


Comparing Associations Between Puberty, Ethnic–Racial Identity, Self-Concept, and Depressive Symptoms Among African American and Caribbean Black Boys

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Research on pubertal development among Black boys is limited. Addressing this gap, we examined associations between three pubertal domains (e.g., voice change, hair growth, and perceived relative timing), depressive symptoms, self-esteem, and self-efficacy, among a nationally representative sample of 395 African American and 164 Caribbean Black boys ($M_{\text{age}} = 15$ years). Moderation by ethnic–racial identity (e.g., racial centrality, racial regard) was also explored. Results indicated that for both ethnic subgroups early voice change increased self-esteem; whereas early voice change increased depressive symptoms among boys who felt society views Blacks more negatively. Buffering effects of ethnic–racial identity also varied significantly between the two groups. Findings suggest that the meaning Black boys ascribe to their ethnic–racial group may explain puberty-linked outcomes.

Empirical evidence suggests that early pubertal timing or maturing earlier than one's peers conveys risks for negative outcomes among both boys and girls (see Mendle, & Ferrero, 2012; Mendle, Turkheimer, & Emery, 2007). Yet early pubertal effects are substantially less well understood among boys than girls (see Deardorff, Hoyt, Carter, & Shirtcliff, 2019). Early development may be particularly detrimental because girls tend to develop earlier than boys and their maturation moves them further away from the thin feminine ideal, whereas boys tend to develop later than girls and their pubertal development causes increased muscle development bringing them closer to the muscular masculine ideal (Blazek & Carter, 2019). If early puberty is problematic for boys, more research is needed to better understand the underlying mechanisms linking early puberty to negative outcomes among this population.

This study focuses on a unique population because the consequences that early puberty may have for Black boys are particularly troubling. Recent national events indicate that pubertal timing may impact the perception others have of Black

boys (Schultz, 2015). Specifically, early pubertal development may result in Black boys appearing older than their chronological age, potentially fostering increased racial discrimination experiences, which may affect adjustment outcomes. Recent research has demonstrated that ethnic–racial identity content (i.e., the significance and meaning that individuals ascribe to being a member of their ethnic–racial group) may protect Black boys from the detrimental effects of early puberty (Carter, Seaton, & Rivas-Drake, 2017). This study evaluated whether ethnic–racial identity moderated the effects of early pubertal timing (i.e., voice change, hair growth, and perceived relative pubertal timing) on depressive symptoms, self-esteem, and self-efficacy among a nationally representative sample of African American and Caribbean Black boys.

Theoretical Frameworks

This study is guided by the contextual amplification hypothesis (Ge & Natsuaki, 2009) and the Phenomenological Variant of Ecological Systems Theory (PVEST; Spencer, 2006; Spencer, Dupree, &

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Hartmann, 1997). The contextual amplification hypothesis posits that early puberty shapes psychosocial contexts, which influences youth outcomes (Ge & Natsuaki, 2009). Adaptation may be difficult because early puberty combined with adverse contextual conditions can overtax the undeveloped coping resources of early developers (Ge & Natsuaki, 2009). Early puberty may be particularly detrimental for adolescents in stressful social environments, such as disadvantaged neighborhoods or harsh parenting practices (Ge & Natsuaki, 2009). However, this theory has not yet integrated ethnicity, race and gender as important contextual amplifiers.

We fill that gap by utilizing the PVEST to explore sociocultural contextual factors that act in concert with the pubertal transition (Spencer, 2006; Spencer, Fegley, & Harpalani, 2003). PVEST considers the unique and cumulative individual–context interactions that stem from being a member of a minority group, which is hypothesized to shape individual experiences and influence individual behaviors over time (Spencer et al., 1997). PVEST includes race, ethnicity, and gender as individual characteristics, which may operate as risk and/or protective factors impacting developmental trajectories and various contexts (Spencer, 2006; Spencer et al., 2003). For some Black youth, social interactions during the pubertal transition may involve negotiating how they are treated and perceived by others as members of their ethnic–racial and gender group (e.g., dealing with disseminated stereotypes related to race and gender; Spencer, 2006). PVEST suggests that normative challenges such as off-timed pubertal maturation may be particularly harmful to Black males given broader societal stereotypes about Black men and boys (Swanson, Cunningham, & Spencer, 2003). Yet, the development of a healthy identity arises from coping behaviors as minority youth appraise their roles in specific situations (Spencer, 2006). Thus, ethnic–racial identity might buffer the negative experiences Black males encounter as a result of the interaction between early pubertal development, race, ethnicity, and gender. Utilizing the contextual amplification hypothesis and PVEST, this study examined whether the effects of early pubertal timing are moderated by ethnic–racial identity among Black boys.

Pubertal Development, Self-Concept, and Depressive Symptoms

Research on associations between early pubertal timing and negative outcomes among Black boys is

limited (Carter, 2015; Cunningham, Swanson, Spencer, & Dupree, 2003; Ge, Brody, Conger, & Simons, 2006; Ge et al., 2003; Hamlat, Stange, Abramson, & Alloy, 2014; Nadeem & Graham, 2005). The little work that has been conducted primarily used samples of African American boys and the findings are similar to those of White boys. African American boys who develop earlier than their same-age peers or who are more advanced in their pubertal development (i.e., pubertal status) display high levels of anxiety (Ge et al., 2006), depressive symptoms (Ge et al., 2003, 2006; Hamlat et al., 2014), and low levels of self-worth (Nadeem & Graham, 2005). Ge et al. (2006) demonstrated that early pubertal timing and more advanced pubertal development predicted the highest levels of anxiety and depressive symptoms among African American boys. Late pubertal timing also appears to be problematic for the mental health and self-concepts of African American boys (Blazek & Carter, 2019; Carter, 2015; Carter, Caldwell, Matusko, & Jackson, 2015). Carter (2015) demonstrated that African American boys who perceived their development as late relative to their same-sex, same-age peers reported higher levels of anxiety symptoms relative to early and on-time African American boys. Taken together, these disparate findings may be related to the measurement of puberty.

Most studies combine multiple indicators of development such as changes in height, changes in skin, and hair growth as indicators of pubertal timing or use Tanner stages (Marshall & Tanner, 1969, 1970) to assess secondary sex characteristics (e.g., pubic hair growth; see Dorn, Dahl, Rojahn, Woodward, & Biro, 2006). It is likely that different pubertal indicators (e.g., pubic hair growth vs. voice change) may be differentially linked with the mental health and self-concept of Black boys. For example, pubic hair growth is a private event and may not factor in boys' social interactions. However, voice change is a socially noticeable event likely to draw public reactions. Support for this line of reasoning stems from research using data collected from boys' choirs suggesting that male singers experienced both negative (e.g., insecure, embarrassed) and positive (e.g., happy, proud) emotions throughout the voice change process (Kennedy, 2004; Killian, 1997, 1999). Moreover, these studies highlighted both positive and negative peer and teacher interactions with developing male singers (Kennedy, 2004; Killian, 1997, 1999). Thus, it is likely that external pubertal indicators such as voice change may be more salient to the boys themselves, as well as to adults and peers in their social

environment. However, more private changes such as pubic hair growth may be less noticeable to others in their social environment.

In addition to external and internal pubertal indicators, boys perceived pubertal timing relative to their same-age peers is important. Perceived relative pubertal timing assesses whether youth see themselves as being normative or non-normative in either direction (e.g., early or late) relative to their peers of the same sex and age (see Dorn et al., 2006). This index of pubertal timing affords the opportunity to assess boys' interpretation and meaning of pubertal changes. For example, a boy might perceive himself to be an early developer not only because it reflects his status relative to his peers, but because it reflects his lack of developmental readiness for maturation. Yet, a boy may also perceive himself to be a late developer because this reflects a desire to either grow up quickly, be taken more seriously, or be treated like an adolescent. Thus, perceived relative pubertal timing may reflect a different process from objective timing, occurring at the social level rather than the biological level. The present study explored independent associations between voice change, hair growth (e.g., pubic, underarm), and perceived relative pubertal timing on depressive symptoms, self-esteem, and self-efficacy.

The Importance of Ethnic Subgroup

Research on differences between ethnic subgroups of the Black American population in the United States is largely understudied (Ferguson & Bornstein, 2014; Medina, Rowley, & Towson, 2018). Variation in language, country of origin, culture, and socialization beliefs and practices exists among Black Americans (Hopp & Herring, 1999; Waters, 1999). These variations may impact the significance and meaning Black boys attribute to the physical and hormonal changes associated with puberty that they ascribe to being a member of their ethnic-racial group. For example, the accent is a defining feature for many Caribbean Blacks (Waters, 1999). Given that pubertal changes alter the voice, deepening it for males, Caribbean Black boys may notice this change more quickly because of the value and focus on accent/voice. Therefore, it might be a particularly important indicator among Caribbean Black boys but not among African American boys. Furthermore, how Caribbean Black boys accommodate to voice changes may vary depending on the extent to which they identify with their ethnic subgroup and their feelings about being a member of that group.

Individual variation among Black Americans in the United States also likely influences the significance and meaning that they ascribe to being a member of their ethnic-racial group (Hopp & Herring, 1999; Waters, 1999). For example, the ethnic-racial identity of Caribbean Blacks may be impacted by the racial diversity in their country of origin, as well as their exposure to and internalization of U.S. racial stereotypes and beliefs (Hopp & Herring, 1999; Waters, 1999). When considering ethnic subgroups, Caribbean Black boys may make both in-group and out-group comparisons because they inhabit multiple cultures. As a result, Caribbean Black boys may choose to identify as one of the following: (a) a Black American and closely identified with African Americans, (b) an American while distancing themselves from African Americans, or (c) an ethnic identity reflecting their parents' culture of origin. Caribbean Black boys' identity development may influence the peers to whom they compare their development. Thus, in this study, a comparison approach was taken to explore the extent to which the effects of puberty and ethnic-racial identity on mental health and self-concept differ among African American boys compared to Caribbean Black boys.

An Unexplored Mechanism: Ethnic-Racial Identity

Ethnic-racial identity is a critical task in adolescence among ethnic and racially diverse youth and a central part of their self-concept because of the salience of ethnicity-race in American society (Umaña-Taylor et al., 2014). Models of ethnic-racial identity include both process and content dimensions that have cognitive, behavioral, and affective components (e.g., Phinney & Ong, 2007; Sellers, Smith, Shelton, Rowley, & Chavous, 1998; Umaña-Taylor et al., 2014). For example, process dimensions include exploration of one's ethnic-racial group; whereas content includes the significance and meaning that one ascribes to being a member of an ethnic-racial group. While multidimensionality is a common feature in models of ethnic-racial identity, research highlights the importance of positively evaluating one's ethnic or racial group in the adjustment among ethnic and racially diverse youth (e.g., Caldwell, Zimmerman, Bernat, Sellers, & Notaro, 2002; Rivas-Drake, Hughes, & Way, 2009; Rivas-Drake et al., 2014). For example, Rivas-Drake et al. (2009) reported that Dominican and Black sixth-graders who perceived that society viewed their ethnic-racial group more positively reported fewer somatic symptoms. Caldwell et al. (2002)

indicated that African American youth who felt positive about being a member of their ethnic-racial group reported lower levels of stress. Thus, ethnic-racial identity appears to serve protective functions among ethnic and racially diverse youth.

This study focused on the content of ethnic-racial identity (Sellers et al., 1998). According to the Multidimensional Model of Racial Identity, the significance and meaning that Black Americans ascribe to being a member of their racial group are comprised of the following three interrelated dimensions: racial centrality, racial regard, and racial ideology (Sellers, Rowley, Chavous, Shelton, & Smith, 1997). Racial centrality and racial regard were examined in this study as past research have linked these dimensions with mental health outcomes among African American and Caribbean Black youth (Caldwell, Guthrie, & Jackson, 2006; Seaton, 2009; Sellers, Copeland-Linder, Martin, & L'Heureux Lewis, 2006). Racial centrality is the extent to which an individual places significance on the role of ethnicity-race in their self-concept (Sellers et al., 1998). Racial regard broadly refers to individuals' affective attitudes toward their ethnicity-race and is broken into two subcomponents (Sellers et al., 1997). Private regard assesses whether an individual feel positively or negatively about being a member of their ethnic-racial group, whereas public regard assesses whether an individual feel the broader society views their ethnic-racial group positively or negatively (Sellers et al., 1998).

Research has demonstrated that African American boys and girls who believed race was an important component of their overall self-concept (i.e., high racial centrality levels) reported fewer depressive symptoms and high levels of self-esteem (Seaton, 2009). Similarly, high private regard levels (e.g., feeling positive about being Black) were negatively associated with depressive symptoms (Seaton, 2009; Sellers et al., 2006) and positively linked with self-esteem among African American boys and girls (Seaton, 2009). Public regard, however, was not linked with depressive symptoms (Sellers et al., 2006) or self-esteem (Rivas-Drake et al., 2009; Seaton, 2009) among African American boys and girls.

The bulk of prior research either controlled biological sex or collapsed across biological sex to examine associations between ethnic-racial identity and well-being such that the protective function of ethnic-racial identity dimensions among Black boys is less understood. Some studies report that high private regard levels (e.g., feeling positive about being Black) were negatively associated with depressive symptoms (Carter et al., 2017) and

positively linked with self-esteem (Rogers, Scott, & Way, 2015). Other studies report that racial centrality and public regard were not linked with depressive symptoms (Carter et al., 2017) or self-esteem (Rogers et al., 2015). Although prior research examining ethnic-racial identity among Caribbean Black youth is sparse, one study indicated that high public regard levels (e.g., belief that other groups view your ethnic-racial group favorably) were linked with less depressive symptoms among Caribbean Black males (Caldwell et al., 2006). These findings suggest that an improved understanding of the relation between dimensions of ethnic-racial identity and well-being among Black boys is needed.

Ethnic-Racial Identity and Pubertal Development

Black youth begin puberty earlier than their White counterparts (Biro et al., 2010; Chumlea et al., 2003; Euling et al., 2008). The early physical changes associated with puberty in Black youth possibly elicit identity-related messages imbued with adult norms and expectations. Consistent with PVEST, Black youth must navigate these messages while engaging in the process of self-reflection and attributing meaning to their changing bodies, and positively evaluating their ethnic-racial group may mitigate the adverse outcomes resulting from early pubertal timing (Spencer, 2006). As of this writing, one study examined ethnic-racial identity with pubertal development among African American boys.

Carter et al. (2017) reported that African American boys who felt more positive about their ethnicity-race (e.g., high private regard levels) and were less advanced in their pubertal development evidenced fewer internalizing problems 1 year later. However, African American boys who were further in their pubertal development with high private regard levels evidenced more internalizing problems 1 year later (Carter et al., 2017). Thus, private regard was protective for late developing African American boys but not protective for early developers (Carter et al., 2017). As of this writing, no published research has examined ethnic-racial identity content dimensions in conjunction with pubertal timing among Caribbean Black males. Nevertheless, the little work that has been conducted suggests how African American boys feel about their ethnic-racial group is an important mechanism in the relation between pubertal timing and adjustment outcomes. To further clarify the nature of the relation between pubertal timing, ethnic-racial identity, and well-being, this study included Caribbean Black boys.

The Current Study

A recent article called for more research examining the pubertal process among ethnic-racial minority boys (see Deardorff et al., 2019) given that few studies have examined pubertal development with ethnic-racial identity among Black boys (Carter et al., 2017). In response, we examined the associations between three pubertal domains (e.g., voice change, hair growth, and perceived relative timing), namely depressive symptoms, self-esteem, and self-efficacy among a nationally representative sample of African American and Caribbean Black boys. The moderating role of ethnic-racial identity content with pubertal dimensions was also examined. Lastly, the extent to which the effects of specific domains of puberty and ethnic-racial identity content dimensions on mental health differed among African American boys and Caribbean Black boys were also examined (Figure 1).

It is important to note that this study is exploratory given limited research on (a) pubertal development among Black boys, (b) specific domains of puberty, and (c) differences between ethnic subgroups of the Black American population. As such, no specific hypotheses were formulated for specific domains of puberty (i.e., voice change, hair growth, and perceived relative pubertal timing) and ethnic subgroups (i.e., African American and Caribbean Black). Although past research has yet to include self-efficacy as an outcome linked to puberty and/or ethnic-racial identity content dimensions, we included self-efficacy because it is an important self-system (e.g., an individual's collection of self-perceptions; Sullivan, 1953) that contributes to a broader sense of favorable self-regard. Individuals develop preconceptions of their capabilities based on age, gender, and ethnicity-race (Bandura & National Institute of Mental Health, 1986). As such, this study assumed that pubertal development and

ethnic-racial identity influenced Black boys' self-efficacy.

Considering the above, three hypotheses were formulated: (a) early pubertal timing would be associated with high levels of depressive symptoms and low levels of self-esteem and self-efficacy; (b) African American and Caribbean Black boys who believe that race is an important aspect of their overall self-concept (e.g., high racial centrality levels), feel positive about their ethnic-racial group membership (e.g., high private regard levels), and believe that the broader society views their ethnic-racial group positively (e.g., high public regard levels) will report low levels of depressive symptoms and high levels of self-esteem. Although research is limited on self-efficacy, it is reasonable to assume that these dimensions will be linked to high levels of self-efficacy as well; and (c) ethnic-racial identity content dimensions would moderate the relation between pubertal timing, depressive symptoms, self-esteem, and self-efficacy such that African American and Caribbean Black boys who are early developers and report a positive ethnic-racial identity (high racial centrality levels, high private regard levels, high public regard levels) will report fewer depressive symptoms and high levels of self-esteem and self-efficacy. Given that only one study, to date, has examined the moderating role of ethnic-racial identity in puberty research, this hypothesis is consistent with previous conceptualizations of ethnic-racial identity as a self-protective mechanism providing ego strengths to buffer adversity (Cross, Parham, & Helms, 1998).

Method

Participants

Data were drawn from the males ($N = 559$) in the National Survey of American Life Adolescent sample (NSAL-A; Jackson et al., 2004). The NSAL-A is a supplemental nationally representative sampling of adolescents (1,170 participants; 52% female) who lived in the households sampled in the NSAL parent study (Jackson et al., 2004). The sample consists of 395 African American and 164 Caribbean Black boys aged 13–17 years (African Americans $M = 14.99$ years; $SD = 1.42$; Caribbean Blacks $M = 14.98$ years; $SD = 1.17$). Ninety-seven percent of the sample was enrolled in school, with the average grade being ninth ($SD = 1.54$). The median education level of mothers for the sample was 12th grade ($SD = 2.22$). The mean family income for African Americans was \$36,693 and \$38,580 for Caribbean Blacks.

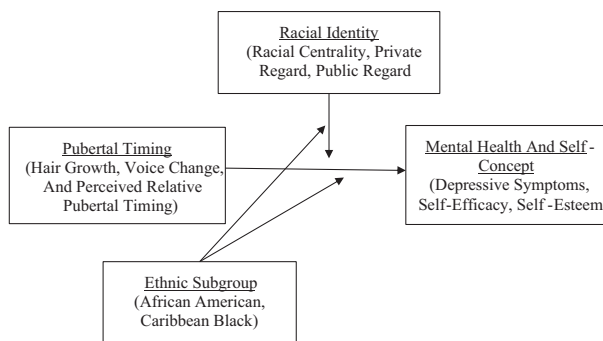


Figure 1. Conceptual model.

Cross-tabulations and analyses of variance were performed to examine potential differences between African American and Caribbean Black boys on social and demographic information. This information was provided by the adolescent and the NSAL adult respondent with whom the adolescent lived the previous year. Significant findings included Caribbean Black boys being more likely to have parents born outside of the United States (75%) compared to African American boys (1%), $\chi^2(1, N = 559) = 300.221, p < .01$. Most Caribbean parents were first generation. Seventy-five percent was born in the Caribbean, 20% had one spouse born in the United States but the other spouse was born in the Caribbean, and 5% had both spouses born in the United States. Approximately 25% of the Caribbean parents came to the United States more than 20 years ago, 16% came 11–20 years ago, and 12% came 0–10 years ago. Caribbean Black boys were also more likely to have parents who completed 1 year of post-high school education, Caribbean Black boys = 57%, African American boys = 32%, $\chi^2(1, N = 559) = 5.43, p < .02$. No other statistically significant differences were found on social and demographic information.

Procedure

A national probability sample of households that included an adult participant in the NSAL was screened for an eligible adolescent in the targeted age range (e.g., 13–17). Adolescents who were eligible to participate in the study were chosen using a random selection procedure. The NSAL-A supplement employed a stratified and clustered sampling design and was weighted to adjust for non-independence in selection probabilities and non-response rates within households, across households and individuals. The weighted data were poststratified to national population distributions for sex (males and females) and age (13, 14, 15, 16, and 17 years) subgroups among Black youth. The specific sampling procedures for identification and recruitment of African American and Caribbean Black households have been described elsewhere (see Carter, Caldwell, Matusko, Antonucci, & Jackson, 2011; Seaton, Caldwell, Sellers, & Jackson, 2008).

Measures

Pubertal Timing

Adolescents completed three items taken from the pubertal development scale (Petersen, Crockett,

Richards, & Boxer, 1988) to assess hair growth, voice change, and perceived relative pubertal timing. The question designed to assess hair growth asked, "Would you say your body hair, meaning underarm and pubic hair, has not yet started to grow, has barely started growing, has definitely started growing, or is hair growth completed?" The question designed to assess voice change asked, "Have you noticed a deepening of your voice? Would you say your voice has not yet started changing, has barely started changing, your voice change is definitely underway, or voice change is completed?" Adolescents responded to each question on a 4-point scale, ranging from 1 (*has not yet started to grow/change*) to 4 (*hair growth/voice change completed*). Perceived relative pubertal timing was assessed by asking "How advanced would you say your physical development is compared to other boys your age?" Adolescents responded to this question on a 5-point scale, ranging from 1 (*I look younger than most*) to 5 (*I look older than most*). Higher numbers indicated earlier perceived development relative to same-sex, same-age peers. Studies have demonstrated reasonable reliability ($r = .61$) of youths' perceptions of their pubertal timing using a single item (Dubas, Graber, & Petersen, 1991; Graber, Lewinsohn, Seeley, & Brooks-Gunn, 1997). We standardized the measures of voice change and hair growth within each age category (e.g., 13, 14, 15, 16, and 17 years old) to generate a variable with a mean of 0 and a standard deviation of 1. This procedure is analogous to the procedure used by Ge et al. (2006).

The Multidimensional Inventory of Black Identity Short Form

A shortened version of the Multidimensional Inventory of Black Identity (MIBI) was utilized to assess racial centrality, private regard, and public regard (Martin, Wout, Nguyen, Sellers, & Gonzalez, 2010). Adolescents responded to each question on a 4-point scale, ranging from 1 (*strongly agree*) to 4 (*strongly disagree*). The racial centrality subscale includes four items (African Americans $\alpha = .67$, Caribbean Blacks $\alpha = .77$) and assesses the degree to which being Black is important to respondents' overall self-concept. A sample item includes, "I have a strong attachment to other Black people." The private regard subscale (African Americans $\alpha = .66$, Caribbean Blacks $\alpha = .68$) includes four items and measures the extent to which respondents feel positively or negatively about being Black. A sample item includes, "I feel good about

Black people." The public regard subscale consists of four items (African Americans $\alpha = .74$, Caribbean Blacks $\alpha = .85$) and measures the respondents' belief of how broader society view Blacks. A sample item includes, "In general, society respects Black people." Items for racial centrality, public regard, and private regard were reverse coded such that higher scores were indicative of high racial centrality levels (e.g., belief that race is an important aspect of one's overall self-concept), high private regard levels (e.g., belief that one feels positive about their ethnic-racial group membership), and high public regard levels (e.g., belief that the broader society views one's ethnic-racial group positively) to be consistent with prior research (Carter et al., 2017).

Although past research has used the MIBI Short Form (MIBI-S) in samples of Caribbean Black youth (e.g., Caldwell et al., 2006; Thomas, Caldwell, Faison, & Jackson, 2009), we investigated measurement equivalence of the MIBI-S between ethnic subgroups given the measure has not been validated with Caribbean Black boys. The results indicate that the items included in the MIBI-S cluster in the same way in both groups, reflecting the same underlying racial identity dimensions. Thus, it appears likely that MIBI-S scores represent the same constructs among African American and Caribbean Black boys. However, only partial invariance was supported. Three items appeared to be more salient indicators of the racial centrality and private regard dimensions for African Americans and public regard dimension for Caribbean Blacks, the difference was in magnitude not direction (see Appendix).

Center for Epidemiological Studies Depression Scale

Adolescents were administered the 12-item version of the Center for Epidemiological Studies Depression Scale (CESD-12; Radloff, 1977; Roberts & Sobhan, 1992). The CESD is a well-validated and widely used self-report instrument developed to measure symptoms of depression within community samples. A sample item includes, "I felt that everything I did was an effort." Adolescents responded to each question on a 4-point scale, ranging from 0 (*rarely*) to 3 (*most or all of the time*). The CESD-12 yields a total score that can range from 0 to 36, with scores > 9 indicating high levels of depressive symptomatology. The CESD-12 has been shown to have adequate reliability and validity (Roberts, Lewinsohn, & Seeley, 1991; Roberts & Sobhan, 1992) and a coefficient alpha of .64 has

been reported for a sample of African American adolescents (Roberts & Sobhan, 1992). In the present sample, the coefficient alpha (weighted) for African Americans and Caribbean Blacks was .65 and .64, respectively.

The Rosenberg Self-Esteem Scale

Adolescents were administered the 10-item Rosenberg Self-Esteem Scale (RSS; Rosenberg, 1965). The RSS is a well-validated and widely used self-report instrument developed to measure self-acceptance. A sample item includes, "I feel that I have a number of good qualities." Adolescents responded to each question on a 4-point scale, ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). The RSS yields a total score that can range from 10 to 40. The RSS has been shown to have adequate reliability and validity (Sinclair et al., 2010) and a coefficient alpha of .82 has been reported for a sample of African American adolescents (Rowley, Sellers, Chavous, & Smith, 1998). In the present sample, the coefficient alpha (weighted) for African Americans and Caribbean Blacks was .71 and .76, respectively.

Mastery Scale

Adolescents were administered the 12-item Mastery scale (MS), which is a widely used self-report instrument developed to measure the extent to which one believes life chances are under one's personal control or are fatalistically governed (Pearlin & Schooler, 1978). A sample item includes, "There is really no way I can solve some of the problems I have." Adolescents responded to each question on a 4-point scale, ranging from 1 (*strongly agree*) to 4 (*strongly disagree*). The MS yields a total score ranging from 12 to 48, with higher numbers indicating more self-efficacy. The MS has been shown to have adequate reliability and validity (Pearlin, Menaghan, Lieberman, & Mullan, 1981; Pearlin & Schooler, 1978; Turner & Noh, 1988) and a coefficient alpha of .70 has been reported for a sample of African American mothers (Jackson, 2000). In the present sample, the coefficient alpha (weighted) for African Americans and Caribbean Blacks was .70 and .72, respectively.

Control Variables

Three variables were used as covariates in the study analyses: (a) adolescents' age in years, (b) parents' nativity status, and (c) adolescents' body

mass index (BMI). Adolescents were asked their age at the time of the interview. Parents' nativity status was assessed with native born (e.g., 1) or foreign born (e.g., 0). BMI was used as a covariate because of the weight gain associated with puberty. BMI was created from self-reported height and weight. A measure of BMI was created according to the formula devised by the Belgian polymath Adolphe Quetelet and is defined as individual body weight divided by the square of their height multiplied by a constant (Eknoyan, 2008). Specifically, the formula was applied as follows, $BMI = (\text{weight})/(\text{height})^2 \times 703$ where weight was measured in pounds, height was measured in inches, and 703 was the factor for U.S. units.

Data Analysis Plan

To test whether ethnic-racial identity dimensions moderated the relations between pubertal timing and self-esteem, depressive symptoms, and self-efficacy, weighted path analyses were conducted using *Mplus 7.4* (Muthén & Muthén, 2010). To calculate the complex design-based estimates of variance, we employed the robust maximum likelihood estimator to make the chi-squared test and standard errors robust to non-normality (Yuan & Bentler, 1998). We used full information maximum likelihood estimation to account for missing data. There were small amounts of missing data, which occurred sporadically and never exceeding more than 4% of the cases for all key study variables.

Separate path models were conducted for each ethnic-racial identity dimension (e.g., racial centrality, private regard, public regard). Adolescent age in years, BMI, and parents' nativity status were included in all path models as covariates for all endogenous variables. Correlated errors between endogenous variables and between adolescent age and pubertal timing variables were permitted. All path models were evaluated using multiple indicators of model fit: chi-square, the comparative fit index (CFI), the root mean squared error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Hu and Bentler (1999) suggested CFI values close to .95 or greater, RMSEA values close to .08 or below, and SRMR values close to .08 represent acceptable model fit. The overall chi-square, a statistical test of the lack of fit based on over-identifying restrictions on the target model was also reported. Non-significant chi-squares suggest good model fit; however, this estimation is a function of sample size and will almost always be significant with large samples. More focused tests

of fit were also used to examine model fit such as modification indices and standardized residuals testing the difference between predicted and observed covariances in each cell.

Prior to the study analyses, the data for the continuous variables were assessed using model-based outlier analysis with a limited information approach in which the endogenous variables were regressed onto relevant predictors and then standardized DFBETAs were examined for each individual. An outlier was defined as an individual with an absolute standardized DfBeta > 1 for a given coefficient. No outliers were found based on this analysis. Examination of univariate indices of skewness and kurtosis revealed no absolute skewness or kurtosis values > 1.08. Finally, to minimize the risk of chance findings, we applied the Holm's-based modified Bonferroni correction in which the *p* values are sorted from lowest to highest and then compared to the nominal alpha levels [$HB = \text{Target } \alpha / (n - \text{rank} + 1)$]. Only significant results based on Holms-based correction were reported.

We conducted the analyses in three stages. The first stage involved descriptive analyses to examine study variable associations. These analyses were intended to isolate subgroup differences in the core variables being studied. The second stage examined the hypothesized associations depicted in Figure 1 using the total sample. The analysis for this stage involved mean centering the pubertal timing and ethnic-racial identity dimensions in the path model to avoid multicollinearity and to make the coefficients more interpretable (Jaccard, Wan, & Turrisi, 1990). Product terms were included in the path model for each pubertal timing and ethnic-racial identity dimension interaction (e.g., Pubertal Timing \times Racial Centrality). Significant interactions were plotted using Aiken, West, and Reno (1991) procedure for probing the interaction at one standard deviation above and below the mean levels of the independent variable and at low (1) and high (4) values of the moderator variables.

The final stage of the analysis tested ethnic subgroup invariance in our baseline model using a multigroup solution strategy, with African American and Caribbean Black boys representing the two groups. The purpose of this analysis was to determine if the path diagram depicted in Figure 1 fit the data equally well for both African American and Caribbean Black boys and if so the regression weights were different between the two groups. First, the path model was simultaneously fit to the two groups to establish a common model for both groups with no equality constraints across groups

(i.e., unconstrained model). Then a model in which the regression weights were constrained (i.e., constrained model) to be equal across the groups was run. Lastly, a model in which the regression weights and covariances were constrained to be equal across the groups was run (i.e., fully constrained model). Comparisons of nested models were performed using a scaled difference chi-squared test (Satorra & Bentler, 2001). If this test indicated that this assumption of equality was untenable, we then tested models that sequentially constrained the parameters of the key study constructs to be equal across groups. This involved invariance testing of each key study parameter (e.g., regression weights) while constraining all parameters found to be cumulatively invariant across groups.

Results

Descriptive Analyses

Results using descriptive statistics such as means, standard errors, and bivariate correlations between variables can be found in Table 1. There were no statistically significant differences in the study variables between African American and Caribbean Black boys.

Testing for Direct and Moderated Relationships

Prior to exploring moderation, a path model was computed without moderation to examine whether

voice change, hair growth, perceived relative pubertal timing, and ethnic-racial identity dimensions were associated with self-esteem, depressive symptoms, and self-efficacy. Then, three product terms were included in the model to test moderation. As noted earlier, separate models were run for each ethnic-racial identity dimension. A variant of the model in Figure 1 was tested, which differed in the following ways: ethnic subgroup was included in the model as a covariate for all endogenous variables and ethnic subgroup was correlated with adolescent age in years and parents' nativity status.

Racial Centrality

The overall fit of the model indicated good fit to the data [$\chi^2(6) = 7.112, p = .310; CFI = .99, RMSEA = .02, CI: .01, .06; SRMR = .02$]. The voice change on self-esteem path was statistically significant ($\beta = .17, p = .014$); such that boys who perceived that their voice changes were early reported high levels of self-esteem. No other statistically significant direct effects were observed. The independent variables and covariates accounted for 18% of the variance in self-esteem. When the three product terms were included in the model, the model was just identified. Racial centrality ($\beta = .12, p = .154$) and perceived relative pubertal timing ($\beta = -.07, p = .569$) were not directly associated with self-efficacy. However, a significant interaction between racial centrality and perceived relative timing on self-efficacy was observed ($\beta = -.10, p = .027$); such

Table 1
Bivariate Correlations, Means and Standard Errors for Study Variables by Ethnic Subgroup

	1	2	3	4	5	6	7	8	9	African Americans M (SE)	Caribbean Blacks M (SE)	Statistics (F)
1. Hair growth	—	.35**	.19**	.05	.08 ⁺	.08*	.01	.02	.12**	3.10 (.031)	3.23 (.089)	0.944
2. Voice change	.39*	—	.22**	.12**	-.01	.07 ⁺	-.05	.17**	.07 ⁺	2.86 (.038)	2.97 (.120)	0.452
3. Perceived relative timing	.05	.18	—	-.09*	-.11**	-.05	-.03	.02	.02	3.81 (.015)	3.77 (.060)	0.376
4. Private regard	-.08	-.15	-.15	—	.25**	.49**	-.14**	.19**	.15**	2.99 (.029)	2.91 (.122)	0.434
5. Public regard	-.20*	-.09	-.41*	.34*	—	.23**	.03	.06	-.01	3.43 (.025)	3.37 (.111)	0.329
6. Racial centrality	-.24*	-.17	.02	.46**	.23	—	-.02	.09*	.11*	9.03 (.234)	8.03 (.820)	1.086
7. Depressive symptoms	-.11 ⁺	-.06	.44*	-.13	-.36*	.03	—	-.51**	-.36**	3.55 (.017)	3.51 (.064)	0.369
8. Self-esteem	.16 ⁺	-.02	-.11	.01	.03	-.02	-.52**	—	.33**	37.38 (.241)	36.05 (.917)	1.786
9. Self-efficacy	.03	.01	-.07	.13	.06	-.22	-.22	.33	—	3.10 (.031)	3.23 (.089)	0.944

Note. Coefficients above the diagonal are for African Americans (n = 395) and those below the diagonal are for Caribbean Blacks (n = 164); Data have been weighted to be nationally representative. Standard errors have been adjusted for sampling stratification, clustering, and weighting of the data.
⁺p < .10. *p < .05. **p < .01.

that Black boys with high racial centrality levels who perceived their pubertal timing as late compared to their peers had higher levels of self-efficacy, but not those with low racial centrality levels. The interaction did not significantly differ from zero at low ($t = 1.959, p = .051$) or high ($t = 1.063, p = .288$) levels of racial centrality. No other statistically significant interaction effects were observed. The independent variables and covariates accounted for 20% of the variance in self-esteem and 14% of the variance in self-efficacy.

Private Regard

The overall fit of the model yielded a good fit to the data [$\chi^2(6) = 17.543, p = .008; CFI = .98, RMSEA = .06$ CI: .03, .09; SRMR = .02]. The private regard on self-esteem ($\beta = .15, p = .002$), private regard on depressive symptoms ($\beta = -.14, p = .022$), and private regard on self-efficacy ($\beta = .16, p = .001$) paths were statistically significant. Black boys who felt positively about being Black reported more self-esteem, more self-efficacy, and fewer depressive symptoms. Like racial centrality, the voice change on the self-esteem path was statistically significant ($\beta = .15, p = .044$). No other statistically significant direct effects were observed. The independent variables and covariates accounted for 23% of the variance in self-esteem, 10% of the variance in depressive symptoms, and 12% of the variance in self-efficacy. When the three product terms were included in the model, the model was just identified. A significant interaction between private regard and hair growth on depressive symptoms was observed ($\beta = .14, p = .007$); such that late hair growth predicted increased depressive symptoms among Black boys who felt negatively about being Black ($t = 2.097, p = .036$), but not among those who felt positively about being Black ($t = 4.727, p = .001$). No other statistically significant interaction effects were observed. The independent variables and covariates accounted for 21% of the variance in self-esteem, 12% of the variance in depressive symptoms, and 14% of the variance in self-efficacy.

Public Regard

The overall fit of the model yielded a good fit to the data [$\chi^2(6) = 17.976, p = .006; CFI = .97, RMSEA = .06$ CI: .03, .09; SRMR = .03]. Like racial centrality and private regard, the voice change on the self-esteem path was statistically significant ($\beta = .18, p = .012$). No other statistically significant

direct effects were observed. The independent variables and covariates accounted for 18% of the variance in self-esteem. When the three product terms were included in the model, the model was just identified. Public regard ($\beta = .02, p = .685$) and voice change ($\beta = -.07, p = .350$) were not directly associated with depressive symptoms. However, a significant interaction between public regard and voice change on depressive symptoms was observed ($\beta = .14, p = .030$); such that early voice changes predicted increased depressive symptoms among Black boys who felt society views Blacks more negatively, but not among those who felt society views Blacks more positively. The interaction did not significantly differ from zero at low ($t = 1.135, p = .257$) or high ($t = 0.764, p = .445$) levels of racial centrality. No other statistically significant interaction effects were observed. The independent variables and covariates accounted for 19% of the variance in self-esteem and 10% of the variance in depressive symptoms.

Testing for Invariance Across Ethnic Subgroups

Racial Centrality

The $\Delta\chi^2$ difference test showed that the unconstrained [$\chi^2(18) = 19.56, p = .358; CFI = .98, RMSEA = .04$ CI: .01, .08; SRMR = .02] and constrained [$\chi^2(39) = 112.99, p = .001; CFI = .93, RMSEA = .05$ CI: .02, .07; SRMR = .05] models were significantly different from each other, $\Delta\chi^2(\Delta 21) = 131.97, p = .001$. As such, we tested models that sequentially constrained the parameters of the study constructs to be equal across groups to determine which parameters were significantly different between African Americans and Caribbean Blacks. The overall fit of the final model yielded good fit to the data [$\chi^2(32) = 41.31, p = .125; CFI = .97, RMSEA = .03$ CI: .01, .06; SRMR = .03].

As shown in Figure 2, in the final model, all regression paths were constrained to be equal except for seven paths: (a) voice change on self-esteem, (b) hair growth on self-esteem, (c) racial centrality by voice change on self-esteem interaction, (d) perceived relative pubertal timing on depressive symptoms, (e) racial centrality by voice change on depressive symptoms interaction, (f) racial centrality on self-efficacy, and (g) racial centrality by perceived relative pubertal timing interaction on self-efficacy. Although the hair growth on self-esteem, the racial centrality by voice change interaction on self-esteem, the racial centrality by voice change interaction on depressive symptoms,

and racial centrality on self-efficacy paths were allowed to vary freely across groups, these paths were not statistically significant for either African Americans or Caribbean Blacks.

The voice change on self-esteem path was statistically stronger for African Americans ($\beta = .19, p = .008$) than Caribbean Blacks ($\beta = -.01, p = .894$). The perceived relative pubertal timing on depressive symptoms path was statistically stronger for Caribbean Blacks ($\beta = .44, p = .001$) than that for African Americans ($\beta = -.01, p = .871$). Lastly, the racial centrality by perceived relative pubertal timing interaction on self-efficacy was statistically stronger for African Americans ($\beta = -.13, p = .003$) than Caribbean Blacks ($\beta = .06, p = .576$); such that African American boys with high racial centrality who perceived their pubertal timing as late compared to their peers had increased in self-efficacy ($t = 2.024, p = .043$) but not those with low racial centrality ($t = .993, p = .321$; Figure 3).

Among African American boys, 6% of the variability in self-esteem, 5% of the variability in depressive symptoms, and 3% of the variability in self-efficacy were accounted for by the independent variables and covariates. Among Caribbean Black boys, 3% of the variability in self-esteem, 19% of the variability in depressive symptoms, and 9% of the variability in self-efficacy were accounted for by the independent variables and covariates.

Private Regard

The $\Delta\chi^2$ difference test showed that the unconstrained [$\chi^2(18) = 16.97, p = .526; CFI = .99, RMSEA = .01$ CI: .01, .06; SRMR = .02] and constrained [$\chi^2(39) = 95.27, p = .001; CFI = .99, RMSEA = .01$ CI: .01, .04; SRMR = .03] models were significantly different from each other, $\Delta\chi^2(\Delta 21) = 93.09, p = .001$. As such, we tested models that sequentially constrained the parameters of the study constructs to be equal

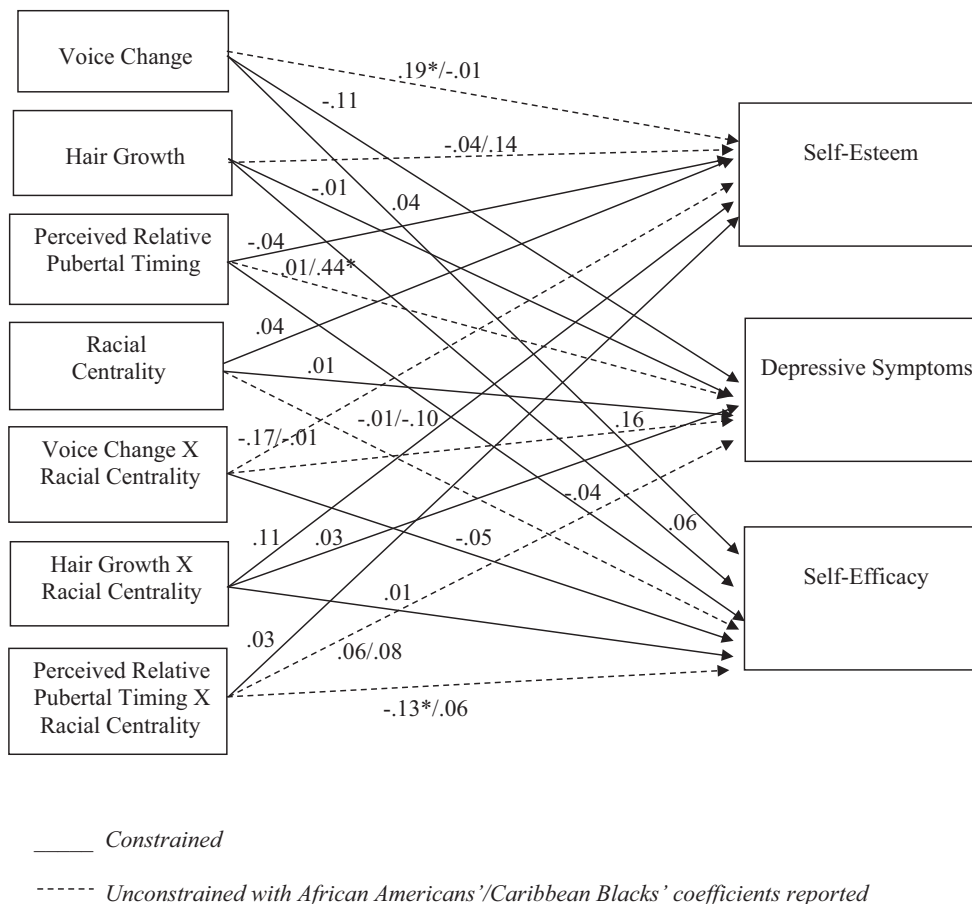


Figure 2. Racial centrality final model: Invariance analysis. Standardized coefficients are reported. Adolescent age and parents' nativity status were included as covariates for endogenous variables although not shown. Data have been weighted to be nationally representative. Standard errors have been adjusted for sampling stratification, clustering, and weighting of the data * $p < .05$.

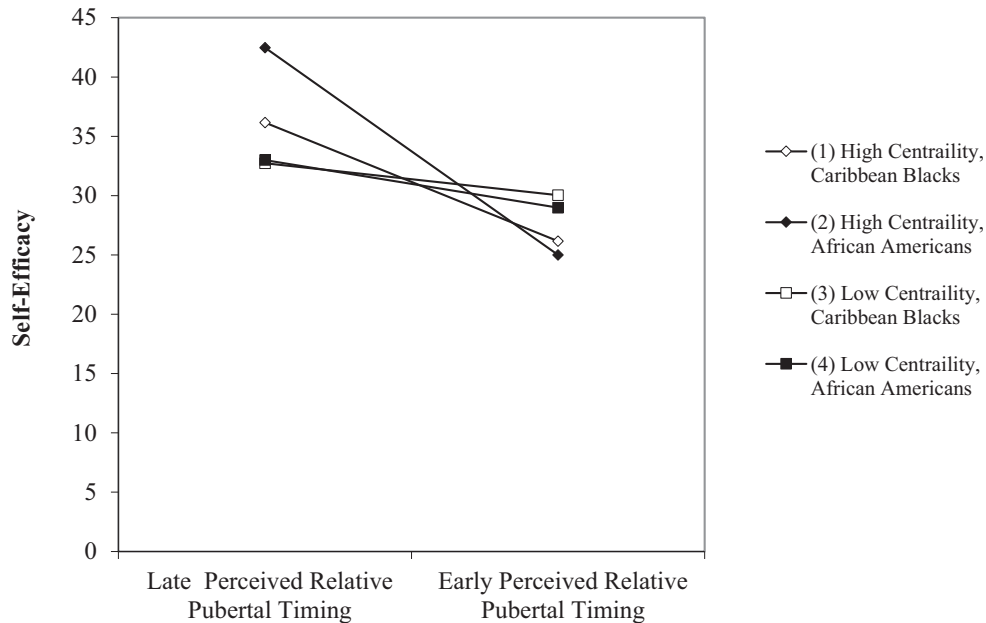


Figure 3. Interaction between racial centrality and perceived relative pubertal timing for African American and Caribbean Black boys.

across groups to determine which parameters were significantly different between the ethnic subgroups. The overall fit of the final model yielded an adequate fit to the data [$\chi^2(31) = 32.29$, $p = .403$; CFI = .99, RMSEA = .01 CI: .01, .05; SRMR = .03].

As shown in Figure 4, in the final model all regression paths were constrained to be equal across groups except for seven paths: (a) voice change on self-esteem, (b) hair growth on self-esteem, (c) private regard by voice change on self-esteem interaction, (d) private regard by perceived relative pubertal timing on self-esteem interaction, (e) hair growth on depressive symptoms, (f) perceived relative pubertal timing on depressive symptoms, and (g) voice change on self-efficacy. Although the hair growth on self-esteem, private regard by voice change on self-esteem interaction, private regard by perceived relative pubertal timing on self-esteem interaction, hair growth on depressive symptoms, and voice change on self-efficacy paths were allowed to vary freely across groups, these paths were not statistically significant for either African Americans or Caribbean Blacks.

The private regard on depressive symptoms ($\beta = -.13$, $p = .005$) and private regard on self-efficacy ($\beta = .17$, $p = .001$) paths were statistically significantly equivalent across groups. African Americans and Caribbean Blacks boys who felt positively about being Black reported more self-esteem, more self-efficacy, and fewer depressive symptoms. However, the voice change on self-esteem path was

statistically stronger for African Americans ($\beta = .19$, $p = .005$) than Caribbean Blacks ($\beta = -.10$, $p = .257$) and the perceived relative pubertal timing on depressive symptoms path was statistically stronger for Caribbean Blacks ($\beta = .43$, $p = .001$) than that for African Americans ($\beta = -.03$, $p = .554$).

Moreover, the private regard by perceived relative pubertal timing interaction on self-esteem was statistically stronger for African Americans ($\beta = .11$, $p = .006$) than Caribbean Blacks ($\beta = -.07$, $p = .520$). African American boys who perceived that their development was early relative to their peers and felt positive about being Black reported more self-esteem, but not among those who felt negatively about being Black (Figure 5). The interaction did not significantly differ from zero at low ($t = 0.089$, $p = .929$) or high ($t = 0.258$, $p = .797$) levels of private regard. The private regard by hair growth interaction on depressive symptoms ($\beta = .13$, $p = .002$) was statistically significantly equivalent across groups. Late hair growth predicted increased depressive symptoms among African American and Caribbean Black boys who felt negatively about being Black ($t = 2.097$, $p = .036$) but not among those who felt positively about being Black ($t = 4.727$, $p = .001$).

Among African American boys, 6% of the variability in self-esteem, 4% of the variability in depressive symptoms, and 5% of the variability in self-efficacy were accounted for by the independent variables and covariates. Among Caribbean Black

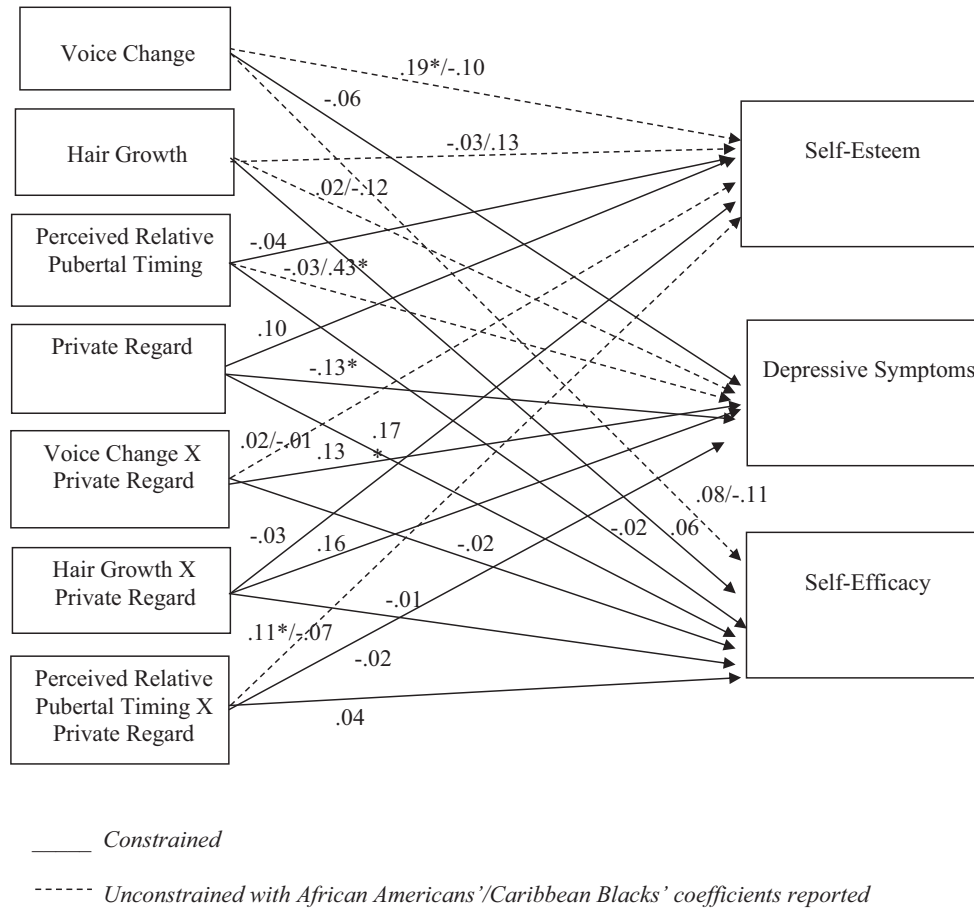


Figure 4. Private regard final model: Invariance analysis. Standardized coefficients are reported. Adolescent age and parents' nativity status were included as covariates for endogenous variables although not shown. Data have been weighted to be nationally representative. Standard errors have been adjusted for sampling stratification, clustering, and weighting of the data * $p < .05$.

boys, 4% of the variability in self-esteem, 23% of the variability in depressive symptoms, and 9% of the variability in self-efficacy were accounted for by the independent variables and covariates.

Public Regard

The $\Delta\chi^2$ difference test showed that the unconstrained [$\chi^2(18) = 28.48, p = .055; CFI = .99, RMSEA = .01$ CI: .01, .06; SRMR = .02] and constrained [$\chi^2(39) = 151.74, p = .001; CFI = .78, RMSEA = .10$ CI: .08, .12; SRMR = .04] models were significantly different from each other, $\Delta\chi^2(\Delta 21) = 192.76, p = .001$. As such, we tested models that sequentially constrained the parameters of the study constructs to be equal across groups to determine which parameters were significantly different between the ethnic subgroups. The overall fit of the final model yielded an adequate fit to the data [$\chi^2(35) = 50.80, p = .583; CFI = .95, RMSEA = .04$ CI: .01, .06; SRMR = .03]. As shown in Figure 6, all regression paths were constrained to be

equal except for four paths: (a) public regard on depressive symptoms, (b) public regard on self-efficacy, (c) perceived relative pubertal timing on depressive symptoms, and (d) public regard by voice change interaction on depressive symptoms.

The public regard on depressive symptoms path was statistically stronger for Caribbean Blacks ($\beta = -.29, p = .001$) than that for African Americans ($\beta = .06, p = .220$). The perceived relative pubertal timing on depressive symptoms path was statistically stronger for Caribbean Blacks ($\beta = .35, p = .001$) than that for African Americans ($\beta = -.02, p = .716$). The public regard on self-efficacy path was statistically stronger for Caribbean Blacks ($\beta = .19, p = .025$) than that for African Americans ($\beta = -.06, p = .204$). The public regard by voice change interaction on depressive symptoms path was statistically stronger for African Americans ($\beta = .15, p = .030$) than that for Caribbean Blacks ($\beta = .02, p = .834$; Figure 7). Early voice changes predicted fewer depressive symptoms among

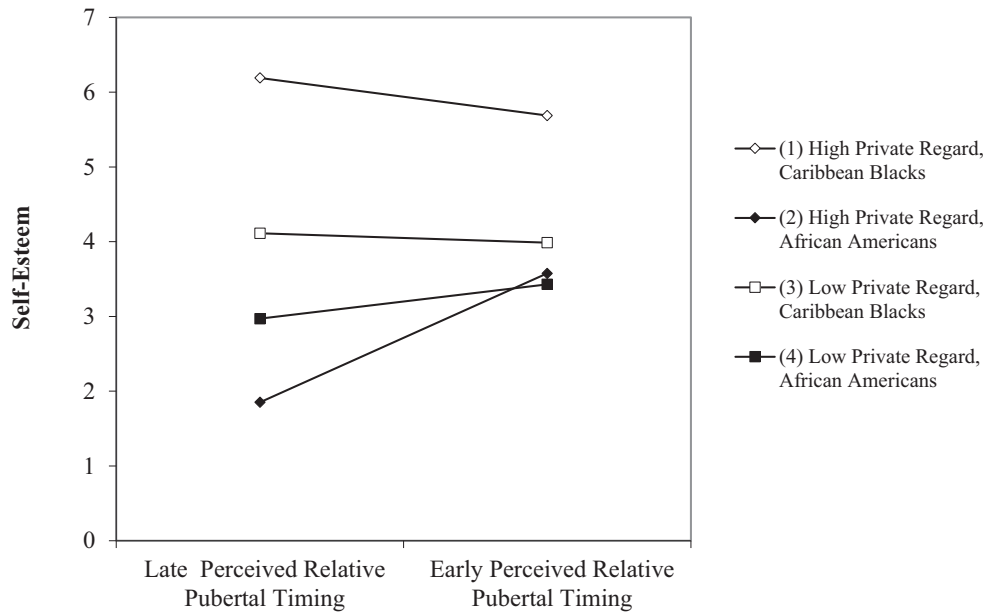


Figure 5. Interaction between private regard and perceived relative pubertal timing for African American and Caribbean Black boys.

African American boys who feel society views Blacks positively (e.g., high public regard levels; $t = 2.210$, $p = .028$). In contrast, late voice changes predicted increased depressive symptoms among African American boys who felt society views Blacks more positively but not among those who feel society views Blacks negatively ($t = 2.364$, $p = .018$).

Among African American boys, 3% of the variability in self-esteem, 4% of the variability in depressive symptoms, and 2% of the variability in self-efficacy were accounted for by the independent variables and covariates. Among Caribbean Black boys, 3% of the variability in self-esteem, 25% of the variability in depressive symptoms, and 9% of the variability in self-efficacy were accounted for by the independent variables and covariates.

Discussion

Research on pubertal development among Black boys is limited. To address this gap, we drew on the NSAL-A, which provided the opportunity to examine associations between three pubertal domains (e.g., hair growth, voice change, perceived relative timing), namely depressive symptoms, self-esteem, and self-efficacy among a nationally representative sample of African American and Caribbean Black boys. The moderating role of ethnic-racial identity content dimensions (e.g., racial

centrality, racial regard) was also explored. Inconsistent with our expectations, early pubertal timing was not associated with high levels of depressive symptoms and low levels of self-esteem and self-efficacy. Instead, African American and Caribbean Black boys who perceived that their voice changes were early reported high levels of self-esteem. Consistent with our expectations, African American and Caribbean Black boys who felt positively about being Black reported more self-esteem, more self-efficacy, and fewer depressive symptoms. Partially in support of our hypothesis, positive ethnic-racial identity levels buffered the effects of early pubertal timing. Early voice changes predicted increased depressive symptoms among African American and Caribbean Black boys who felt society views Blacks more negatively, but not among those who felt society views Blacks more positively. These findings were derived when we tested our hypotheses for the total sample by collapsing across the two ethnic subgroups.

A second aim of the study took a comparison approach to explore the extent to which the effects of pubertal timing and ethnic-racial identity on depressive symptoms and self-concept differed among African American boys compared to Caribbean Black boys. Although the present study revealed many similarities in the roles of pubertal timing and ethnic-racial identity on well-being and self-concept between African American and Caribbean Black boys, there are also noteworthy

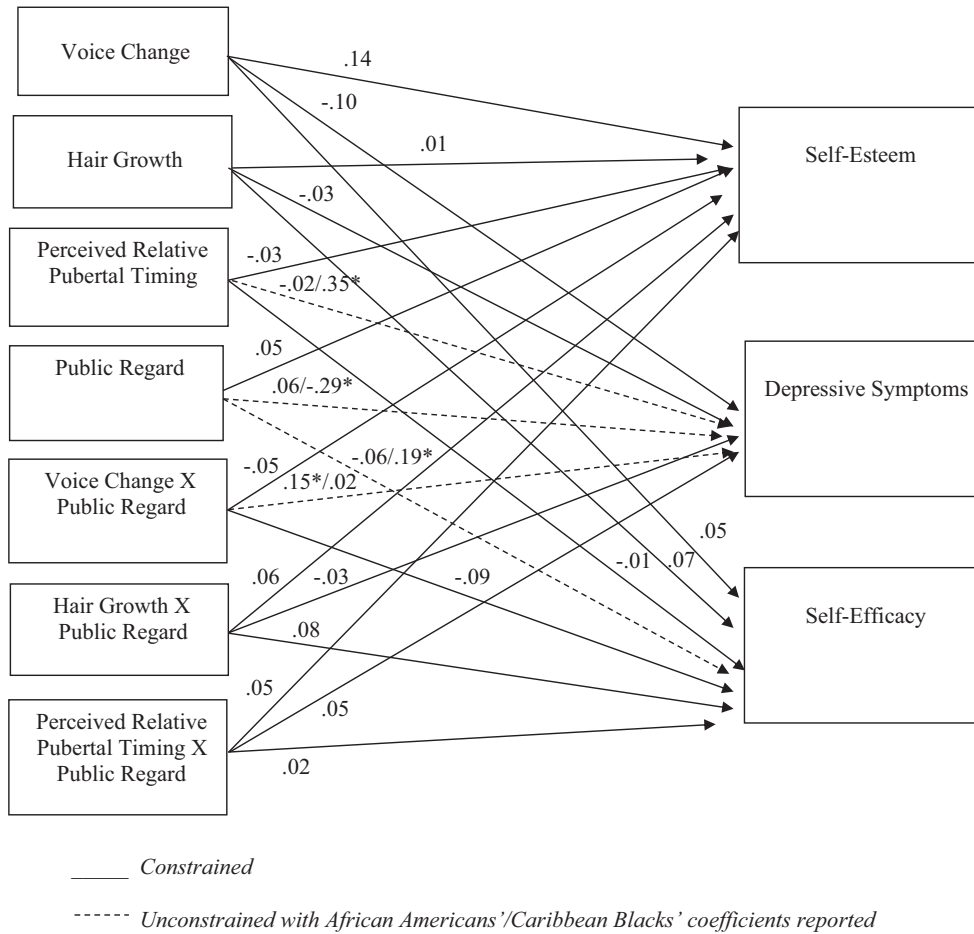


Figure 6. Public regard final model: Invariance analysis. Standardized coefficients are reported. Adolescent age and parents' nativity status were included as covariates for endogenous variables although not shown. Data have been weighted to be nationally representative. Standard errors have been adjusted for sampling stratification, clustering, and weighting of the data * $p < .05$.

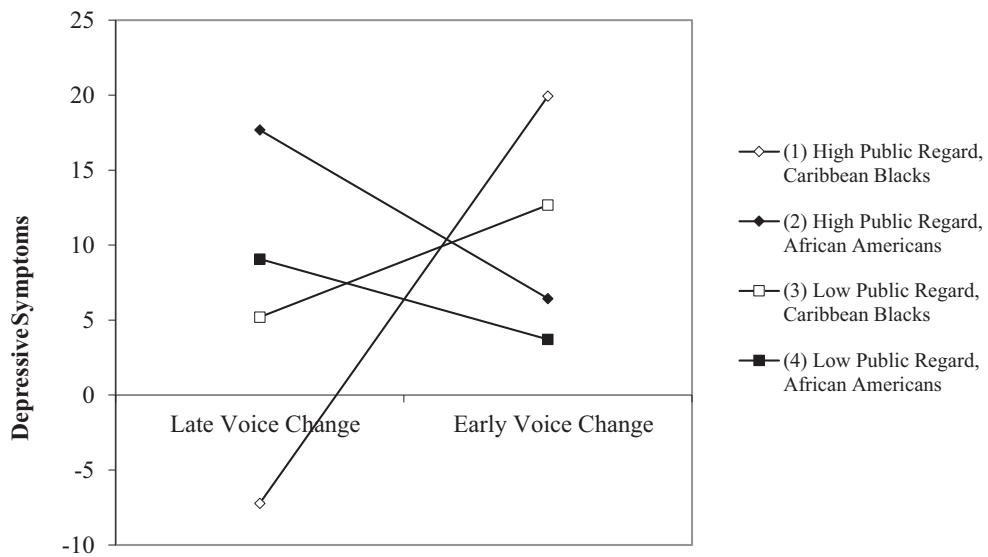


Figure 7. Interaction between public regard and voice change for African American and Caribbean Black boys.

differences between the two groups. We begin our discussion by noting that at a descriptive level, there were more similarities than differences between African American and Caribbean Black boys. For example, there were no significant mean level differences in puberty domains, ethnic-racial identity dimensions, depressive symptoms, self-esteem, and self-efficacy. However, important distinctions between the groups were observed when examining the main effects of each pubertal domain and ethnic-racial identity dimension on study outcomes.

For example, perceived voice changes significantly predicted self-esteem only among African Americans, whereas both perceived hair growth and perceived relative pubertal timing significantly predicted depressive symptoms and self-efficacy only among Caribbean Blacks. These findings are partially consistent with our expectations. Early pubertal timing (e.g., perceived relative timing) predicted increased depressive symptomatology, whereas specific pubertal indicators (e.g., voice change and hair growth) predicted increased self-esteem and self-efficacy. Thus, early pubertal timing or perceived relative timing conveys risks for negative outcomes such as depressive symptomatology among Caribbean Black boys but not among African American boys. This finding is consistent with past research using samples of African American boys (Ge et al., 2003, 2006; Hamlat et al., 2014).

Although no specific hypotheses were formulated for specific domains of puberty and ethnic subgroups, the effect of voice change on self-esteem was significantly stronger for African Americans than that for Caribbean Blacks and the effect of perceived relative pubertal timing was significantly stronger for Caribbean Black boys than that for African American boys. It is possible that, among African American boys, external markers of puberty may be more salient. Deeper voices are assumed to be more masculine (taller, heavier, hairier; Collins, 2000), and as such developing a deeper voice earlier may put African American boys closer to a more masculine ideal (Ricciardelli & McCabe, 2004). However, among Caribbean Black boys, peers might be particularly salient given that perceived timing consists of perceptions of pubertal development relative to peers. Caribbean Black youth have diverse friendships and maintain this diversity when in heterogeneous school settings (Reynolds, 2007). These diverse friend groups likely expose them to a wider range of developmental time frames including an increase in peers who will develop later, namely White boys, who develop an

average of 7 months later than Black boys. If Caribbean Black boys develop early, they may feel more out of place in these diverse friend groups. Another potential explanation is that Caribbean Black youth are navigating multiple sources of information due to acculturation, namely Black culture, White culture and ethnic subgroup culture. Blending these identities effectively is often taxing and has been related to negative academic outcomes and may also be related to depressive symptoms among Caribbean Black youth (Ferguson & Bornstein, 2014).

Noteworthy distinctions between African American and Caribbean Black boys were also observed when examining the main effects of ethnic-racial identity dimensions on study outcomes. High private regard levels (e.g., feeling positive about one's ethnic-racial group) predicted fewer depressive symptoms, increased self-esteem, and increased self-efficacy among both African American and Caribbean Black boys. These findings are consistent with our expectations such that positively evaluating one's ethnic-racial group appears to serve protective functions among African American and Caribbean Black boys. However, high public regard levels (e.g., believing that the broader society viewed one's ethnic-racial group positively) predicted fewer depressive symptoms among Caribbean Black boys. These divergent findings suggest that the protective nature of ethnic-racial identity differs significantly between ethnic subgroups of Black American boys. The effect of high private regard levels was similar for African American and Caribbean Black boys, but the effect of high public regard levels was stronger for Caribbean Black boys than that for African American boys.

Our findings are consistent with past research on private regard and well-being among African American boys (Rogers et al., 2015; Seaton, 2009; Sellers et al., 2006); however, our findings diverge from past research on public regard and well-being among African American boys (Sellers et al., 2006). It is possible, for example, that African American and Caribbean Black boys differ in the kinds of messages they receive from adults and peers regarding their ethnic-racial group as reflected in societal perceptions of their ethnic-racial group. Caribbean Black boys, particularly those with immigrant parents, are not only receiving discriminatory messages about Blacks from society broadly but also disparaging messages from their parents about non-Caribbean, Black Americans (Waters, 1999). Interestingly, there were no direct effects of racial centrality on study outcomes, which is consistent with prior research among African American boys (Carter et al., 2017; Rogers et al., 2015).

The Moderating Role of Ethnic–Racial Identity in the Relationship Between Pubertal Timing and Well-Being Racial Centrality

One important distinction between the two ethnic subgroups emerged. African American boys who believed that race is an important component of their overall self-concept and perceived their pubertal timing as late compared to their peers had higher self-efficacy. Despite developing later, which might disadvantage them in terms of peer acceptance (Smith & Leaper, 2006), African American boys may use racial centrality to gain acceptance from peers. Perhaps holding racial identity as an important part of one's self-concept allows it to be a stronger measure of self than the gender perceptions associated with pubertal development. This line of reasoning is consistent with previous conceptualizations of ethnic–racial identity as a self-protective mechanism, providing ego strengths to buffer adversity (Cross et al., 1998). The lack of results among Caribbean Black males suggests that Black identity may not be as central to their self-concept given alternative ethnic subgroup identities available to them.

Private Regard

African American and Caribbean Black boys who perceived that their hair growth was late and felt positive about being Black (i.e., high private regard levels) reported fewer depressive symptoms. However, late developing boys who felt negative about being Black reported more depressive symptoms. One important distinction between the two ethnic subgroups was that African American boys who perceived that their development was early relative to their peers and felt positive about being Black reported more self-efficacy. These findings are consistent with prior research among African American boys (Carter et al., 2017; Rogers et al., 2015). Thus, positively evaluating one's ethnic–racial group appears to serve protective functions among both African American and Caribbean Black boys who develop off-time (e.g., early, late).

One explanation for these divergent findings stems from research on ethnic–racial identity among Caribbean Black adolescents, which reported a latent racial identity profile classified as conflicted ethnic–racial identity (Sanchez, Bentley-Edwards, Matthews, & Granillo, 2016). Some Caribbean Black youth struggled with anxiety related to awareness of racism and denied the salience of ethnicity–race in their lives (Sanchez et al., 2016). Yet

this profile was not apparent for African American youth suggesting that ethnic–racial identity operates differently for the two ethnic subgroups (Sanchez et al., 2016). Other research suggests that Caribbean Black Americans are equally oriented to ethnic and Black American identities, but given that they are navigating three cultural influences (e.g., ethnic culture, Black American culture, mainstream-White culture), they potentially face different implications compared to their Black American peers (Ferguson & Bornstein, 2014; Medina et al., 2018). These distinctions may explain why private regard functions differently in the context of puberty, self-concept, and well-being among African American and Caribbean Black boys, although more empirical research is needed.

Public Regard

One important distinction between the two ethnic subgroups emerged. Early voice changes predicted fewer depressive symptoms among African American boys who feel society views Blacks positively (e.g., high public regard levels). It is possible that African American boys who are more advanced in their pubertal development and feel society views Blacks negatively may worry about being perceived as Black adult males resulting in more negative social experiences. Previous research has shown that Black youth report more racial discrimination experiences from adult and peer perpetrators as they mature (Greene, Way, & Pahl, 2006). Consistent with past research on public regard and youth outcomes (Fuller-Rowell et al., 2012; Seaton, 2009), positive messages relevant for public regard perceptions appear to serve protective functions among African American Black boys who develop early. However, the study findings also revealed that late voice change and high public regard were associated with more, rather than less depressive symptoms. Carter et al. (2017) also demonstrated that late pubertal timing coupled with high public regard levels predicted more externalizing problems among African American boys and girls (Carter et al., 2017). Given the scant research on puberty and ethnic–racial identity, it is difficult to speculate as to why public regard functioned differently among African American boys who develop either early or late. It is possible that African American boys who develop late feel dissatisfied with the pace of their developing bodies due to their body's childlike appearance. As such, the cultural benefits that may accrue from boys' voice change may not yet be realized by late developing African American boys.

Theoretical Considerations

There are several theoretical implications of this study. Unlike theoretical models of pubertal development, the PVEST model concerns itself with the lived experiences of racially and ethnically diverse youth and explicitly drawing attention to the unique risk and protective factors operating in their lives as well as adaptive coping processes (Spencer, 2006). Moreover, it underscores the importance of recognizing systematic and structural forces that serve to confer privilege on some groups and oppression on others (Spencer, 2006). The interplay between pubertal development and the lived experiences of racially and ethnically diverse youth can be seen in the case of Tamir Rice. The police purportedly saw him as a physical threat because he appeared “big” for a 12-year-old boy. Research supports the notion that White adults view Black boys as “older” compared to White boys (Goff et al., 2014). These preconceived stereotypes about Black boys can make navigating the pubertal transition uniquely challenging. Consistent with the PVEST, our findings suggest voice changes, an external indicator of puberty, maybe salient to the social interactions of African American boys. This finding represents aspects of the PVEST model because African American boys relative to Caribbean Black boys have a long history of social exclusion in the United States.

However, consistent with the PVEST model, if African American boys positively evaluate what it means to be a member of their ethnic-racial group, the impact of negative social encounters likely linked to pubertal changes can be mitigated. Specifically, our findings suggest that Black boys’ affective attitudes (e.g., private regard, public regard) toward their ethnic-racial group may explain the differential impact of pubertal development on mental health. How Black boys feel about being Black and how they believe society views Blacks interacts with visible and vocal markers of pubertal development to exacerbate and ameliorate certain puberty-linked outcomes. Lastly, the differential effects of early and late development are consistent with PVEST’s argument that off-timed pubertal maturation may be difficult for Black males given broader societal stereotypes and expectations about Black men and boys (Swanson et al., 2003). It would be important for future research to examine whether the racial ideology dimensions (e.g., humanist, assimilationist, oppressive-minority, nationalist) of the Multidimensional Model of Racial Identity and the ethnic-racial identity process

dimensions (e.g., exploration, resolution) intersect with pubertal development and youth outcomes among Black boys.

The current findings also have implications for the contextual amplification hypothesis given the link between early pubertal timing and diminished mental health for Black boys with specific ethnic-racial identity beliefs. The contextual amplification hypothesis proposed that stressful contexts included disadvantaged neighborhoods and harsh parenting practices (Ge & Natsuaki, 2009) and contending with societal racism may also be a stressful context. If societal racism is considered a stressful context then adaptation may be difficult if early puberty coupled with societal racism overtaxes the coping resources of early developing Black males (Ge & Natsuaki, 2009). Thus, bridging normative developmental processes (e.g., pubertal development) with a critical developmental task linked to ethnicity-race and gender (e.g., ethnic-racial identity) further elucidates the extent to which contextual conditions can attenuate or intensify the effects of puberty on adjustment outcomes. Taken together, individual characteristics such as race, ethnicity, gender, and the effects of various layers of social context affect the degree to which experience or context impacts the mental health and self-concept of Black boys. Future research using the contextual amplification hypothesis and PVEST is needed to examine the varied effects of pubertal development on adjustment while considering the intersection of race, ethnicity, gender, and pubertal timing among ethnic-racial minority youth.

Limitations and Future Directions

The results of this study suggest that ethnic-racial identity content dimensions (e.g., racial centrality, private regard, public regard) intersect with pubertal timing (e.g., voice change, hair growth, and perceived relative timing) among Black boys in important ways that require further investigation. Future research on this topic could build on the present study by addressing several limitations. First, the present study relied on self-report to assess perceived voice changes, hair growth, and perceived relative timing. Although the bulk of prior research has used self-report data to assess boys’ pubertal timing, Dorn, Susman, and Ponirakis (2003) demonstrated that the effects of pubertal timing on adolescent outcomes vary depending upon who rates adolescents’ pubertal development (i.e., self, parent, physician). Future studies should include a broader assessment approach of pubertal development.

Relatedly, how Black boys experienced their pubertal changes and the potentially racialized nature of these changes within their peer and family context is unknown. Puberty acts as a social stimulus, altering how adults and peers respond to adolescents as their bodies develop (Carter, Mustafaa, & Leath, 2018; Ge, Brody, Conger, Simons, & Murry, 2002; Reynolds & Juvonen, 2011). Thus, how other individuals respond to developing adolescents can be a critical determinant of how adolescents feel about their developing bodies. Given that Black youth are the first in their age cohort to develop, future research should examine how Black youth make meaning around potentially racialized aspects of pubertal development. It is also important to note that future studies should consider examining Caribbean Black boys based on their cultural background. Caribbean Black boys come from diverse islands and cultural backgrounds and this diversity could play a role in the effects of pubertal timing and/or the moderating effects of ethnic-racial identity. Unfortunately, we did not have data on their specific cultural backgrounds.

Another limitation of this study was the cross-sectional nature of the data preventing causal conclusions. For example, it is unclear whether perceived voice changes and hair growth cause difficulties with Black boy's self-concept and mental health or if pubertal timing exacerbates the difficulties faced by Black boys displaying mental health problems and poor self-concepts. One last limitation was our limited ability to address immigration status for the Caribbean Black boys given that prior research suggests that immigration status plays a role in Caribbean Black youths' ethnic-racial identities (Waters, 1999). Given the potential interconnectiveness of voice changes to pubertal development and accent to ethnic-racial identity, this would be a valuable area for future research to explore. Despite these limitations, this study highlights the complex relations between pubertal timing and Black boys' mental health and self-concept when different pubertal markers and moderation models are considered.

Conclusion

This study adds to the growing recognition that variables linked to ethnicity and race are important mechanisms for understanding puberty-linked outcomes. Black boys who adopt healthy ethnic-racial identity beliefs during the pubertal transition will have better mental health and stronger self-concepts. Greater attention might be placed on pubertal

education programs that include exploration of one's ethnic-racial identity to help Black boys process the identity-related messages they receive while navigating the pubertal transition. However, there were important similarities and differences in the patterns of relations among perceived pubertal domains, ethnic-racial identity dimensions, depressive symptoms and self-concept among African American and Caribbean Black boys. It will be necessary to continue examining African American and Caribbean Black boys' construction of their ethnic-racial identities throughout adolescence to identify the long-term consequences for their mental health and well-being as they navigate social encounters in their daily lives.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's website:

Appendix S1. A Multiple-Group Confirmatory Factor Analysis of the MIBI