

Special Issue Article

The Future of Developmental Psychopathology: Honoring the Contributions of Dante Cicchetti

A multisystem model for understanding stress and adaptation in ethnically and racially diverse youth

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Abstract

Contemporary biological and contextually based theoretical frameworks have conceptualized how stress exposure may influence adaptation in youth. However, nearly all of this scholarship neglects the role of specific contextual features and/or biological processes that are involved in ethnic-racial minority youth's responses and adaptation to sociocultural stressors. Drawing on the theoretical principles of the developmental psychopathology framework and contemporary models of stress and adaptation, this article proposes a new multisystem model that explains how multiple levels and systems within and outside of individual youth influence their sociocultural adaptation. We provide empirical evidence to support components of this multisystem model. We propose that research based on our new theoretical framework will capture the sociocultural experiences of ethnic-racial minority youth by centering processes that are relevant to their lived experiences, coping, and adjustment. In doing so, this model will inform psychosocial interventions focused on promoting healthy adaptation among ethnic and racial diverse youth. Finally, we offer recommendations to guide future research on stress and adaptation among ethnic and racial diverse youth, in particular, and developmental psychopathology more broadly.

Keywords: adaptation; coping; ethnic-racial minority youth; physiology; sociocultural stress

(Received 15 January 2024; revised 11 February 2024; accepted 21 February 2024; First Published online 20 March 2024)

Sociocultural and contextual experiences influence youth's perceptions and responses to stress as well as how youth and their families adapt to stressful life experiences (Bernard et al., 2021; Clark et al., 1999; García Coll et al., 1996; McEwen, 1998; Murry et al., 2018; Spencer et al., 1997; Suárez-Orozco et al., 2018). However, scholars who study stress and adaptation have failed to produce an integrative model that can account for the complex interconnections and transactions among stressful life experiences, physiological functioning, coping processes, and adaptational outcomes in diverse and historically minoritized youth. Moreover, given that most of the literature on stress, coping, and physiological functioning has been conducted with individuals from European American descent (Pedersen et al., 2022), little is known about the ways that youth's sociocultural experiences and intersectional identities influence transactions between stress exposure and adaptational outcomes in ethnic and racial diverse youth.

Developing an integrative model that provides a comprehensive understanding of the linkages between stress and adaptation among diverse and historically minoritized youth is important because these youth are exposed to high levels of general and race-based stress (López et al., 2017; Williams, 2018), and utilize different coping

strategies to adapt and navigate different sociocultural experiences (Clark et al., 1999; Gaylord-Harden et al., 2012). In addition, ethnic and racial diverse youth with other intersecting marginalized identities (e.g., women, immigrants, sexual minorities, and youth with disabilities) are particularly vulnerable to stressful life experiences and poor adaptational outcomes (Kim et al., 2018; Leary, 2019; Mereish et al., 2022). Therefore, this article briefly reviews existing theoretical models focused on stress exposure and adaptational outcomes. This review sets the stage for us to propose a new theoretical framework. Our framework integrates the unique features of contemporary models on stress and adaptation and extend them by providing a more nuanced and multisystemic approach to understanding pathways from stress exposure to health and adaptational outcomes in youth of color. In addition, we offer empirical evidence to support different components of this multisystem model. We also highlight how the model may inform future research on stress and adaptation among ethnic and racial diverse youth and illustrate how it may contribute to future directions in developmental psychopathology.

Contemporary models on context, stress, coping, physiology, and adaptation

In the nascent stages of research on stress, multiple scholars argued that the direct experience of a stressor, referring to an environmental demand that requires responses that exceed the adaptive capacity of an organism or threaten homeostasis (Chrousos, 1998), can lead

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Cite this article: Tyrell, F. A., Wang, Y. S., Eboigbe, L. I., & Skeeter, B. D. (2024). A multisystem model for understanding stress and adaptation in ethnically and racially diverse youth. *Development and Psychopathology* 36: 2439–2451, <https://doi.org/10.1017/S0954579424000592>



to different psychological and behavioral outcomes (McEwen, 1998; Selye, 1956). However, some theoretical models, such as the phenomenological variant of ecological systems theory (PVEST; Spencer et al., 1997), purported that the individual's perception and meaning making about the stressful life experience are important to their coping responses and adaptational outcomes. The PVEST model also theorized that youth adopt different coping strategies in response to stress that can be either adaptive or maladaptive. Other scholars, including García Coll et al. (1996), extended this body of literature, emphasizing the additional burden placed on historically minoritized youth and families to adopt specific cultural values and practices to protect them from various sociocultural stressors. In their integrative model for the study of developmental competencies in minority children, García Coll et al. (1996) highlighted the role of social position (race-ethnicity, gender) to the adaptation of minority children. These theoretical models provided a strong foundation for our understanding of how sociocultural context impacts ethnic and racial minority youth's adaptation; nonetheless, they often neglected or de-emphasized the importance of biological processes in diverse youth's health and adaptation.

Several key theoretical models have acknowledged the relevance of biological processes for understanding how youth adapt to stress. For example, McEwen (1998) proposed the allostatic load model that posits that the perception of stress by the brain initiates both physiological and behavioral responses that ultimately lead to changes in allostasis and adaptation. Over time, these processes have cumulative effects on *allostatic load (AL)* — a multisystem index assessing neuroendocrine, metabolic, cardiovascular, and immune functioning that captures the physiological wear and tear of the brain and body. McEwen (1998) also argued that both acute and chronic stress can have long-term health consequences, but the impact of stress on the individual depends on their genetics and environmental experiences. Although McEwen's model has been used to explain the biological consequences of stress among individuals from different cultural and racial groups, it does not capture how the unique sociocultural and contextual demands experienced by historically minoritized youth affect their physiological functioning.

Other contemporary theoretical frameworks have aimed to provide a more holistic understanding about the role of biological processes in the adaptation of stress among ethnic and racial diverse youth. For example, Clark et al. (1999) proposed the biopsychosocial model of perceived racism to explain the impact of race-based stress on minoritized youth's psychological and physiological well-being. According to Clark et al. (1999), the perception of specific environmental stressors may lead to exaggerated psychological and physiological responses, but the impact of these environmental stressors depends on an individual's constitutional (e.g., skin tone, family history of hypertension), sociodemographic, psychological, and behavioral (e.g., Type A behavior, neuroticism, and self-esteem) factors. Similar to contextually based frameworks by Clark et al. (1999) and García Coll et al. (1996), Spencer et al. (1997) posited that historically minoritized youth utilize different coping strategies to deal with different forms of sociocultural stress. The scholars argued that race-based stressors are unique to other stressors and youth of color must employ different coping strategies to effectively navigate their environments. Thus, the use of adaptive or maladaptive coping strategies in response to sociocultural stress and unique contextual demands may lead to divergent physiological responses. Recent theoretical models, such as the culturally-informed adverse childhood experiences (C-ACE) model (Bernard et al., 2021), have expanded on the fundamental premise of

the biopsychosocial model of perceived racism to highlight the importance of understanding the influences of sociohistorical context, intergenerational trauma, and multiple forms of environmental stressors (general and race-based stressors) on minoritized youth's well-being and adaptation.

Families and communities are pivotal to the successful adaptation of youth of color (Constante et al., 2019; Doan et al., 2022; Murry et al., 2018). However, these contextual features are often neglected in models of stress, physiology, and adaptation. Recent theoretical models have emphasized the need to consider the cultural assets and strengths of families and communities in understanding youth of color's adaptation to stress. For example, Murry et al. (2018) applied a family systems approach to elucidate how Black American families and children navigate sociocultural stressors. Their integrative model highlights the unique cultural strengths of Black families in responding to and navigating overwhelming sociocultural stressors, while at the same time protecting and promoting youth's successful thriving and adaptation. Nonetheless, these models do not capture the sociocultural experiences of all ethnic and racial diverse youth. Often missing from this literature is reference to the unique sociocultural and intersectional experiences of diverse youth of color from immigrant-origin backgrounds. The integrative risk and resilience model for the adaptation of immigrant-origin children and youth (Suárez-Orozco et al., 2018) is one of the few models that has produced a culturally-relevant framework recognizing the unique challenges and resilience of immigrant-origin youth and their families. In their model, the authors incorporated the global and political contexts in understanding youth's adaptation and illustrated how immigrant-origin youth must develop competencies for both developmental and acculturative (knowledge and skills acquired to navigate different cultural contexts) tasks.

A new multisystem model of stress and adaptation for ethnic and racial diverse youth

The theoretical models described above offer unique information about how stress, biology, and sociocultural processes influence diverse youth's coping and adaptation. However, each model lacks information that may be crucial to a comprehensive understanding of stress and adaptation in ethnic and racial diverse youth living in the United States. Therefore, a primary aim of this article is to propose a multisystem framework that incorporates distinct features of these contemporary models, while illuminating interconnections and processes that may be pertinent to understanding the adaptation of diverse youth.

Figure 1 illustrates our proposed new model of stress and adaptation for ethnic and racial diverse youth. As illustrated in the model, exposure to multiple sociocultural and contextual stressors influences an individual's perception of stress (Clark et al., 1999; McEwen, 1998; Murry et al., 2018). Ethnic and racial diverse youth may perceive environmental stressors differently based on whether the stressful event is controllable or uncontrollable (Bollini et al., 2004; Liu et al., 2021) and the extent to which this stressful experience is shared by everyone in the broader social context (e.g., COVID-19, natural disasters, major life events) or unique to their lived experiences as historically minoritized individuals (e.g., racism, xenophobia, acculturation; Bernard et al., 2022; Clark et al., 1999). In response to these sociocultural stressors, youth may adopt certain coping strategies (Clark et al., 1999; García Coll et al., 1996; Murry et al., 2018; Spencer et al., 1997; Suárez-Orozco et al., 2018). For diverse youth, these strategies may entail coping processes that are commonly utilized by individuals from the dominant, mainstream culture

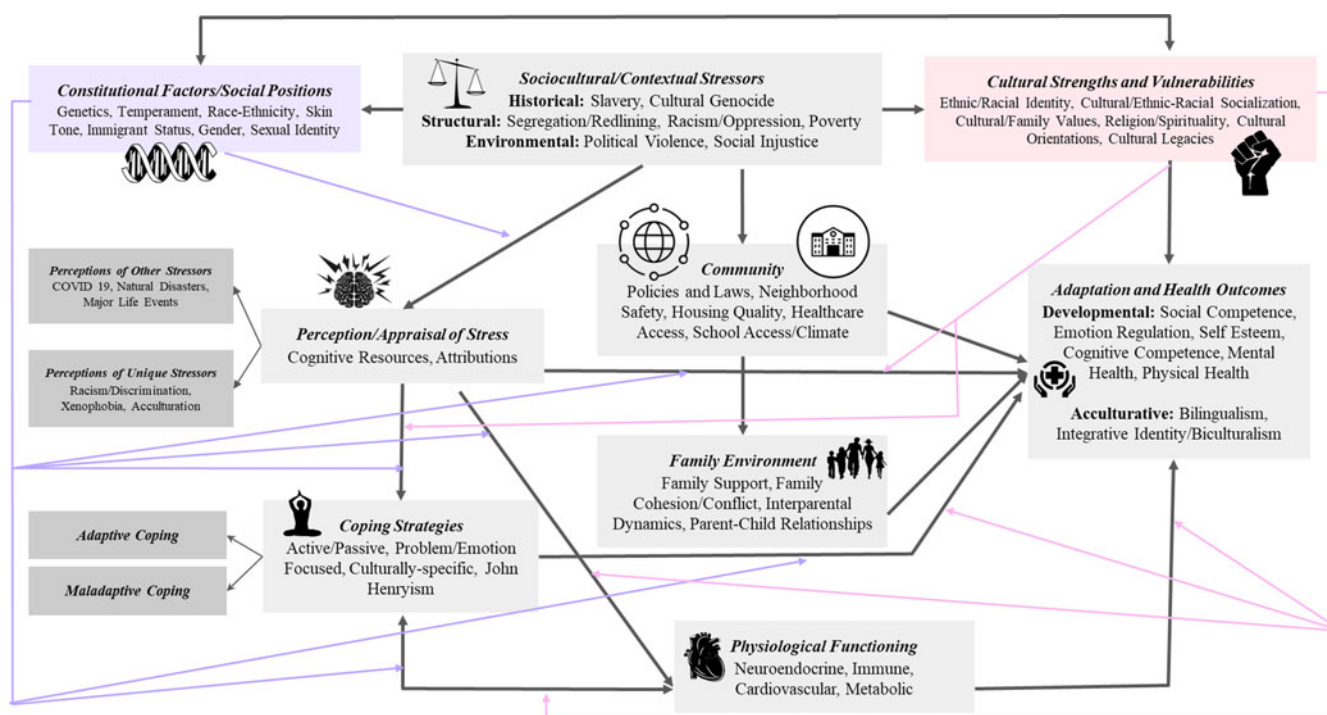


Figure 1. Multisystem model of stress and adaptation for ethnic and racial diverse youth.

(e.g., problem-focused versus emotion-focused, active versus distraction). However, to survive and adapt to an environment that undervalues the humanity and well-being of ethnic and racial diverse youth, different cultural groups developed specific cultural heritages, legacies, and values that teach youth culturally-specific coping strategies (e.g., communalism, religion/spirituality, preparation for bias) to navigate race-based stress (García Coll et al., 1996; Murry et al., 2018; Spencer et al., 1997).

Both mainstream and culturally-specific coping processes are context-dependent and can be perceived as maladaptive or adaptive given the appropriateness and effectiveness of the coping strategy employed in response to the sociocultural stressor (Bendezú & Wadsworth, 2017; Gaylord-Harden et al., 2011; Umaña-Taylor & Hill, 2020). Thus, the perception of general and race-based stress or the utilization of mainstream or culturally-specific coping strategies may lead to divergent physiological responses that are triggered by the hyperactivation or hypoactivation of multiple neurobiological systems (e.g., neuroendocrine, immune, cardiovascular, metabolic; Clark et al., 1999; Gunnar & Vazquez, 2001; McEwen, 2019). In turn, the experience of physiological arousal or activity (e.g., increased heart rate, perspiration) may activate specific coping responses. Ultimately, youth's perception of sociocultural stress, coping strategies, and physiological responses may influence their adaptation and health outcomes. While for most diverse youth, adaptation is based on their competence and attainment of age-salient developmental milestones, other diverse youth from immigrant-origin backgrounds must acquire skills and identities that allow them to navigate the cultural values and beliefs of their host and heritage cultures (Suárez-Orozco et al., 2018).

Although our multisystem model illuminates the pathway from stress to adaptation at the individual level, this theoretical framework also considers how sociocultural stressors (historical, structural) may impact diverse youth's adaptation via their community and family environments. Experiences in different sociocultural and historical

contexts may lead to the acquisition of cultural strengths and vulnerabilities that may modify and/or directly support or undermine youth's adaptation. Furthermore, sociocultural and historical conditions may leave some youth more susceptible to stress and poor adaptation based on their social positions (e.g., gender, race-ethnicity, immigrant status, sexual identity) and constitutional factors (e.g., temperament, genetics, skin tone). It is important to note that while this multisystem framework recognizes the role of multiple levels and systems in diverse youth's adaptation to sociocultural stress, the model does not account for all possible connections across these systems. For example, ample evidence indicates that community and family environments can modify the direct and indirect pathways from stress to youth's adaptation (Brody et al., 2006; Henry et al., 2015).

Empirical support for the multisystem model

Although the multisystem model illuminates opportunities for new research questions and inquiry, various components of this model have been supported by previous research. The following sections offer empirical evidence to support the proposed model.

Sociocultural/contextual stressor and perception of stress

In general, research has been limited in broadening our understanding of how structural inequities, sociopolitical and historical context, and other sociocultural stressors impact the development and adaptation of diverse youth and their families (García Coll et al., 1996; Murry et al., 2018; Tyrell & Masten, 2022). However, the legacies of slavery, colonialism, poverty, segregation, and racism continue to have enduring and debilitating effects on the current lived experiences and opportunities available to historically minoritized youth and their families. Although psychological researchers tend to focus on understanding processes at the individual level, one of the primary reasons that can account for the dearth of research on this topic is due

to the lack of training and inability of scholars to appropriately measure indicators of sociocultural stressors such as structural and institutional racism (Neblett & Neal, 2022). Recently, scholars have highlighted the importance of measuring these constructs and offered nuanced approaches to assess how structural and institutional policies and practices embedded in multiple social systems affect individuals' lives and well-being (Neblett & Neal, 2022; Needham et al., 2023). Previous research assessing cultural and social level stressors often used proxy-based measures (police stops, drug arrests), which may not directly capture the cultural, institutional, and structural policies and practices that are systematically responsible for the conditions that induce stress in the lives of diverse youth and their families (Causadias, 2013; Neblett & Neal, 2022).

Despite the limited amount of research in this area, recent work suggests that exposure to multiple sociocultural stressors is associated with higher rates of perceived stress exposure among diverse youth and adults. For example, in comparison to their White peers, Black, Indigenous, and Latine/x individuals are more likely to report elevated rates of generalized and race-based stress (Williams, 2018). During the COVID-19 pandemic after a significant rise in racist and xenophobic encounters and policies, 82% of Asian American youth reported experiencing discrimination (Ermis-Demirtas et al., 2022), which was substantially greater than the average rates reported pre-COVID-19 (60%–70%; Huynh & Fuligni, 2010; Wang & Atwal, 2015). Recently, Hope et al. (2021) found that Black youth who reported more experiences of racism at the individual, cultural, and institutional level i.e., multilevel racism) endorsed greater anticipatory racism-related stress responses (e.g., prolonged negative thinking, higher expectation of future racism). Research on poverty has revealed similar findings, indicating that exposure to greater poverty is associated with higher levels of perceived discrimination (Fuller-Rowell et al., 2012). Finally, recent work on unjust policing and police stops showed that youth of color who witnessed or experience unjust or intrusive police stops reported higher levels of emotional and psychological distress than their unexposed peers (Jackson et al., 2023).

Perception of stress and adaptation

Ample evidence has shown that exposure to stressful life experiences is associated with higher rates of internalizing and externalizing symptoms. A recent meta-analysis with 13,340 adolescents found moderate effects ($r_s = .28-.33$) for stressful life events for both internalizing and externalizing psychopathology (March-Llanes et al., 2017). This finding is consistent with empirical evidence suggesting that higher perception of stress or greater exposure to stressful life events is associated with poor socioemotional adaptation (Jenness et al., 2019). Similarly, exposure to high levels of ethnic-racial discrimination is associated with higher levels of sleep disturbance (Yip et al., 2022), internalizing and externalizing symptoms (Anderson & Mayes, 2010; Gaylord-Harden & Cunningham, 2009), and poor academic outcomes (e.g., lower grades, academic motivation and success; Levy et al., 2016) among youth of color. Empirical evidence suggests that some youth, such as Black immigrants and Asian Americans, are more vulnerable to ethnic-racial discrimination than their African American peers due to lack of preparation for exposure to discriminatory experiences (Hitti et al., 2020; Seaton et al., 2008). Less research has explored the cross-sectional and longitudinal effects of acculturative stress on youth's adaptation, however, emerging research with Latinx, Asian, and Arab

immigrant-origin youth have shown that acculturative stress (stress associated with acculturating to new cultures) is associated with higher rates of anxiety and depression (Ahmed et al., 2011; Leong et al., 2013).

Few studies have evaluated the unique contribution of multiple sociocultural stressors on youth's socioemotional adaptation. This limitation could be attributed to the use of small sample sizes that often typify studies focused on historically marginalized populations (Bornstein et al., 2013) or due to the inadvertent exclusion of youth who have multiple intersectional identities from research. One of the few studies that have evaluated the perceptions of multiple forms of sociocultural stress on youth's adaptation found that racial discrimination was uniquely associated with depressive and anxiety symptoms above and beyond the effects of other types of generalized stress (peer stress, economic stress, family stress, and exposure to violence) in a sample of African American adolescents (Gaylord-Harden & Cunningham, 2009). A recent study investigating the effects of different types of adversity/social stressors on internalizing symptoms in a national representative sample of Black youth in the U.S., found that racial discrimination was positively associated with youth's internalizing symptoms even after accounting for the effects of generalized stressors such as exposure to parental psychopathology, domestic and neighborhood violence (Bernard et al., 2022). Although these analyses are less common in immigrant populations, research using a latent composite of racial discrimination and acculturative stress in a sample of Arab American adolescents also found that "socio-cultural adversities" were associated with psychological distress (Ahmed et al., 2011).

Perception of stress and coping

Research has established links between stress exposure and coping responses in youth of color (Brittian et al., 2013; Forster et al., 2022; Gaylord-Harden & Cunningham, 2009). However, the majority of studies on stress and coping responses has been conducted with cross-sectional designs (Forster et al., 2022; Gaylord-Harden & Cunningham, 2009), investigates mainstream coping strategies (e.g., problem-focused versus emotion-focused, active coping versus distraction coping; Pelekanakis et al., 2022; Wicks et al., 2022) or examines the moderating (Christophe et al., 2019; Forster et al., 2022; Gaylord-Harden & Cunningham, 2009) rather than the mediating role of coping on the association between stress exposure and youth's socioemotional adaptation. Nevertheless, theoretical and empirical evidence suggest that youth of color use different coping strategies in response to different types of sociocultural stress (Clark et al., 1999; Gaylord-Harden et al., 2012) and the use of distinct coping strategies, in turn, are associated with divergent adaptational outcomes (Chen et al., 2023; Gaylord-Harden & Cunningham, 2009). For example, findings obtained from a sample of Somali and Latine/x immigrant youth showed that adolescents who reported more experiences of discrimination and predominately use problem-focused coping endorsed fewer depressive symptoms than adolescents who used emotion-focused coping (Forster et al., 2022).

In addition to mainstream coping strategies, youth of color also utilize culturally-relevant coping responses to navigate race-based stress, but few studies have looked at the role of culturally-relevant coping strategies, such as communalism or spirituality in understanding diverse youth's adaptive responses to sociocultural stress and even less research has evaluated the differential effects of mainstream versus culturally-relevant coping strategies on youth's

developmental outcomes. One of the few studies with African American adolescents showed that although exposure to discrimination stress, mainstream coping strategies (active coping, distraction coping, avoidant coping), and culturally-relevant coping (emotional debriefing, spiritually centered coping, communalistic/collective coping) were uniquely associated with youth's depressive and anxiety symptoms, only cultural-relevant coping moderated the association between discriminatory stress and anxiety (Gaylord-Harden & Cunningham, 2009). Taken together, these findings indicate that more research is needed to understand the differential effects of mainstream versus culturally-relevant coping strategies on the pathway from stress exposure to socioemotional adaptation in ethnic and racial diverse youth.

Perception of stress and physiological functioning

Children and adolescents who are exposed to a high number of stressful life experiences exhibited higher levels of physiological dysregulation (Dich et al., 2015). However, some individuals are more susceptible to poor physiological functioning. For example, Evans and Kim (2007) have shown that youth who are exposed to higher levels of stress and received low levels of maternal support are at greater risk for poor physiological functioning. Multisystemic indices of AL are lauded as the best assessment of physiological dysregulation (Guidi et al., 2021; Juster et al., 2010). However, the vast majority of research on stress exposure and physiological dysregulation only include single biomarkers even though research with single biomarkers using diverse samples of children and adolescents have produced mixed findings. For example, some scholars have found that perceived exposure to daily or major life stress was not related to diastolic and systolic blood pressure in early adolescence (ages 11–13; Caputo et al., 2000); however, other empirical evidence suggests that exposure to negative, chronic stressors was related to diastolic and systolic blood pressure in adolescents between the ages of 14 and 16 (Brady & Matthews, 2006). These findings point to the importance of using a multisystemic index of physiological functioning as well as highlight how timing, type of stressor, and amount of exposure to stress may impact physiological regulation.

Research on perceived ethnic-racial discrimination and physiological dysregulation has increased over the past few years. In one of the first studies examining the association between perceived discrimination and AL as assessed by cortisol, epinephrine, norepinephrine, blood pressure, C-Reactive Protein (CRP), and body mass index in African American adolescents, Brody et al. (2014) found that discrimination was related to higher AL, but only in youth who experienced low levels of emotional support from their mothers and peers. Findings with single biomarkers of physiological functioning indicated that perceived discrimination was related to higher levels of blood pressure, CRP and BMI in Black youth (Goosby et al., 2015) and greater cortisol output in Mexican-American adolescents (Zeiders et al., 2012).

In comparison to research on perceived stress and ethnic-racial discrimination, little is known about the link between acculturative stress and physiological functioning. Empirical evidence primarily based on proxy indicators (e.g., time spent living in the US) of acculturative stress has revealed a positive association between acculturative stress and physiological dysregulation (i.e., blunted cortisol awakening and flatter diurnal cortisol responses; Arévalo et al., 2014; Torres et al., 2018) in Black and Latine/x adult samples. For example, two empirical studies with African and Mexican-American adult

immigrants found that the amount of time spent living in the U.S. was associated with elevated AL and physiological dysregulation in these populations (Bingham et al., 2016; Kaestner et al., 2009). Equally noticeable is the lack of research on the effects of acculturative stress on physiological functioning in children and adolescent immigrants. However, recent work suggests that developmental timing matters. Scholars have shown that individuals who migrated to the U.S. during middle childhood or adolescence and were exposed to chronic stress exhibited higher levels of AL at older ages, but not among individuals who arrived in the U.S. at earlier or later ages (Arévalo et al., 2014).

Coping and physiological functioning

Despite empirical evidence indicating that there is an association between coping responses and physiological functioning (Perez et al., 2023; Robinson & Thomas Tobin, 2021; Singleton et al., 2008), the direction of this association in the pathway from stress to adaptation is still unclear. However, emerging literature suggests specific coping strategies may be associated with discrete physiological responses and some of these effects may be context-dependent (Bendezú & Wadsworth, 2017; Perez et al., 2023). For example, studies have shown that higher levels of shift-and-persist coping (i.e., reappraising and reframing a stressful experience, while maintaining optimism and meaning in the face of adversity) are associated with less low-grade inflammation among low SES adolescents (Chen et al., 2019; Robinson & Thomas Tobin, 2021), whereas other studies have shown that John Henryism/skin deep resilience coping (i.e., high effortful coping with a single-minded determination to achieve one's goal despite adversity) is associated with higher levels of AL in Black American youth and adults (Robinson & Thomas Tobin, 2021). Additionally, research has shown that whereas passive coping (i.e., avoidance) is associated with higher blood pressure, active coping (i.e., proactively figuring things out) is associated with lower blood pressure (Singleton et al., 2008). However, there is evidence to suggest that context may alter the utility and effectiveness of a coping strategy. For example, an empirical study with a majority of ethnic and racial diverse youth (i.e., 62% Hispanic/Latine/x, 11% Black, 7% Native American) revealed that active coping was related to faster cortisol reactivity to a stress task among youth who experienced multiple school hassles, but active coping was associated with slower cortisol reactivity among youth who did not report having any school hassles (Perez et al., 2023). These findings are consistent with current theoretical arguments indicating that successful adaptation occurs when individuals' coping and physiological responses are a "regulatory fit" or match their environmental contexts (Bendezú & Wadsworth, 2017; Wadsworth et al., 2018).

Coping, physiological functioning, and adaptation

Distinct coping strategies are associated with individual differences in adaptational outcomes (Chen et al., 2023; Gaylord-Harden & Cunningham, 2009). For example, in a recent cross-sectional study evaluating the impact of John Henryism/skin deep resilience coping and shift-and-persist coping on health outcomes, researchers found that shift-and-persist coping style was associated with positive mental (lower anxiety and depression) and physical (lower rates of asthma and inflammation) health outcomes, whereas John Henryism coping was associated with good mental health, but poor physical health outcomes (Chen et al., 2023).

The effectiveness of coping strategies on the adaptation among youth of color is also context-dependent. A longitudinal study with Latine/x adolescents experiencing community violence found that active coping was negatively associated with internalizing problems, whereas avoidant coping was positively associated with internalizing problems and posttraumatic stress symptoms (Gudiño *et al.*, 2017). However, greater reliance on active coping was related to increased posttraumatic stress problems at high levels of violence exposure. Thus, the use of specific coping strategies needs to match the environmental demands for successful adaptation.

Stress-related physiological changes across the neurobiological systems play an important role in mental and physical health outcomes (Stephoe & Poole, 2022). Notably, indicators of hypothalamic-pituitary-adrenal axis dysregulation are linked to a host of negative outcomes. For example, flatter diurnal cortisol slopes are related to fatigue, depression, internalizing and externalizing disorders, inflammatory disorders, obesity, cardiovascular disease and cancer in youth and adults (Adam *et al.*, 2017). Similarly, higher low-grade inflammation, a measure of immune system dysregulation, is robustly linked to internalizing symptoms (Flouri *et al.*, 2019) and physical disease (Hunter, 2012). Additionally, higher allostatic load is linked to unhealthy lifestyle habits, cardiovascular disease, lower bone density, alcohol dependence, and internalizing disorders (Guidi *et al.*, 2021). Among African American adolescents and young adults, AL has been associated with higher depressive symptoms and faster cellular aging (Brody *et al.*, 2014; Ehrlich *et al.*, 2023). However, although physiological dysregulation has been shown to have negative consequences for ethnic-racial minority youth (Rogosch *et al.*, 2011; Zeiders *et al.*, 2012), most of the samples in these studies are comprised of non-Hispanic White individuals. Thus, more research is needed to understand how physiological functioning affects adaptation in ethnic-racial minority youth.

Sociocultural stressors, community, and adaptation

Systemic inequities and hostile sociopolitical climates disrupt and destabilize communities. Research has shown that historical racism (i.e. ideologies, behaviors, beliefs) is associated with economic, educational, and social disadvantage within communities of color (Shonkoff *et al.*, 2021). Poverty, redlining, and segregation leads to limited access to affordable housing and health care, food insecurity, less cohesive communities, and higher incidences of neighborhood violence (Bailey *et al.*, 2017; Lynch *et al.*, 2021). In turn, these factors create enduring ethnic and racial health disparities. The sociopolitical climate also matters to the well-being of communities. Societies that believe in cultural pluralism (values that acknowledge the unique contribution and acceptance of individuals from different cultural groups and identities) create laws and policies (e.g., culturally-sensitive health care, multicultural curricula in schools) that support multiculturalism and the integration of minoritized communities in the larger culture (Berry, 2005; Suárez-Orozco *et al.*, 2018). However, societies that promote assimilation and exclusion of non-dominant cultural groups often enact laws that undermine the well-being of minoritized communities. For example, research on undocumented youth and families show that fear of deportation and relocation, which are heightened by xenophobic laws and policies, induce worry and hypervigilance among racialized immigrant communities (Aranda & Vaquera, 2015). Moreover, the perceived context of reception for immigrants impacts economic opportunities, feelings of isolation and belonging, and the ability of

individuals to develop social ties and connections within their communities (Schwartz *et al.*, 2014).

Community, family context, and adaptation

Community-level factors are crucial to the social, physical, and psychological well-being of families and their children. Neighborhood social capital, social cohesion, and community violence have direct impacts on youth's academic and psychological well-being (Caughy *et al.*, 2006; Dorsey & Forehand, 2003) as well as indirect effects through their influence on family functioning (Dorsey & Forehand, 2003; Gorman-Smith *et al.*, 2004). In addition, what occurs at the community level may affect families' caregiving and socialization practices, which in turn, have implications for diverse youth's adaptation and developmental outcomes. Community-based institutions and settings can either support or undermine family or caregiving practices. For instance, empirical evidence suggests that when there is a congruence between children's school and family environments, students tend to have better academic and developmental outcomes (Castagno & Brayboy, 2008; Lohman *et al.*, 2007). In a study with middle and high school students, findings showed that when there is a high match between school and family environments, as measured by levels of autonomy granting behavior and connectedness, children reported better psychosocial adjustment (e.g., lower internalizing and externalizing symptoms, greater sense of peer group membership) and academic achievement (e.g., fewer disciplinary actions, higher grade point averages, lower school absences) compared to youth who have low or discrepant matches between their school and family environments (Lohman *et al.*, 2007). These findings highlight the importance of infusing cultural and family values into community-based practices and settings to support the positive adaptation of ethnic and racial diverse youth.

Family members or caregivers may engage in specific socialization practices to protect youth from the harmful effects of their immediate social contexts. Although harsh community environments characterized by exposure to community violence and low social capital may increase the probability for negative developmental outcomes (Caughy *et al.*, 2006; Gorman-Smith *et al.*, 2004), supportive family environments may mitigate these negative effects. Using data with a sample of Black and Latine/x American males living in inner-city neighborhoods, researchers found that youth who were exposed to high levels of community violence, but belong to well-functioning families (e.g., positive parenting practices, emotional cohesion) engage in less delinquent activities than youth who were from struggling families. In the context of racism and discrimination, parents and families who engage in positive parenting and ethnic-racial socialization practices may attenuate the effects of negative neighborhood social climates on youth adaptation (Caughy *et al.*, 2006; Henry *et al.*, 2015).

Family context and adaptation

Family context, including family support, family cohesion/conflict, and parent-child relationship quality, also impact youth's health and adaptation outcomes. Positive parent-child relationships and attachment to parents are related to lower feelings of depression and anxiety, higher cognitive functioning and social competence, and better mental and physical health outcomes in children and adolescents (Papini & Roggman, 1992; Ranson & Urichuk, 2008). A study with racially diverse adolescents found that maternal attachment indirectly reduced depressive symptoms through active coping (Gaylord-Harden *et al.*, 2009). In

contrast, avoidant attachment to fathers is associated with low self-esteem in African and Mexican-American high schoolers (Arbona & Power, 2003).

In immigrant Latine/x families, family cohesion contributes to improvements in youth's problem-solving and self-efficacy and reductions in conduct problems, rule breaking, and psychological distress (Leidy et al., 2010; Marsiglia et al., 2009; Pimentel et al., 2022). Family cohesion can also buffer the negative effects of sociocultural stress. It has served as a significant protective factor for identity exploration, internalizing symptoms, and psychological distress (Constante et al., 2019; Shah et al., 2021). A recent study with African American and Latine/x youth revealed that higher levels of cultural socialization and family cohesion were related to lower anxiety symptoms even after accounting for experiences of racial discrimination (Saleem et al., 2023). However, although family cohesion may buffer the effects of discrimination on youth's psychological distress, some evidence suggests that family cohesion may exacerbate the effects of stress on adaptation (Pimentel et al., 2022), which highlights the complex role that family environments may have on youth's mental health outcomes.

Cultural strengths and vulnerabilities

Cultural processes are important to the positive adaptation of ethnic-racial minority and immigrant youth. Ethnic-racial socialization (ERS; the process through which children learn about the beliefs, attitudes, and values about their ethnicity/race) and ethnic-racial identity (ERI; the process of exploring and internalizing the importance of one's ethnic-racial group membership) are associated with psychosocial adjustment among ethnic-racial minority youth (Rivas-Drake et al., 2014; Umaña-Taylor & Updegraff, 2007). However, whereas some dimensions (e.g., cultural socialization, private regard, internalization, achievement) of ethnic-racial socialization and identity are associated with positive health and developmental outcomes, other dimensions (e.g., preparation for bias, promotion of mistrust, exploration, centrality), depending on the context, can lead to negative cognitive, academic, and socioemotional outcomes (Rivas-Drake et al., 2014; Umaña-Taylor & Hill, 2020). Similarly, immigrant youth who adopt an integrated cultural identity (adopting the values of their heritage and host cultures) are more likely to have better psychosocial adjustment than youth who adopt an assimilated, separatist, or marginalized cultural identity (Berry, 2005; Ferguson et al., 2012). However, recent work suggests that triculturals (youth adopting the values of three cultures) report higher psychological distress than monoculturals (Ferguson et al., 2014).

Existing research has examined the moderating role of cultural processes on the association between stressful life experiences and psychological adjustment among youth of color (Costigan et al., 2010; Jones & Neblett, 2017). For example, research has shown that Afrocentrism (cultural attitudes, beliefs, and behaviors cultivated by individuals of African descendants) can attenuate the effects of racism-related stress on depressive symptoms and other health-related outcomes (Jones & Neblett, 2017). However, less is known about the role of cultural processes on the pathway from stress to adaptation via coping or physiological functioning. Only recently have researchers examined the moderating role of cultural processes on the link between stress exposure and physiological dysregulation. In a cross-sectional study of 119 Black young adults enrolled at a predominately White institution, researchers found that experience of racial discrimination was related to acute parasympathetic responses (Volpe et al., 2019). However, this association was

moderated by ERI centrality (the extent to which an individual's ethnicity-race are important to their identity). At lower levels of ERI centrality, racial discrimination was associated with better physiological responses. Other measures of ERI such as private regard (positive feelings individuals have about their ethnicity-race) did not have an effect on this association between racial discrimination and parasympathetic activity.

Similarly, literature examining the moderating role of cultural processes on chronic stress and coping is still in its nascent stage. However, the emerging literature suggests that cultural processes may either amplify or attenuate the effects of youth's coping responses to stressful life experiences (Brittian et al., 2013; Christophe et al., 2019; Forster et al., 2022). For example, a study with Mexican-American adolescents revealed that the association between perceived discrimination and internalizing symptoms was buffered by distraction coping among youth who score low on Anglo orientation, but not among youth who were high on Anglo orientation (Brittian et al., 2013). Similar findings emerge with a sample of Latine/x youth (Christophe et al., 2019), indicating that greater use of shift-and-persist coping strategies attenuated the association between racial discrimination and depressive symptoms, but not among youth with high ethnic-racial identity. More research is needed to understand the effects of cultural processes on the associations among stress exposure, coping, physiological functioning, and adaptation.

Constitutional factors and social positioning

Intersectional theory purports that individuals with multiple marginalized identities are more susceptible to higher levels of stress and poor adaptation due in part to their limited access to socioeconomic resources and social capital (Crenshaw, 1989). Consistent with this premise, other theoretical frameworks and empirical evidence suggests that certain constitutional factors (skin tone, temperament) and social positions (gender, race-ethnicity, immigrant status, and sexual identity) increase an individual's risk to chronic stress exposure and poor adaptation (García Coll et al., 1996; Shepherd et al., 2023). For instance, Lewis (2023) proposed a theoretical model illustrating that Black women are more vulnerable to poor health outcomes and psychosocial well-being given their frequent encounters with racism and sexism. Findings have supported this claim, showing that racial discrimination was associated with higher levels of cortisol and increased cardiovascular reactivity in Black women, but not among Black men (Brownlow et al., 2019). Moreover, across different age groups, multiple studies revealed that Black/African American women experience higher allostatic load than women and men from different ethnic-racial groups (Chyu & Upchurch, 2011; Geronimus et al., 2006).

Lingering legacies of colonialism and colorism led to discriminatory practices and beliefs that resulted in preferential treatment and privileges to individuals with light-skin tone and Eurocentric features over individuals with dark-skin tone and Afrocentric features (Monk, 2021). Consequently, individuals with darker-skin tone accumulate more experiences of discrimination and vulnerability to poor adaptation. The effects of skin tone on youth adaptation also are gendered in complex ways. Darker-skinned Black males are more likely to experience higher rates of school suspensions and disciplinary actions (Skiba et al., 2022), whereas they tend to fare better in other social domains (e.g., dating, marriage; Landor & McNeil Smith, 2019). Darker-skinned women across all ethnic-racial groups in the US are more likely to experience negative outcomes compared to light-skinned women

(Alexander & Carter, 2022; Hall, 2017). Cumulatively, the small body of research to date suggests that Black and Latine/x children and adults who are exposed to colorist beliefs and have darker-skinned complexion report higher rates of loneliness, anxiety, and depressive symptoms, and these effects seem to be stronger among dark-skinned girls and women (Alexander & Carter, 2022; Hall, 2017; Monk, 2015). More research is needed to understand how skin tone influences pathways from stress exposure to adaptation in ethnic and racial diverse youth.

Immigrant-origin youth of color navigate ethnic-racial discrimination, xenophobia, and acculturative stress because of their intersecting identities (Agi & Rivas-Drake, 2022; Jolie *et al.*, 2021; Kiang *et al.*, 2022). However, the majority of research on immigrant youth's experiences in the U.S. tend to focus on Hispanic/Latine/x individuals (Haft *et al.*, 2021), even though other immigrant-origin youth of color (e.g., Black, Asian, Arab) encounter unique stressful life experiences (anti-Blackness, foreign objectification, minority model stereotyping) that impact their psychosocial well-being and adaptation (Agi & Rivas-Drake, 2022; Ahmed *et al.*, 2011). Moreover, although research has shown that immigrant-origin youth are vulnerable to the effects of multiple sociocultural stressors and poor adaptation (Suárez-Orozco *et al.*, 2018), the immigrant healthy paradox hypothesis stipulates that some immigrant-origin youth of color are more susceptible to poor psychological and health outcomes than others (Bowe, 2017; Marks *et al.*, 2014; Tilley *et al.*, 2021). For example, first generation immigrant youth tend to have healthier profiles than other youth (native-born and later generation peers) despite having access to fewer economic and social resources (Bowe, 2017; Marks *et al.*, 2014). However, recent evidence suggests there are more nuances to the influence of immigrant generational status on youth health outcomes. For example, a recent meta-analysis indicated that while first generation youth report few behavioral symptoms, these youths tend to endorse higher internalizing symptoms compared to later generations (Tilley *et al.*, 2021). Given the mixed findings, it is important to understand which generation of immigrant-origin youth is more vulnerable to the impact of stress exposure on socioemotional adaptation and what mechanisms can account for the individual differences among immigrant-origin youth of color.

Conclusion and future directions

Decades of research have highlighted the complexities of understanding how ethnic and racial diverse youth respond and adapt to multiple types of sociocultural stressors and contextual demands. Contemporary models on stress and adaptation have provided crucial information but an incomplete picture of how youth of color and families navigate stressful life experiences. Capitalizing on empirical evidence and the features of multiple theoretical frameworks, we have proposed a new multisystem model to illustrate how different systems within and outside individual youth of color influence their responses and adaptation to sociocultural stress. In addition to offering empirical evidence to support different components of the proposed model, we also highlighted gaps and limitations in the current literature. In our closing comments, we offer some guidance and recommendations for future research evaluating stress and adaptation among ethnic and racial diverse youth and their families.

Past research is dominated by cross-sectional studies to investigate the impact of stress on adaptation among youth of color. However, longitudinal data are needed to test mechanisms (e.g. coping and physiological responses) and the transactional

associations among stress exposure and socioemotional adaptation in children and youth across developmental time. In addition to clarifying the moderating and mediating mechanisms underlying the association between stress exposure and adaptation, longitudinal studies will help elucidate the reciprocal and directional links between coping and physiological responses as it is unclear in the literature whether coping leads to the emergence of certain physiological responses, physiological responses give rise to specific coping strategies, or both. Furthermore, longitudinal studies may advance our understanding about the differential role of mainstream versus culturally-relevant coping processes across developmental time. Knowledge of the role of coping and physiological responses could inform policy and culturally-relevant intervention programs for youth of color and their families.

The majority of research on stress and physiology to date is focused on older adults. We need to expand research with younger populations to understand *when* exposure to chronic stress leads to the emergence of pathological physiological functioning and poor health trajectories. In a recent study investigating the biological and psychosocial consequences of exposure to cumulative socioeconomic (SES) risk in a low-income sample of 491 ethnic and racial diverse children ages 8–12, we found subgroups of children who reported high exposure to SES risk and mental health problems and high SES risk and AL or both (high mental health problems and AL; Tyrell *et al.*, 2023). The findings suggest that although the majority of children around this age are relatively healthy, evidence suggests that patterns of poor mental and physiological health are emerging among youths who are exposed to chronic social stressors. Thus, knowledge of how the association between stress exposure and adaptation unfolds during key developmental transitions (e.g., early adolescence and emerging adulthood) could serve to open windows of opportunity for targeted interventions to promote healthy adaptation among youth of color.

There also is a need for future research to elucidate the direct and interactive connections between cultural processes and stress physiology in different subgroups of youth of color. In a recent meta-analysis investigating the literature on culture and stress physiology, researchers found that the majority of studies were comprised of Latine/x immigrant samples (Haft *et al.*, 2021). Most of these studies examined how bicultural identities or acculturation to two cultures may influence youth's physiological functioning and adaptation. However, recent theoretical and empirical evidence suggests that other forms of acculturation (tridimensional or polycultural) may be more appropriate in understanding the experiences of youth from other cultural groups who may have to adopt the cultural values and beliefs of three or more cultural groups (Ferguson *et al.*, 2012). Therefore, research is needed with other ethnic and racialized groups of immigrants to create better measurement to capture the cultural experiences of these populations (Agi & Rivas-Drake, 2022) and to understand the generalizability of existing research on culture and stress physiology. Novel research on different cultural groups may illuminate how cultural processes, including navigating three or more cultural orientations, can mitigate or strengthen pathways from early stress exposure to mental and physiological health outcomes in youth.

In addition to examining the role of cultural processes on youth's adaptation, future research needs to capitalize on the principles of intersectional theory to understand which subgroups of historically minoritized youth (women, immigrants, sexual minorities, individuals with disabilities) are more susceptible to

sociocultural stress and poor adaptation. For instance, although Black immigrants experience anti-Blackness, xenophobia, and acculturative stress, not much is known about how their intersectional experiences influence their adaptation. In identifying youth who are more vulnerable to sociocultural stress, we need to know how intersecting identities affect youth's experiences and interactions with different systems and people and how their experiences across different contexts and settings influence their utilization of specific coping processes and ultimately, their mental and physical health outcomes.

Finally, although historically marginalized youth and communities are justified in their apprehension to participate in biological research due to historic scientific and medical mistreatment of these communities (Rivas-Drake et al., 2016), one of the notable lessons from the COVID-19 pandemic is that research focused on addressing health disparities is essential. Therefore, it is important that researchers engage in humane, ethical, and inclusive research practices that will build sustainable and genuine collaborative partnerships with communities of color. To establish and maintain trust with these communities, researchers must be transparent and think more about the communities' interests more so than their research agendas (Gard et al., 2022). Establishing and maintaining healthy community partnerships with historically minoritized communities will allow researchers to develop innovative and culturally-relevant research that will further our understanding of the protective and promotive processes that buffer the negative effects of sociocultural stress and support positive adaptation among ethnic and racial diverse youth and their families.

Conceptual and empirical contributions to developmental psychopathology

Notwithstanding the broader impact on research on stress and adaptation, we believe that this multisystem model of stress and adaptation in ethnically and racially diverse youth will extend and actualize key principles of developmental psychopathology. In their compelling account of developmental psychopathology "coming of age" as a discipline, Cicchetti and Toth (2009) characterized it as an "interdisciplinary scientific field that seeks to elucidate the interplay among the biological, psychological, and sociocultural contexts" of typical and atypical patterns of behaviors. Over the years, despite the expanding literature focused on biological and psychological levels and processes of developmental psychopathology, there has been limited focus on sociocultural influences and the synergistic effects of these different levels of analysis on youth's adaptation. The current multisystem model is intended to enhance developmental psychopathology by encouraging research and providing a roadmap for scholars to integrate sociocultural perspectives and conduct research with ethnic and racial diverse youth through multilevel and multisystem lenses. Consistent with previous efforts to understand processes and mechanisms that shape convergent (i.e., equifinality) and divergent (i.e., multifinality) developmental pathways, patterns, and outcomes, research informed by our model may elucidate how different sociocultural, biological, and psychological processes co-act to influence multiple developmental patterns and pathways towards psychological adaptation. Finally, this new model serves as a framework to support translational research in informing prevention and intervention programs for ethnic and racial diverse youth. Empirical evidence guided by the conceptual underpinnings of our multisystem model has the potential to influence the

development of culturally tailored and community-based interventions that might be more efficacious for historically minoritized youth. We believe that this model will support research and intervention efforts in underexplored territories, which will ultimately generate meaningful advances in the integrative discipline of developmental psychopathology.

Acknowledgments. This article is dedicated to Dr Dante Cicchetti and his contributions to the integrative discipline of developmental psychopathology. The theoretical framework of developmental psychopathology has inspired me (FT) to examine my work through multiple lens and to acquire knowledge from multiple ontologies to develop a strong understanding of the complex patterns underlying the sociocultural adaptation of historically minoritized youth. I also want to thank Dante for the opportunities that you have given me and for your constant encouragement to pursue my passions.

Funding statement. None.

Competing interests. None.

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