognitive-control regions during emotion regulation among young adults (P. Kim et al., 2013). Concurrent income during adulthood is not associated with neural activity, suggesting that childhood SES has a long-term impact on brain development and may not be compensated by later SES during adulthood (P. Kim et al., 2013). Extending research on objective SES and youths' neural activation, Barch et al. (2016) showed that lower family income was associated with reduced connectivity between the hippocampus and amygdala and several neural regions that are associated with increased depression, suggesting that such changes in neural connectivity related to SES may precede mental illness. Moreover, in a large community-based study investigating how neighborhood SES influences functional brain network connectivity, the typical age-related increases in the local segregation of neural networks is less evident among youths in low-SES neighborhoods than among those in high-SES neighborhoods (Tooley et al., 2020). Taken together, these findings suggest that SES may not only change normative patterns of neural activation but also alter neural connectivity in childhood and adolescence.

Association between subjective measures of SES and brain function. Although most research on SES and brain development relies on objective SES, subjective SES—subjective feelings about one's standing in society relative to others (Goodman et al., 2001; Goodman et al., 2000)—also plays a role in youths' neural development. For instance, a recent study measured both objective and subjective SES and examined whether either of these aspects makes distinctive contributions to youths' neural processing of race (Muscatell, McCormick, & Telzer, 2018). Although there is no relationship between objective SES and neural response to race, adolescents who perceived themselves as having lower social status in society showed greater activity in neural regions involved in processing salience (e.g., amygdala), deeper perceptual encoding of faces (e.g., fusiform face area), and thinking about the minds of others (e.g., dorsomedial prefrontal cortex, medial prefrontal cortex) when viewing Black faces relative to White faces. These results suggest that race may be more salient for youths with relatively low subjective social status and highlight the unique role of subjective SES in shaping how the brain responds to race. Given that culture is multifaceted, this study is a good example of how different dimensions of culture—race and social class—interact with each other. An exciting line of research suggests that the meanings and impacts of high (vs. low) social status as well as subjective (vs. objective) social status may vary across Western and East Asian countries (e.g., Miyamoto et al., 2018; Park et al., 2013), providing directions for future research examining the impact of social status on the developing brain across cultures.

Culture as beliefs and values

Culture is also reflected in the beliefs that parents, teachers, and children hold, which further play a profound role, either consciously or unconsciously, in children's development. For example, stereotypes of adolescence—widely held, oversimplified beliefs about the teen years—are embedded in culture. American parents, teachers, and youths tend to view teens as irresponsible, conflictual, rebellious, and disengaged (Buchanan & Holmbeck, 1998; Hines & Paulson, 2006), whereas Chinese youths often view adolescence as a time of fulfilling family and school responsibilities (Qu, Pomerantz, Wang, Cheung, & Cimpian, 2016; Qu, Pomerantz, Wang, & Ng, 2020). Research is beginning to show that these cultural stereotypes of adolescence may also modulate brain development (Qu, Pomerantz, McCormick, & Telzer, 2018). Adolescents who hold negative stereotypes of teens show longitudinal increases in ventrolateral prefrontal cortex activation during cognitive control, which is, in turn, associated with longitudinal increases in risk taking over time. These findings offer initial evidence that negative stereotypes of adolescence, which are culturally shaped, may become self-fulfilling prophecies via changes in neural processing over this phase of development. Moreover, these findings underscore that cultural beliefs—in this example stereotypes of adolescence—become embedded in the developing brain and can impact developmental trajectories of adjustment and well-being.

Summary of current developmental cultural neuroscience research

As we reviewed above, advances in developmental cultural neuroscience research so far have provided exciting findings on the role of culture in brain development, which also points to promising directions for future research. First, current research suggests that neural regions involved in several processes and functions, such as face perception, emotion regulation, cognitive control, and perspective taking are influenced by culture in developing youths. It is important to note that there are many other psychological patterns and processes that have yet to be explored. As documented by extant literature in cultural neuroscience research in adults, neural processes underlying other cognitive abilities or social functions (e.g., self-construal and attribution) differs across cultures (e.g., Han & Humphreys, 2016; Kitayama et al., 2018; Mason & Morris, 2010). Therefore, it is important to call for more research in developmental cultural neuroscience so that we can fully understand how brain regions are culturally shaped across development.

Second, because developmental cultural neuroscience is still in its nascent stage, it is too early to draw conclusions about the overall pattern for psychological and neural mechanisms by which cultural shaping occurs. It is possible that some neural regions may be particularly sensitive to culture, as they are shaped by environmental input during sensitive periods of development, suggesting that culture may play an outsized role during developmentally plastic periods. For example, prior research suggests that amygdala activation is shaped by cultural input, especially early in development, which has long-term consequences in later neural processes (Telzer, Flannery, et al., 2013). As more studies accumulate, researchers will be able to summarize what psychological and neural processes are culturally general and culturally sensitive across the life span, which will provide important insights into understanding the role of culture in neuroplasticity.

Third, in addition to using a functional MRI (fMRI) approach, future research should take advantage of the diverse tools in neuroscience and use a variety of neuroimaging methods (e.g., electroencephalogram, functional near-infrared spectroscopy, structural MRI, and diffusion tensor imaging) to unpack the role of culture in brain development at different levels (e.g., brain function, brain structure, and neural connectivity). Moreover, accompanied by observation, surveys, experience sampling methods (e.g., daily diaries), experimental designs, and physiological assessments, this line of research can shed light on how culture plays a role in brain development via social contexts and how such culturally shaped neural processes have implications in children's and adolescents' adjustment in daily life.

Guidelines for Conducting Developmental Cultural Neuroscience Research

Research on children and adolescents' brain development has grown considerably—from a few hundred publications in 2000 to more than 1,400 publications in 2010 (Blakemore, 2012). As the field continues to grow, it is important to provide guidelines for future studies, even for those not focusing on culture. Below we outline five guidelines for better incorporating culture into developmental neuroimaging research.

1. *Provide detailed information to characterize the sample.* As we review, most studies do not report detailed cultural information such as ethnicity or SES information that is crucial for advancing our understanding of normative human development. We propose key information that should be reported in any publication (Table 2). Although any single study may not be able to examine cultural differences in youths' neural processes because of small sample sizes, providing such information will make it possible for future meta-analyses to examine this issue across multiple studies. Moreover, collecting information on participants' cultural background and SES is not only important for future research aimed at directly examining cultural differences in brain development but also useful for studies aimed at understanding population-level effects that can be generalized across samples. For example, controlling for culture-related variables or weighting the sample of cultural composition to make it more representative (e.g., LeWinn et al., 2017) allows researchers to examine cultural similarity or general patterns across populations. Finally, we recommend that researchers in the future be clearer about whether certain effects are based on specific groups or are generalizable to the population or across the globe.
2. *Recruit diverse cultural groups.* Researchers should provide more detailed reports of their samples. It is also theoretically and empirically important that they actively and purposefully broaden the diversity of their samples. We encourage researchers to recruit participants across different countries and societies around the world, as well as across different ethnicities, regions (e.g., rural vs. urban), and socioeconomic groups within the same country. By recruiting diverse cultural groups, we can elucidate whether, how, and why brain development and its association with psychological and behavioral adjustment vary across cultures. Recent advances in neuroscience have minimized cross-site variation (i.e., differences in data due to different scanners) in fMRI data (Friedman & Glover, 2006; Friedman et al., 2008; Parrish, Gitelman, LaBar, & Mesulam, 2000), making it more feasible to recruit children and adolescents from different cultures. Of course, access to MRI scanners is limited in many regions around the world, but efforts are in place (e.g., Fogarty International Center) to build the capacity for brain research in low- and middle-income countries.
3. *Make use of both convenience and large-scale samples.* In developmental cultural neuroscience, both convenience and large-scale samples have important implications, and it is vital that researchers use samples that best meet their specific research questions. For example, any study that aims to understand general developmental processes should use samples that are representative of the population of interest. These studies not only have sufficient statistical power to compare cultural groups but also are much more likely to generalize across the population. Despite the strengths of these types of studies, they are very costly and require large teams with diverse expertise, which are not available to all researchers. Furthermore, measures are often inherently less adaptable to specific cultures, and these psychological constructs need to be common and accessible to most participants. Therefore, researchers may be unable to examine cultural processes using detailed and in-depth measures and assessments.

Table 2. Checklist of Key Demographic Information to Collect and Report

Information	Reason	Guidelines
Essential		
Sex	Understanding biological sex	Include biological sex (male/female)
Age	Understanding development	Include age (mean and range)
Race/ethnicity	Understanding cultural influences and generalizability	Include number/percentage of participants from each ethnicity/panethnicity (e.g., Asian-American) and specific country, culture, or race (e.g., Chinese)
Objective SES	Understanding cultural influences and generalizability	Include measures such as family income, income-to-needs ratio, parental education, etc.
Recommended		
Gender	Understanding gender identity	Gender along continuum, male/female, nonbinary, intersex, trans male, trans female, LGBTQIA+ status
Immigrant status	Understanding multicultural influences in youths' lives	First-, second-, or third-generation or greater; years in the host country
Cultural orientation	Addressing acculturation	Measures of orientation toward host and native cultures
Cultural values	Measuring processes underlying cultural influences on development	Interdependent vs. independent values, collectivism vs. independence, etc.
Subjective SES	Understanding cultural influences associated with social standing	Perceived social standing relative to others at neighborhood and country levels

Note: Essential information is suggested for all developmental neuroscience research to report regardless of whether the researchers are interested in culture. Recommended information is intended for those wishing to examine culture more deeply. SES = socioeconomic status.

Given such economical and empirical concerns, it is also crucial to highlight the value of convenience or more targeted samples (Jager, Putnick, & Bornstein, 2017) that allow researchers to use culturally specific tasks, a key guideline that we elaborate on below. Indeed, homogeneous convenience samples that recruit participants using specific cultural criteria can examine cultural values and processes specific to that group. Such approaches will provide a narrow but unique understanding of youths' development in specific cultural groups with clearer generalizability than conventional convenience samples (Jager et al., 2017). In summary, researchers should carefully consider the strengths and weaknesses of sampling techniques in reference to their specific research questions, understanding that both large-scale and convenience samples are useful in developmental cultural neuroscience.

4. *Combine cross-sectional and longitudinal designs.* To better examine the role of culture in youths' neurodevelopment, researchers need to use both cross-sectional and longitudinal neuroimaging designs. Cross-sectional designs can provide an important snapshot of age differences in neural processes underlying cognitive, social, and emotional functioning, but they also have limitations that may yield misleading conclusions about developmental processes (Grimm, Davoudzadeh, & Ram, 2017; Kraemer, Yesavage, Taylor, & Kupfer, 2000). For example, although children in two cultures may show the same neural activation at the mean level when the neuroimaging is only conducted once, children in one culture may be in the upward trajectories and children in the other culture may be in the downward trajectories. Such differences would not be observable in children's mean-level activation at a single time point. Therefore, many scholars highlight the importance of applying longitudinal designs in developmental neuroscience and provide guidelines for such practices (e.g., Dahl, 2011; Telzer et al., 2018). These designs are better able to assess key aspects of the developmental cultural neuroscience framework, including general adolescent brain development (e.g., Braams, van Duijvenvoorde, Peper, & Crone, 2015; Pfeifer et al., 2011; Qu, Galván, Fuligni, Lieberman, & Telzer, 2015), the influence of culture on brain development and its associations with youths' adjustment, as well as reciprocal relationships between neurodevelopment, the cultural environment, and adjustment.

5. *Design culturally relevant tasks that capture culture-specific values and practices.* Given that developmental cultural neuroscience aims to examine the role of culture in youths' neural development, designing culturally relevant tasks that capture unique cultural values and practices is key to this endeavor. When designing these tasks, it is important to consider two issues. First, the usefulness of a task paradigm depends on whether it captures the cultural values and practices that researchers aim to examine. Therefore, it is essential to identify the psychological process informed by past literature in cultural or developmental psychology and then accordingly to design a task to measure the neural

mechanisms underlying that process. Second, as we study youths in different cultures, tasks need to be culturally comparable. Cross-cultural work in developmental psychology explicitly tests for measurement equivalence in self-report measures across cultures, which ensures that the same psychological construct is measured across different cultural groups (e.g., participants use the same scale in the same manner). The practice and emphasis on the cultural equivalence of measurement should also be applied in developmental cultural neuroscience research in which researchers develop tasks that participants from different cultures use in the same manner, ensuring that the cultural comparisons are meaningful.

Key Contributions of Developmental Cultural Neuroscience

Developmental cultural neuroscience represents an integrative approach to examining neural mechanisms underlying cultural differences and similarities in psychological processes across development. Advances in developmental cultural neuroscience will provide promising theoretical and applied implications, including but not limited to the following three key contributions: broadening the understanding of cultural transmission, providing insights into neuroplasticity, and highlighting important implications for youths' learning and psychological adjustment. We discuss each of these contributions in turn.

Broadening the understanding of cultural transmission

The developmental cultural neuroscience framework provides a holistic perspective on how culture influences child development. Instead of treating cultural influence as static, this approach captures the dynamic process of cultural transmission. Prior developmental research has revealed the role of culture in shaping youths' trajectories at the psychological and behavioral level (e.g., X. Chen, 2018; Greenfield & Suzuki, 1998; Rogoff, 2003). Developmental cultural neuroscience research not only will provide insights into how culture shapes child development at the neural level but also will delineate how neurodevelopment interacts with psychological and behavioral adjustment across different cultural contexts. Youths' neurodevelopment may serve as a key mechanism through which culturally rooted social practices contribute to divergent trajectories in academic, cognitive, social, and emotional development. Thus, youths' brain development provides a window for researchers to examine how culture influences youths' beliefs, feelings, and behaviors. By examining youths' neural development, we can elucidate some of the processes through which cultural values are transmitted from the social environment to children across generations. Moreover, this research can help us better understand when, how, and why there are cultural differences in youths' adjustment over the course of development. In addition to depicting different trajectories of brain development across cultures, developmental cultural neuroscience can help us identify key social practices that contribute to such differences in neural development, providing empirical explanations for cultural differences in child functioning.

Insights into neuroplasticity

The brain is highly plastic and sensitive to the social environment and engagement in cultural practices. For example, neuroimaging research has documented how unique experience leads to variations in brain structure and function among musicians, taxi drivers, and jugglers (Draganski et al., 2004; Maguire et al., 2000; Münte, Altenmüller, & Jäncke, 2002). With a focus on culture, developmental cultural neuroscience can provide evidence on how culturally rooted social practices contribute to changes in brain structure and function. Cultural psychology has demonstrated that East Asians are more interdependent or less independent in their social orientation than are European Americans (Markus & Kitayama, 1991). Likewise, American adults, especially young adults, have greater gray-matter volume and thickness of the orbitofrontal cortex and medial prefrontal cortex than their East Asian counterparts do (e.g., Chee, Zheng, Goh, Park, & Sutton, 2011; Yu et al., 2019), and the number of years spent in the United States predicts increased gray-matter volume in the orbitofrontal cortex among East Asians who are genetically more sensitive to cultural influences (i.e., carrying the 7- or 2-repeat allele of the dopamine D4 receptor gene; Yu et al., 2019). Therefore, exposure to a new culture may guide neural plasticity in a culturally specific way over the life span.

Important implications for youths' learning and psychological adjustment

An advantage of developmental cultural neuroscience is the ability to identify key cultural resources that help to promote youths' positive development. As an interdisciplinary approach, this framework can provide empirical evidence at behavioral, psychological, and neural levels to examine whether a specific social practice has positive implications for youths' adjustment. For example, to reduce heightened risk taking among some cultural groups, there is a great need for systematic research that examines cultural resources. Using a developmental cultural neuroscience approach, we identified a meaningful cultural resource—family obligation—in reducing Latin American adolescents' real-life risk taking via modulating reward-related processing in the brain (Telzer et al., 2013a, 2013b). Moreover, as a growing number of interventions aim to promote minority and underserved youths' achievement (Destin, 2020; Yeager & Walton, 2011; Yeager et al., 2016), researchers highlight the importance of incorporating neurobiology in closing racial and ethnic disparities in school readiness and academic achievement (Levy, Heissel, Richeson, & Adam, 2016; Noble, Tottenham, & Casey, 2005). Moving beyond prior research that solely focuses on youths' behavior, developmental cultural neuroscience equips us with valuable tools for examining the underlying neural mechanisms by which social environments and practices shape child development.

Conclusion

Progress in neuroimaging for the study of human brain structure and function in vivo has led to a groundbreaking understanding of brain development across the life span. Despite such success, we call attention to the importance of incorporating culture into the empirical investigation of neurodevelopment. Our analyses of studies included in recent meta-analyses suggest that prior developmental cognitive neuroscience research tends to both underreport cultural demographic information and use culturally homogeneous samples. To fully address these issues, we propose an emerging interdisciplinary approach—developmental cultural neuroscience—that aims to examine the role of culture in youths' brain, psychological, and behavioral development. Equipped by theories and tools from developmental psychology, cultural psychology, and neuroscience, this interdisciplinary approach will provide both theoretical and practical implications—it will not only increase our understanding of youths' brain development under divergent cultural circumstances but also provide the foundation for future interventions that target culturally diverse youths.

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Supplemental Material

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References

Adler, N. E., Epel, E. S., Castellazzo, G., & Ickovics, J. R. (2000). Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy, White women. *Health Psychology*, *19*, 586–592. doi:10.1037/0278-6133.19.6.586

Anderson, A. K., & Phelps, E. A. (2001). Lesions of the human amygdala impair enhanced perception of emotionally salient events. *Nature*, *411*, 305–309. doi:10.1038/35077083

Arnett, J. J. (1999). Adolescent storm and stress, reconsidered. *American Psychologist*, *54*, 317–326. doi:10.1037/0003-066X.54.5.317

Arnett, J. J. (2008). The neglected 95%: Why American psychology needs to become less American. *American Psychologist*, *63*, 602–614. doi:10.1037/0003-066X.63.7.602

Barch, D., Pagliaccio, D., Belden, A., Harms, M. P., Gaffrey, M., Sylvester, C. M., . . . Luby, J. (2016). Effect of hippocampal and amygdala connectivity on the relationship between preschool poverty and school-age depression. *The American Journal of Psychiatry*, *173*, 625–634. doi:10.1176/appi.ajp.2015.15081014

Belsky, J. (1984). The determinants of parenting: A process model. *Child Development*, *55*, 83–96. doi:10.2307/1129836

Berry, J. W. (1997). Immigration, acculturation and adaptation. *Applied Psychology*, *46*, 5–68. doi:10.1111/j.1464-0597.1997.tb01087.x

Berry, J. W., Phinney, J. S., Sam, D. L., & Vedder, P. (2006). Immigrant youth: Acculturation, identity and adaptation. *Applied Psychology*, *55*, 303–332. doi:10.1111/j.1464-0597.2006.00256.x

Betancourt, H., & López, S. R. (1993). The study of culture, ethnicity, and race in American psychology. *American Psychologist*, *48*, 629–637. doi:10.1037/0003-066X.48.6.629

Blakemore, S.-J. (2012). Imaging brain development: The adolescent brain. *NeuroImage*, *61*, 397–406.

Blakemore, S.-J., & Mills, K. L. (2014). Is adolescence a sensitive period for sociocultural processing? *Annual Review of Psychology*, *65*, 187–207. doi:10.1146/annurev-psych-010213-115202

Bond, M. H. (2002). Reclaiming the individual from Hofstede's ecological analysis—A 20-year odyssey: Comment on Oyserman et al. (2002). *Psychological Bulletin*, *128*, 73–77. doi:10.1037/0033-2909.128.1.73

Braams, B. R., van Duijvenvoorde, A. C. K., Peper, J. S., & Crone, E. A. (2015). Longitudinal changes in adolescent risk-taking: A comprehensive study of neural responses to rewards, pubertal development, and risk-taking behavior. *The Journal of Neuroscience*, *35*, 7226–7238. doi:10.1523/JNEUROSCI.4764-14.2015

Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology*, *53*, 371–399. doi:10.1146/annurev.psych.53.100901.135233

Brooks-Gunn, J., & Duncan, G. J. (1997). The effects of poverty on children. *The Future of Children*, *7*(2), 55–71. doi:10.2307/1602387

Buchanan, C. M., & Holmbeck, G. N. (1998). Measuring beliefs about adolescent personality and behavior. *Journal of Youth and Adolescence*, *27*, 607–627. doi:10.1023/A:1022835107795

Bukowski, W. M., & Sippola, L. K. (1998). Diversity and the social mind: Goals, constructs, culture, and development. *Developmental Psychology*, *34*, 742–746. doi:10.1037/0012-1649.34.4.742

Casey, B. J., Cohen, J. D., Jezzard, P., Turner, R., Noll, D. C., Trainor, R. J., . . . Rapoport, J. L. (1995). Activation of prefrontal cortex in children during a nonspatial working memory task with functional MRI. *NeuroImage*, *2*, 221–229.

Causadias, J. M., Telzer, E. H., & Gonzales, N. A. (2017). Introduction to culture and biology interplay. In J. M. Causadias, E. H. Telzer, & N. A. Gonzales (Eds.), *The handbook of culture and biology* (pp. 3–29). Hoboken, NJ: Wiley. doi:10.1002/9781119181361.ch1

Chao, R., & Tseng, V. (2002). Parenting of Asians. In M. H. Bornstein (Ed.), *Handbook of parenting. Vol. 4: Social conditions and applied parenting* (2nd ed., pp. 59–93). Mahwah, NJ: Erlbaum.

Chee, M. W. L., Zheng, H., Goh, J. O. S., Park, D., & Sutton, B. P. (2011). Brain structure in young and old East Asians and Westerners: Comparisons of structural volume and cortical thickness. *Journal of Cognitive Neuroscience*, *23*, 1065–1079. doi:10.1162/jocn.2010.21513

Chen, P.-H. A., Heatherton, T. F., & Freeman, J. B. (2015). Brain-as-predictor approach: An alternative way to explore acculturation processes. In J. E. Warnick & D. Landis (Eds.), *Neuroscience in intercultural contexts* (pp. 143–170). New York, NY: Springer. doi:10.1007/978-1-4939-2260-4_6

Chen, X. (2018). Culture, temperament, and social and psychological adjustment. *Developmental Review*, *50*, 42–53. doi:10.1016/j.dr.2018.03.004

Chen, X., Cen, G., Li, D., & He, Y. (2005). Social functioning and adjustment in Chinese children: The imprint of historical time. *Child Development*, *76*, 182–195. doi:10.1111/j.1467-8624.2005.00838.x

Chiao, J. Y. (2009). Cultural neuroscience: A once and future discipline. *Progress in Brain Research*, *178*, 287–304. doi:10.1016/S0079-6123(09)17821-4

Chiao, J. Y. (2015). Current emotion research in cultural neuroscience. *Emotion Review*, *7*, 280–293. doi:10.1177/1754073914546389

Chiao, J. Y. (2018). Developmental aspects in cultural neuroscience. *Developmental Review*, *50*(Pt. A), 77–89. doi:10.1016/j.dr.2018.06.005

Chiao, J. Y., & Ambady, N. (2007). Cultural neuroscience: Parsing universality and diversity across levels of analysis. In S. Kitayama & D. Cohen (Eds.), *Handbook of cultural psychology* (pp. 237–254). New York, NY: Guilford Press.

Choudhury, S. (2010). Culturing the adolescent brain: What can neuroscience learn from anthropology? *Social Cognitive and Affective Neuroscience*, *5*, 159–167. doi:10.1093/scan/nsp030

Cohen, A. B., & Varnum, M. E. W. (2016). Beyond East vs. West: Social class, region, and religion as forms of culture. *Current Opinions in Psychology*, *8*, 5–9. doi:10.1016/j.copsyc.2015.09.006

Crone, E. A., & Dahl, R. E. (2012). Understanding adolescence as a period of social–affective engagement and goal flexibility. *Nature Reviews Neuroscience*, *13*, 636–650. doi:10.1038/nrn3313

Cunningham, W. A., & Brosch, T. (2012). Motivational salience: Amygdala tuning from traits, needs, values, and goals. *Current Directions in Psychological Science*, *21*, 54–59. doi:10.1177/0963721411430832

Dahl, R. E. (2011). Understanding the risky business of adolescence. *Neuron*, *69*, 837–839. doi:10.1016/j.neuron.2011.02.036

Dahl, R. E., Allen, N. B., Wilbrecht, L., & Suleiman, A. B. (2018). Importance of investing in adolescence from a developmental science perspective. *Nature*, *554*, 441–450. doi:10.1038/nature25770

Decety, J., & Meyer, M. (2008). From emotion resonance to empathic understanding: A social developmental neuroscience account. *Development and Psychopathology*, *20*, 1053–1080. doi:10.1017/S0954579408000503

Defoe, I. N., Dubas, J. S., Figner, B., & van Aken, M. A. G. (2015). A meta-analysis on age differences in risky decision making: Adolescents versus children and adults. *Psychological Bulletin*, *141*, 48–84. doi:10.1037/a0038088

Destin, M. (2020). Identity research that engages contextual forces to reduce socioeconomic disparities in education. *Current Directions in Psychological Science*, *29*, 161–166. doi:10.1177/0963721420901588

Draganski, B., Gaser, C., Busch, V., Schuierer, G., Bogdahn, U., & May, A. (2004). Changes in grey matter induced by training. *Nature*, *427*, 311–312. doi:10.1038/427311a

Dubois, S., Rossion, B., Schiltz, C., Bodart, J. M., Michel, C., Bruyer, R., & Crommelinck, M. (1999). Effect of familiarity on the processing of human faces. *NeuroImage*, *9*, 278–289. doi:10.1006/nimg.1998.0409

Duncan, G. J., & Brooks-Gunn, J. (1997). *Consequences of growing up poor*. New York, NY: Russell Sage Foundation.

Duval, E. R., Garfinkel, S. N., Swain, J. E., Evans, G. W., Blackburn, E. K., Angstadt, M., . . . Liberzon, I. (2017). Childhood poverty is associated with altered hippocampal function and visuospatial memory in adulthood. *Developmental Cognitive Neuroscience*, *23*, 39–44. doi:10.1016/j.dcn.2016.11.006

Elfenbein, H. A., & Ambady, N. (2002). On the universality and cultural specificity of emotion recognition: A meta-analysis. *Psychological Bulletin*, *128*, 203–235. doi:10.1037/0033-2909.128.2.203

Evans, G. W. (2004). The environment of childhood poverty. *American Psychologist*, *59*, 77–92. doi:10.1037/0003-066X.59.2.77

Farah, M. J. (2017). The neuroscience of socioeconomic status: Correlates, causes, and consequences. *Neuron*, *96*, 56–71. doi:10.1016/j.neuron.2017.08.034

Frank, C. K., & Temple, E. (2009). Culture effects on the neural basis of theory of mind. *Progress in Brain Research*, *178*, 213–223. doi:10.1016/S0079-6123(09)17815-9

Freeman, J. B., Rule, N. O., & Ambady, N. (2009). The cultural neuroscience of person perception. *Progress in Brain Research*, *178*, 191–201. doi:10.1016/S0079-6123(09)17813-5

Friedman, L., & Glover, G. H. (2006). Report on a multicenter fMRI quality assurance protocol. *Journal of Magnetic Resonance Imaging*, *23*, 827–839. doi:10.1002/jmri.20583

Friedman, L., Stern, H., Brown, G. G., Mathalon, D. H., Turner, J., Glover, G. H., . . . Potkin, S. G. (2008). Test-retest and between-site reliability in a multicenter fMRI study. *Human Brain Mapping*, *29*, 958–972.

García Coll, C. G., Lamberty, G., Jenkins, R., McAdoo, H. P., Crnic, K., Wasik, B. H., & Garcia, H. V. (1996). An integrative model for the study of developmental competencies in minority children. *Child Development*, *67*, 1891–1914. doi:10.2307/1131600

Giedd, J. N., Blumenthal, J., Jeffries, N. O., Castellanos, F. X., Liu, H., Zijdenbos, A., . . . Rapoport, J. L. (1999). Brain development during childhood and adolescence: A longitudinal MRI study. *Nature Neuroscience*, *2*, 861–863. doi:10.1038/13158

Giedd, J. N., Snell, J. W., Lange, N., Rajapakse, J. C., Casey, B. J., Kozuch, P. L., . . . Rapoport, J. L. (1996). Quantitative magnetic resonance imaging of human brain development: Ages 4–18. *Cerebral Cortex*, *6*, 551–560. doi:10.1093/cercor/6.4.551

Goldsmith, H. H., Pollak, S. D., & Davidson, R. J. (2008). Developmental neuroscience perspectives on emotion regulation. *Child Development Perspectives*, *2*, 132–140. doi:10.1111/j.1750-8606.2008.00055.x

Goodman, E., Adler, N. E., Kawachi, I., Frazier, A. L., Huang, B., & Colditz, G. A. (2001). Adolescents' perceptions of social status: Development and evaluation of a new indicator. *Pediatrics*, *108*(2), Article E31. doi:10.1542/peds.108.2.e31

Goodman, E., Amick, B. C., Rezendes, M. O., Levine, S., Kagan, J., Rogers, W. H., & Tarlov, A. R. (2000). Adolescents' understanding of social class: A comparison of white upper middle class and working class youth. *Journal of Adolescent Health*, *27*, 80–83. doi:10.1016/S1054-139X(99)00116-0

Greenfield, P. M., & Suzuki, L. K. (1998). Culture and human development: Implications for parenting, education, pediatrics and mental health. In W. Damon, I. E. Sigel, & K. A. Renninger (Eds.), *Handbook of child psychology: Child psychology in practice* (Vol. 4, 5th ed., pp. 1059–1109). Hoboken, NJ: Wiley.

Grimm, K. J., Davoudzadeh, P., & Ram, N. (2017). Developmental methodology: IV. Developments in the analysis of longitudinal data. *Monographs of the Society for Research in Child Development*, *82*(2), 46–66. doi:10.1111/mono.12298

Hackman, D. A., & Farah, M. J. (2009). Socioeconomic status and the developing brain. *Trends in Cognitive Sciences*, *13*, 65–73. doi:10.1016/j.tics.2008.11.003

Han, S., & Humphreys, G. (2016). Self-construal: A cultural framework for brain function. *Current Opinions in Psychology*, *8*, 10–14. doi:10.1016/j.copsyc.2015.09.013

Han, S., & Ma, Y. (2014). Cultural differences in human brain activity: A quantitative meta-analysis. *NeuroImage*, *99*, 293–300. doi:10.1016/j.neuroimage.2014.05.062

Han, S., & Ma, Y. (2015). A culture-behavior-brain loop model of human development. *Trends in Cognitive Science*, *19*, 666–676. doi:10.1016/j.tics.2015.08.010

Han, S., & Northoff, G. (2008). Culture-sensitive neural substrates of human cognition: A transcultural neuroimaging approach. *Nature Reviews Neuroscience*, *9*, 646–654. doi:10.1038/nrn2456

Han, S., Northoff, G., Vogeley, K., Wexler, B. E., Kitayama, S., & Varnum, M. E. W. (2013). A cultural neuroscience approach to the biosocial nature of the human brain. *Annual Review of Psychology*, *64*, 335–359. doi:10.1146/annurev-psych-071112-054629

Hanson, J. L., Nacewicz, B. M., Sutterer, M. J., Cayo, A. A., Schaefer, S. M., Rudolph, K. D., . . . Davidson, R. J. (2015). Behavioral problems after early life stress: Contributions of the hippocampus and amygdala. *Biological Psychiatry*, *77*, 314–323. doi:10.1016/j.biopsych.2014.04.020

Hariri, A. R., Tessitore, A., Mattay, V. S., Fera, F., & Weinberger, D. R. (2002). The amygdala response to emotional stimuli: A comparison of faces and scenes. *NeuroImage*, *17*, 317–323. doi:10.1006/nimg.2002.1179

Hart, A. J., Whalen, P. J., Shin, L. M., McInerney, S. C., Fischer, H., & Rauch, S. L. (2000). Differential response in the human amygdala to racial outgroup vs ingroup face stimuli. *NeuroReport*, *11*, 2351–2355. doi:10.1097/00001756-200008030-00004

Heine, S. J., Kitayama, S., Lehman, D. R., Takata, T., Ide, E., Leung, C., & Matsumoto, H. (2001). Divergent consequences of success and failure in Japan and North America: An investigation of self-improving motivations and malleable selves. *Journal of Personality and Social Psychology*, *81*, 599–615. doi:10.1037/0022-3514.81.4.599

Heine, S. J., & Norenzayan, A. (2006). Toward a psychological science for a cultural species. *Perspectives on Psychological Science*, *1*, 251–269. doi:10.1111/j.1745-6916.2006.00015.x

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, *33*, 61–83. doi:10.1017/S0140525X0999152X

Hill, S. A. (2001). Class, race, and gender dimensions of child rearing in African American families. *Journal of Black Studies*, *31*, 494–508. doi:10.1177/002193470103100407

Hines, A. R., & Paulson, S. E. (2006). Parents' and teachers' perceptions of adolescent storm and stress: Relations with parenting and teaching styles. *Adolescence*, *41*, 597–614.

Ho, D. Y. F. (1996). Filial piety and its psychological consequences. In M. H. Bond (Ed.), *Handbook of Chinese* *psychology* (pp. 155–165). New York, NY: Oxford University Press.

Jager, J., Putnick, D. L., & Bornstein, M. H. (2017). Developmental methodology: II. More than just convenient: The scientific merits of homogeneous convenience samples. *Monographs of the Society for Research in Child Development*, *82*(2), 13–30. doi:10.1111/mono.12296

Kachmar, A. G., Connolly, C. A., Wolf, S., & Curley, M. A. Q. (2019). Socioeconomic status in pediatric health research: A scoping review. *The Journal of Pediatrics*, *213*, 163–170. doi:10.1016/j.jpeds.2019.06.005

Kang, P., Lee, Y., Choi, I., & Kim, H. (2013). Neural evidence for individual and cultural variability in the social comparison effect. *The Journal of Neuroscience*, *33*, 16200–16208. doi:10.1523/JNEUROSCI.5084-12.2013

Kelly, D. J., Quinn, P. C., Slater, A. M., Lee, K., Ge, L., & Pascalis, O. (2007). The other-race effect develops during infancy: Evidence of perceptual narrowing. *Psychological Science*, *18*, 1084–1089. doi:10.1111/j.1467-9280.2007.02029.x

Kim, H. S., & Sasaki, J. Y. (2014). Cultural neuroscience: Biology of the mind in cultural contexts. *Annual Review of Psychology*, *65*, 487–514. doi:10.1146/annurev-psych-010213-115040

Kim, P., Evans, G. W., Angstadt, M., Ho, S. S., Sripada, C. S., Swain, J. E., . . . Phane, K. L. (2013). Effects of childhood poverty and chronic stress on emotion regulatory brain function in adulthood. *Proceedings of the National Academy of Sciences, USA*, *110*, 18442–18447. doi:10.1073/pnas.1308240110

Kitayama, S., & Salvador, C. E. (2017). Culture embrained: Going beyond the nature-nurture dichotomy. *Perspectives on Psychological Science*, *12*, 841–854. doi:10.1177/1745691617707317

Kitayama, S., & Uskul, A. K. (2011). Culture, mind, and the brain: Current evidence and future directions. *Annual Review of Psychology*, *62*, 419–449. doi:10.1146/annurev-psych-120709-145357

Kitayama, S., Varnum, M. W. E., & Salvador, C. E. (2018). Cultural neuroscience. In D. Cohen & S. Kitayama (Eds.), *Handbook of cultural psychology* (2nd ed., pp. 79–118). New York, NY: Guilford Press.

Kitayama, S., Yanagisawa, K., Ito, A., Ueda, R., Uchida, Y., & Abe, N. (2017). Reduced orbitofrontal cortical volume is associated with interdependent self-construal. *Proceedings of the National Academy of Sciences, USA*, *114*, 7969–7974. doi:10.1073/pnas.1704831114

Kraemer, H. C., Yesavage, J. A., Taylor, J. L., & Kupfer, D. (2000). How can we learn about developmental processes from cross-sectional studies, or can we? *The American Journal of Psychiatry*, *157*, 163–171. doi:10.1176/appi.ajp.157.2.163

Kraus, M. W., Piff, P. K., Mendoza-Denton, R., Rheinschmidt, M. L., & Keltner, D. (2012). Social class, solipsism, and contextualism: How the rich are different from the poor. *Psychological Review*, *119*, 546–572. doi:10.1037/a0028756

Lee, F. S., Heimer, H., Giedd, J. N., Lein, E. S., Šestan, N., Weinberger, D. R., & Casey, B. J. (2014). Adolescent mental health—Opportunity and obligation: Emerging neuroscience offers hope for treatments. *Science*, *346*, 547–549. doi:10.1126/science.1260497

Levy, D. J., Heissel, J. A., Richeson, J. A., & Adam, E. K. (2016). Psychological and biological responses to race-based social stress as pathways to disparities in educational outcomes. *American Psychologist*, *71*, 455–473. doi:10.1037/a0040322

LeWinn, K. Z., Sheridan, M. A., Keyes, K. M., Hamilton, A., & McLaughlin, K. A. (2017). Sample composition alters associations between age and brain structure. *Nature Communications*, *8*, Article 874. doi:10.1038/s41467-017-00908-7

Liberzon, I., Phan, K. L., Decker, L. R., & Taylor, S. F. (2003). Extended amygdala and emotional salience: A PET activation study of positive and negative affect. *Neuropsychopharmacology*, *28*, 726–733. doi:10.1038/sj.npp.1300113

Lieberman, M. D., Hariri, A., Jarcho, J. M., Eisenberger, N. I., & Bookheimer, S. Y. (2005). An fMRI investigation of race-related amygdala activity in African American and Caucasian American individuals. *Nature Neuroscience*, *8*, 720–722. doi:10.1038/nn1465

Maguire, E. A., Gadian, D. G., Johnsrude, I. S., Good, C. D., Ashburner, J., Frackowiak, R. S., & Frith, C. D. (2000). Navigation-related structural change in the hippocampi of taxi drivers. *Proceedings of the National Academy of Sciences, USA*, *97*, 4398–4403. doi:10.1073/pnas.070039597

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, *98*, 224–253. doi:10.1037/0033-295X.98.2.224

Markus, H. R., & Kitayama, S. (2010). Cultures and selves: A cycle of mutual constitution. *Perspectives on Psychological Science*, *5*, 420–430. doi:10.1177/1745691610375557

Mason, M. F., & Morris, M. W. (2010). Culture, attribution and automaticity: A social cognitive neuroscience view. *Social Cognitive and Affective Neuroscience*, *5*, 292–306. doi:10.1093/scan/nsq034

McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *American Psychologist*, *53*, 185–204. doi:10.1037/0003-066X.53.2.185

Mead, M. (1928). *Coming of age in Samoa: A psychological study of primitive youth for Western civilization*. Oxford, England: Morrow.

Mistry, J., Li, J., Yoshikawa, H., Tseng, V., Tirrell, J., Kiang, L., . . . Wang, Y. (2016). An integrated conceptual framework for the development of Asian American children and youth. *Child Development*, *87*, 1014–1032. doi:10.1111/cdev.12577

Miyamoto, Y., Yoo, J., Levine, C. S., Park, J., Boylan, J. M., Sims, T., . . . Ryff, C. D. (2018). Culture and social hierarchy: Self- and other-oriented correlates of socioeconomic status across cultures. *Journal of Personality and Social Psychology*, *115*, 427–445. doi:10.1037/pspi0000133

Moreira, J. F. G., Van Bavel, J. J., & Telzer, E. H. (2017). The neural development of "us and them." *Social Cognitive and Affective Neuroscience*, *12*, 184–196. doi:10.1093/scan/nsw134

Münte, T. F., Altenmüller, E., & Jäncke, L. (2002). The musician's brain as a model of neuroplasticity. *Nature Reviews Neuroscience*, *3*, 473–478. doi:10.1038/nrn843

Muscatell, K. A., McCormick, E. M., & Telzer, E. H. (2018). Subjective social status and neural processing of race in Mexican American adolescents. *Development and Psychopathology*, *30*, 1837–1848. doi:10.1017/S0954579418000949

Muscatell, K. A., Morelli, S. A., Falk, E. B., Way, B. M., Pfeifer, J. H., Galinsky, A. D., & Eisenberger, N. I. (2012). Social status modulates neural activity in the mentalizing network. *NeuroImage*, *60*, 1771–1777. doi:10.1016/j.neuroimage.2012.01.080

Noble, K. G., Tottenham, N., & Casey, B. J. (2005). Neuroscience perspectives on disparities in school readiness and cognitive achievement. *The Future of Children*, *15*, 71–89. doi:10.1353/foc.2005.0006

Noble, K. G., Wolmetz, M. E., Ochs, L. G., Farah, M. J., & McCandliss, B. D. (2006). Brain-behavior relationships in reading acquisition are modulated by socioeconomic factors. *Developmental Science*, *9*, 642–654. doi:10.1111/j.1467-7687.2006.00542.x

Park, J., Kitayama, S., Markus, H. R., Coe, C. L., Miyamoto, Y., Karasawa, M., . . . Ryff, C. D. (2013). Social status and anger expression: The cultural moderation hypothesis. *Emotion*, *13*, 1122–1131. doi:10.1037/a0034273

Parrish, T. B., Gitelman, D. R., LaBar, K. S., & Mesulam, M. M. (2000). Impact of signal-to-noise on functional MRI. *Magnetic Resonance in Medicine*, *44*, 925–932.

Pfeifer, J. H., Masten, C. L., Moore, W. E., Oswald, T. M., Mazziotta, J. C., Iacoboni, M., & Dapretto, M. (2011). Entering adolescence: Resistance to peer influence, risky behavior, and neural changes in emotion reactivity. *Neuron*, *69*, 1029–1036. doi:10.1016/j.neuron.2011.02.019

Programme for International Student Assessment. (2012). *PISA 2012 results*. Retrieved from http://www.oecd.org/pisa/keyfindings/PISA-2012-results-snapshot-Volume-I-ENG.pdf

Qu, Y., Galván, A., Fuligni, A. J., Lieberman, M. D., & Telzer, E. H. (2015). Longitudinal changes in prefrontal cortex activation underlie declines in adolescent risk taking. *The Journal of Neuroscience*, *35*, 11308–11314. doi:10.1523/JNEUROSCI.1553-15.2015

Qu, Y., & Pomerantz, E. M. (2015). Divergent school trajectories in early adolescence in the United States and China: An examination of underlying mechanisms. *Journal of Youth and Adolescence*, *44*, 2095–2109. doi:10.1007/s10964-014-0201-0

Qu, Y., Pomerantz, E. M., & Deng, C. (2016). Mothers' goals for adolescents in the United States and China: Content and transmission. *Journal of Research on Adolescence*, *26*, 126–141. doi:10.1111/jora.12176

Qu, Y., Pomerantz, E. M., McCormick, E. M., & Telzer, E. H. (2018). Youth's conceptions of adolescence predict longitudinal changes in the prefrontal cortex activation and risk taking. *Child Development*, *89*, 773–783.

Qu, Y., Pomerantz, E. M., Wang, M., Cheung, S., & Cimpian, A. (2016). Conceptions of adolescence: Implications for differences in engagement in school over early adolescence in the United States and China. *Journal of Youth and Adolescence*, *45*, 1512–1526. doi:10.1007/s10964-016-0492-4

Qu, Y., Pomerantz, E. M., Wang, Q., & Ng, F. F. (2020). Early adolescents' stereotypes about teens in Hong Kong and Chongqing: Reciprocal pathways with problem behavior. *Developmental Psychology*, *56*, 1092–1106. doi:10.1037/dev0000911

Qu, Y., & Telzer, E. H. (2017). Cultural differences and similarities in beliefs, practices, and neural mechanisms of emotion regulation. *Cultural Diversity and Ethnic Minority Psychology*, *23*, 36–44. doi:10.1037/cdp0000112

Raizada, R. D., Richards, T. L., Meltzoff, A., & Kuhl, P. K. (2008). Socioeconomic status predicts hemispheric specialisation of the left inferior frontal gyrus in young children. *NeuroImage*, *40*, 1392–1401. doi:10.1016/j.neuroimage.2008.01.021

Ray, R. D., Shelton, A. L., Hollon, N. G., Matsumoto, D., Frankel, C. B., Gross, J. J., & Gabrieli, J. D. E. (2010). Interdependent self-construal and neural representations of self and mother. *Social Cognitive and Affective Neuroscience*, *5*, 318–323. doi:10.1093/scan/nsp039

Reiss, A. L., Abrams, M. T., Singer, H. S., Ross, J. L., & Denckla, M. B. (1996). Brain development, gender and IQ in children: A volumetric imaging study. *Brain: A Journal of Neurology*, *119*, 1763–1774. doi:10.1093/brain/119.5.1763

Rogoff, B. (2003). *The cultural nature of human development*. New York, NY: Oxford University Press.

Rule, N. O., Freeman, J. B., Moran, J. M., Gabrieli, J. D. E., Adams, R. B., Jr., & Ambady, N. (2010). Voting behavior is reflected in amygdala response across cultures. *Social Cognitive and Affective Neuroscience*, *5*, 349–355. doi:10.1177/0272431699019003001

Sam, D. L., & Berry, J. W. (2010). Acculturation: When individuals and groups of different cultural backgrounds meet. *Perspectives on Psychological Science*, *5*, 472–481. doi:10.1177/1745691610373075

Sanson, A. V., & Rothbart, M. K. (1995). Child temperament and parenting. In M. H. Bornstein (Ed.), *Handbook of Parenting: Vol. 4. Applied and practical parenting* (pp. 299–321). Hillsdale, NJ: Erlbaum.

Santos, A., Mier, D., Kirsch, P., & Meyer-Lindenberg, A. (2011). Evidence for a general face salience signal in human amygdala. *NeuroImage*, *54*, 3111–3116. doi:10.1016/j.neuroimage.2010.11.024

Schlegel, A., & Barry, H., III. (1991). *Adolescence: An anthropological inquiry*. New York, NY: Free Press.

Scott, L. S., & Monesson, A. (2009). The origin of biases in face perception. *Psychological Science*, *20*, 676–680. doi:10.1111/j.1467-9280.2009.02348.x

Sergerie, K., Chochol, C., & Armony, J. L. (2008). The role of the amygdala in emotional processing: A quantitative meta-analysis of functional neuroimaging studies. *Neuroscience & Biobehavioral Reviews*, *32*, 811–830. doi:10.1016/j.neubiorev.2007.12.002

Sheridan, M. A., Sarsour, K., Jutte, D., D'Esposito, M., & Boyce, W. T. (2012). The impact of social disparity on prefontal function in childhood. *PLOS ONE*, *7*(4), Article e35744. doi:10.1371/journal.pone.0035744

Sherman, L., Steinberg, L., & Chein, J. (2018). Connecting brain responsivity and real-world risk taking: Strengths and limitations of current methodological approaches. *Developmental Cognitive Neuroscience*, *33*, 27–41. doi:10.1016/j.dcn.2017.05.007

Shutts, K. (2015). Young children's preferences: Gender, race, and social status. *Child Development Perspectives*, *9*, 262–266. doi:10.1111/cdep.12154

Silverman, M. H., Jedd, K., & Luciana, M. (2015). Neural networks involved in adolescent reward processing: An activation likelihood estimation meta-analysis of functional neuroimaging studies. *NeuroImage*, *122*, 427–439. doi:10.1016/j.neuroimage.2015.07.083

Sirin, R. S. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of Educational Research*, *75*, 417–453. doi:10.3102/00346543075003417

Snibbe, A. C., & Markus, H. R. (2005). You can't always get what you want: Educational attainment, agency, and choice. *Journal of Personality and Social Psychology*, *88*, 703–720. doi:10.1037/0022-3514.88.4.703

Somerville, L. H., & Casey, B. J. (2010). Developmental neurobiology of cognitive control and motivational systems. *Current Opinion in Neurobiology*, *20*, 236–241. doi:10.1016/j.conb.2010.01.006

Steinberg, L. (2008). A social neuroscience perspective on adolescent risk-taking. *Developmental Review*, *28*, 78–106. doi:10.1016/j.dr.2007.08.002

Stephens, N. M., Markus, H. R., & Phillips, L. T. (2014). Social class culture cycles: How three gateway contexts shape selves and fuel inequality. *Annual Reviews of Psychology*, *65*, 611–634. doi:10.1146/annurev-psych-010213-115143

Stevens, C., Lauinger, B., & Neville, H. (2009). Differences in the neural mechanisms of selective attention in children from different socioeconomic backgrounds: An event-related brain potential study. *Developmental Science*, *12*, 634–646. doi:10.1111/j.1467-7687.2009.00807.x

Stevenson, H. W., Chen, C., & Lee, S. (1993). Mathematics achievement of Chinese, Japanese, and American children: Ten years later. *Science*, *259*, 53–58. doi:10.1126/science.8418494

Stevenson, H. W., & Lee, S. (1990). Contexts of achievement: A study of American, Chinese, and Japanese children. *Monographs of the Society for Research in Child Development*, *55*, 1–123. doi:10.2307/1166090

Suárez-Orozco, C., & Suárez-Orozco, M. M. (1995). *Transformations: Immigration, family life, and achievement motivation among Latino adolescents*. Stanford, CA: Stanford University Press.

Telzer, E. H., Flannery, J., Shapiro, M., Humphreys, K. L., Goff, B., Gabard-Durman, L., . . . Tottenham, N. (2013). Early experience shapes amygdala sensitivity to race: An international adoption design. *The Journal of Neuroscience*, *33*, 13484–13488. doi:10.1523/JNEUROSCI.1272-13.2013

Telzer, E. H., & Fuligni, A. J. (2009). Daily family assistance and the psychological well-being of adolescents from Latin American, Asian, and European backgrounds. *Developmental Psychology*, *45*, 1177–1189. doi:10.1037/a0014728

Telzer, E. H., Fuligni, A. J., & Gálvan, A. (2016). Identifying a cultural resource: Neural correlates of familial influence on risk taking among Mexican-origin adolescents. In J. Y. Chiao, S.-C. Li, R. Seligman, & R. Turner (Eds.), *The Oxford handbook of cultural neuroscience* (pp. 209–221). New York, NY: Oxford University Press.

Telzer, E. H., Fuligni, A. J., Lieberman, M. D., & Gálvan, A. (2013a). Meaningful family relationships: Neurocognitive buffers of adolescent risk taking. *Journal of Cognitive Neuroscience*, *25*, 374–387. doi:10.1162/jocn_a_00331

Telzer, E. H., Fuligni, A. J., Lieberman, M. D., & Gálvan, A. (2013b). Ventral striatum activation to prosocial rewards predicts longitudinal declines in adolescent risk taking. *Developmental Cognitive Neuroscience*, *3*, 45–52. doi:10.1016/j.dcn.2012.08.004

Telzer, E. H., Humphreys, K., Shapiro, M., & Tottenham, N. L. (2013). Amygdala sensitivity to race is not present in childhood but emerges in adolescence. *Journal of Cognitive Neuroscience*, *25*, 234–244. doi:10.1162/jocn_a_00311

Telzer, E. H., Masten, C. L., Berkman, E. T., Lieberman, M. D., & Fuligni, A. J. (2010). Gaining while giving: An fMRI study of the rewards of family assistance among White and Latino youth. *Social Neuroscience*, *5*, 508–518. doi:10.1080/17470911003687913

Telzer, E. H., McCormick, E. M., Peters, S., Cosme, D., Pfeifer, J. H., & van Duijvenvoorde, A. C. K. (2018). Methodological considerations for developmental longitudinal fMRI research. *Developmental Cognitive Neuroscience*, *33*, 149–160. doi:10.1016/j.dcn.2018.02.004

Telzer, E. H., Qu, Y., & Lin, L. C. (2017). Neural processes underlying cultural differences in cognitive persistence. *NeuroImage*, *156*, 224–231. doi:10.1016/j.neuroimage.2017.05.034

Todd, R. M., Evans, J. W., Morris, D., Lewis, M. D., & Taylor, M. J. (2011). The changing face of emotion: Age-related patterns of amygdala activation to salient faces. *Social Cognitive and Affective Neuroscience*, *6*, 12–23. doi:10.1093/scan/nsq007

Trends in International Mathematics and Science Study. (2011). *Mathematics achievement of fourth- and eighth-graders in 2011*. Retrieved from https://nces.ed.gov/TIMSS/results11_math11.asp

Tomalski, P., Moore, D. G., Ribeiro, H., Axelsson, E. L., Murphy, E., Karmiloff-Smith, A., . . . Kushnerenko, E. (2013). Socioeconomic status and functional brain development—Associations in early infancy. *Developmental Science*, *16*, 676–687.

Tooley, U. A., Mackey, A. P., Ciric, R., Ruparel, K., Moore, T. M., Gur, R. C., . . . Bassett, D. S. (2020). Associations between neighborhood SES and functional brain network development. *Cerebral Cortex*, *30*, 1–19. doi:10.1093/cercor/bhz066

Triandis, H. C. (1995). *Individualism & collectivism*. Boulder, CO: Westview Press.

Tsai, J., & Qu, Y. (2018). The promise of neuroscience for understanding the cultural shaping of emotion and other feelings. *Culture and Brain*, *6*, 99–101.

van Hoorn, J., Shablack, H., Lindquist, K., & Telzer, E. H. (2019). Incorporating the social context into neurocognitive models of adolescent decision-making: A neuroimaging meta-analysis. *Neuroscience & Biobehavioral Reviews*, *101*, 129–142.

Varnum, M. E. W., Shi, Z., Chen, A., Qiu, J., & Han, S. (2014). When "your" reward is the same as "my" reward: Self-construal priming shifts neural responses to own vs. friends' rewards. *NeuroImage*, *87*, 164–269. doi:10.1016/j.neuroimage.2013.10.042

Vijayakumar, N., Cheng, T. W., & Pfeifer, J. H. (2017). Neural correlates of social exclusion across ages: A coordinate-based meta-analysis of functional MRI studies. *NeuroImage*, *153*, 359–368. doi:10.1016/j.neuroimage.2017.02.050

Vogel, M., Monesson, A., & Scott, L. S. (2012). Building biases in infancy: The influence of race on face and voice emotion matching. *Developmental Science*, *15*, 359–372. doi:10.1111/j.1467-7687.2012.01138.x

Wang, F., Peng, K., Chechlacz, M., Humphreys, G. W., & Sui, J. (2017). The neural basis of independence versus interdependence orientations: A voxel-based morphometric analysis of brain volume. *Psychological Science*, *28*, 519–529. doi:10.1177/0956797616689079

Weisner, T. S. (2002). Ecocultural understanding of children's developmental pathways. *Human Development*, *45*, 275–281.

Weisner, T. S. (2013). Culture. In M. K. Underwood & L. H. Rosen (Eds.), *Social development: Relationships in infancy, childhood, and adolescence* (pp. 372–402). New York, NY: Guilford.

Yeager, D. S., & Walton, G. M. (2011). Social-psychological interventions in education: They're not magic. *Review of Educational Research*, *81*, 267–301.

Yeager, D. S., Walton, G. M., Brady, S. T., Akcinar, E. N., Paunesku, D., Keane, L., . . . Dweck, C. S. (2016). Teaching a lay theory before college narrows achievement gaps at scale. *Proceedings of the National Academy of Sciences, USA*, *113*, E3341–E3348. doi:10.1073/pnas.1524360113

Yu, Q., Abe, N., King, A., Yoon, C., Liberzon, I., & Kitayama, S. (2019). Cultural variation in the gray matter volume of the prefrontal cortex is moderated by the dopamine D4 receptor gene (DRD4). *Cerebral Cortex*, *29*, 3922–3931. doi:10.1093/cercor/bhy271