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Adults' Perceptions of Children's Age: Implications for Child Development

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Dedication

This dissertation is dedicated to two of my biggest fans- my mother and father.

Everything I do, I do for you.

ABSTRACT OF THE DISSERTATION

Adults' Perceptions of Children's Age:
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by

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Doctor of Philosophy, Psychology
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Children of color can be misperceived as being much older than they are. However, anecdotal evidence of this phenomenon has outpaced its empirical investigation. Utilizing a longitudinal sample of 245 children (50% assigned female at birth, 88.8% non-white), the current study examined adults' perceptions of children's age (APCA) over time (i.e., ages 4, 6, 8, 10, and 12 years) to address questions regarding the shape of growth in APCA across childhood, predictors of growth, and how growth parameters (i.e., slope and intercept) may predict children's educational (i.e., school grades and disciplinary actions) and socioemotional functioning (i.e., externalizing behaviors and social competence) at age 12. Four hundred adult raters provided over 15,000 ratings across more than 1,000 headshots of children from preschool to early adolescence. First, results indicated that growth in APCA proceeded linearly as perceived age ratings steadily increased with chronological age. There was also significant variation in patterns of linear change over time and estimated age values at age 12. Second, child sex assigned at

birth and skin tone emerged as significant predictors of APCA over time. Adults' overestimations of boys' ages were greater than girls in early development (i.e., 4 to ~5.5 years), but girls were seen as older than boys in later development (i.e., ~ 5.5-12 years old). Children with darker skin tone ratings were perceived as older than those with lighter skin tones at all ages. Third, the APCA slope and intercept growth parameters did not significantly predict early adolescents' educational and socioemotional functioning at age 12. Lastly, given the influence of pubertal status on the appearance of age, a supplementary, within-time analysis including the child's pubertal status as a predictor of APCA at age 12 showed that the once-significant sex effect became non-significant, while the interaction between sex and skin tone became significant. Specifically, at age 12, adults rated girls with lighter skin tone as older than girls with darker skin tone, but skin tone was not related to APCA for boys. Together, these findings extend the evidentiary base for research on APCA while illuminating promising avenues for investigations of APCA in future research.

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Introduction

> *In 2012, 15-year-old Alexis Sumpter was arrested in Harlem for using her student subway card. The arresting officers believed she was too old to use a student card because it was only valid for those under the age of 19. Alexis was kept in custody until police were shown her birth certificate. Upon leaving the police station, Alexis had to get her wrists treated at a hospital due to being kept in handcuffs for a prolonged period of time. (Parascandola, 2012)*
>
> *In 2014, 12-year-old Tamir Rice was playing with a toy gun in a Cleveland park. Within seconds of leaving his squad car, an officer shot and killed Tamir, reporting, "Shots fired. Male down. Black male, maybe 20." (Dewan & Oppel Jr., 2015)*

As illustrated in the experiences of Alexis Sumpter, Tamir Rice and countless others, Black and Brown children can be misperceived as being much older than they are, often with dire consequences. However, anecdotal evidence of this phenomenon, as shared through various media outlets (e.g., magazines; Mwai, 2022), has far outpaced its empirical investigation. Although there is a wealth of research regarding adults' perceptions of other adults' age (e.g., Nielsen et al., 2015; Voegeli et al., 2021), far fewer studies have examined adults' perceptions of children's age (APCA; see Epstein et al., 2017; Cooke & Halberstadt, 2021, Goff et al., 2014 for notable exceptions). Moreover, the limited available research on APCA to date has been conducted outside the field of developmental psychology, despite the clear need to understand this phenomenon through the lens of development wherein both the form and function of APCA may change over time with varying implications for children's adaptation.

This dissertation investigated APCA over time utilizing an ethnically and racially diverse sample of both child targets (shown in static headshots) and adult raters. In doing

so, the current study filled prominent gaps in the literature on APCA while providing a foundation for future research. First, I used longitudinal data to document the expression of APCA across childhood from ages 4 to 12. Second, I evaluated the influence of child sex assigned at birth[1], skin tone, ethnic-racial status, and their interactions on patterns of growth in APCA over time (i.e., slope) and in early adolescence at age 12 (i.e., intercept). Third, I examined the predictive utility of APCA growth parameters (i.e., slope and intercept) for early adolescents' educational and socioemotional functioning at age 12. Finally, given the likely influence of pubertal status APCA, I conducted a supplementary, within-time analysis with pubertal status as an additional predictor of APCA at age 12.

Ecological Approaches to Social Perception and Child Development

Human behavior, perceptions, and development are shaped by the nested ecological contexts in which they occur. Integrating and extending ecological perspectives on human perception (McArthur & Baron, 1983) and child development (Bronfenbrenner, 1979; García Coll et al., 1996; Spencer et al., 1997), this dissertation provides the first developmental analysis of how APCA changes over time may influence children's functioning.

The ecological approach to social perception (McArthur & Baron, 1983) draws on other prominent theories (e.g., Gibson's theory of visual perception; Gibson, 2014) to provide a conceptual framework for research on age (and other) perceptions (e.g., Montepare & Zebrowitz, 1998). Three tenets of this approach are especially relevant to the current study. First, social perceptions, including perceptions of age, serve social and

[1] Hereafter referred to as "child sex" or "sex."

biological adaptive functions. For example, age perceptions are relevant to social goals (e.g., driving a car, drinking alcohol) and species survival (e.g., likelihood of being selected for reproduction). Second, social perceptions are informed by people's movements, voices, faces, and bodies. Third, physical qualities indirectly communicate "affordances" to others in terms of how they may be able to interact or engage with the perceived individual. Together, these principles explain that and why social perception informs social action.

Importantly, the ecological approach to social perception does not assume that perceptions are invariably accurate. For example, "overgeneralization effects" (Zebrowitz, 1997) may lead to biased perceptions as when a "baby faced" person is presumed to be younger in age, naïve in conation, and innocent in motivation (Berry & McArthur, 1985; Poutvaara et al., 2009). Thus, systematic inaccuracies in social perception across groups may drive biased social actions. While the ecological approach to social perception provides a useful framework for understanding the origins and implications of APCA, it is wholly non-developmental, such that little consideration is given to whether and how age perceptions shift over development (with regard to both perceiver and the perceived) and whether and how the implications of age perceptions (and inaccuracies therein) may change over time or context.

In the absence of theories that explicitly incorporate others' perceptions into a model of human development, the current study drew from and extended ecological models of child development. As the first, comprehensive theory of contextual influences in developmental psychology, Bronfenbrenner's ecological systems theory (EST;

Bronfenbrenner, 1979) posits various, nested and interacting contextual effects on child development. These influences are conceptualized in terms of proximity to the child (i.e., from proximal to distal) and include the microsystem (e.g., family), mesosystem (i.e., interacting microsystems; e.g., teachers talking with parents), exosystem (e.g., social services), macrosystem (e.g., cultural attitudes), and chronosystem (e.g., historical events). Because EST emphasizes the importance of various contextual factors in children's lives, this theory is well-suited to consider others' perceptions of the child as relevant to child development and adaptation.

Recent efforts to identify and understand unique influences and experiences affecting development among ethnic and racial minority youth provide additional theoretical support to ground research on APCA in development. García Coll's integrative model for the study of developmental competencies in minority children posits "social position factors" as being a central factor in development (García Coll et al., 1996). Social position factors encompass individual characteristics used by societies to hierarchically situate children by gender (or sex assigned at birth) and ethnicity-race, among other factors (e.g., social class) in ways that shape developmental outcomes for minority youth via structural racism and the discriminatory practices it supports. Importantly, the integrative model also incorporates "child characteristics," including chronological age and physical features (e.g., skin tone, height, weight), as important influences on children's developmental competencies (e.g., educational and socioemotional functioning). Taken together, ecological theories of social perception and child development support the value of studying adults' perceptions of child

characteristics, including age, as likely influences on their actions towards children and, by extension, on children's later social and education adjustment.

Intragenerational Age Perceptions

The correlates of perceived age have been widely studied in adult samples, particularly among older adults. For example, an abundance of research demonstrates the deleterious effects of age stereotypes (Levy et al., 2016), ageism (Chang et al., 2020), and (perceived) age discrimination (Hooker et al., 2019) on both physical (Stokes & Moorman, 2020) and mental health (Kim & Lee, 2020) in older adults. That said, in an international sample of more than fifty-six thousand adolescents and adults (i.e., ages 15-105), researchers found that younger people reported the highest level of age discrimination (Bratt et al., 2018). Thus, there is a need to understand the expression and impact of age perceptions across the life span.

Research regarding adults' perceptions of other adults' age has primarily focused on the workplace (e.g., perceived age discrimination; Harada et al., 2019; Marchiondo et al., 2019). However, in addition to employment-related outcomes, a substantial body of work has established perceived age as an incrementally valid biomarker beyond chronological age (Jones et al., 2019). For example, extant research suggests that, over and above chronological age, perceived age is negatively associated with measures of bone density (Nielsen et al., 2015), cognitive functioning (Umeda-Kameyama et al., 2020), and cardiovascular health (Kido et al., 2012). In prospective investigations of elderly samples, perceived age uniquely predicts life expectancy (Dykiert et al., 2012; Gunn et al., 2016).

A robust body of research has examined children's perceptions of their peers' behaviors (e.g., aggression and bullying; Lochman, 1987; Mehari et al., 2019; Reijntjes et al., 2013), but few studies have considered children's perceptions of peers' appearances beyond physical attractiveness (e.g., Blötte et al., 2014). Although it would not make sense to have children guess the ages of peers in their class (since children likely know this information), research could examine how children perceive the ages of other children with whom they are not familiar. Indeed, this research gap persists, despite evidence that children's age perceptions may underlie important developmental phenomena. For example, several studies have mentioned "looking older" (Skoog & Kapetanovic, 2022), having an "older appearance" (Bucci et al., 2021), and looking "grown-up" or "adult-like" (Reynolds & Juvonen, 2011), as potentially negative influences on early-maturing adolescents' socioemotional adjustment (e.g., peer victimization; Skoog & Kapetanovic, 2022).

The newly created AgeGuess Database, which contains over 200,000 perceived age guesses of over 4,000 self-uploaded photos of individuals ages 5-100 from around the world (Jones et al., 2019), underscores mounting global interest in age perceptions across the life span. Overall, these developments speak to the need for efforts to understand the nature and impact of age perceptions across development and across generations.

Intergenerational Age Perceptions

Although limited, extant research with child samples has demonstrated the salience, not only of self-perceptions (Nishina et al., 2018), but also of others' perceptions (Goff et al., 2014) for understanding child development. Scholars suggest

that potential bias in APCA may be related to apparent disproportionalities in surveillance and arrest rates across groups as defined by children's ethnicity-race and/or sex assigned at birth (e.g., Hall et al., 2016). However, only a handful of studies have systematically examined APCA within or across groups, and still fewer have considered their potential effects on children's educational and socioemotional adaptation.

Two major barriers have likely stymied ongoing efforts to understand APCA. First and foremost, a developmental analysis of APCA necessitates visual stimuli of the same perceptual targets over time (e.g., photos of the same child over time) which is expensive and requires years of data collection. Thus, researchers interested in exploring APCA over time may not be able to do so due to not having the required data at their disposal. Second, ongoing discrepancies in terminology and a tendency to overreach the interpretive strength of extant data have further hindered research progress aimed at identifying potential group differences in APCA and their implications for child development.

Evidence that children can be perceived, portrayed, and/or treated like adults has been mounting since the 1970s when psychologists began studying *parentification* (Boszormenyi-Nagy, 1972; Winder et al., 1976). This phenomenon, wherein parents treat their child like an adult, has been studied extensively as evidenced by the numerous variations in terminology, including *adultification* (Burton, 2007), *boundary dissolution* (Kerig & Swanson, 2010), *enmeshment* (Barber & Buehler, 1996), *parentification* (Haxhe, 2016), *role confusion* (Linde-Krieger & Yates, 2021), *role reversal* (Oznobishin & Kurman, 2009), *role equalization* (Shaffer & Egeland, 2011), and *spousification*

(Kerig, 2005). Recent papers have adopted the term, *adultification*, to capture adults' estimations of a child's age as being more advanced in years than is chronologically accurate (Cooke & Halberstadt, 2021; Epstein et al., 2017), but this term has a long and varied history.

In the 1980s, *adultification* was used to describe a media pattern wherein children were portrayed like adults (d'Heurle, 1983; Fetz, 1985). The media ecologist, Neil Postman, was largely responsible for popularizing this new use of the term in his (1982) book entitled, *The Disappearance of Childhood*, which discussed the increasingly blurred distinction between childhood and adulthood in television and film. The American Psychological Association (APA) has also used *adultification* in this manner when discussing the sexualization of girls (Zurbriggen et al., 2007). Perhaps in an attempt to combine these discrepant definitions, Epstein and colleagues (2017) suggested that *adultification* can refer to either the phenomenon in which children are *treated* like adults and/or the phenomenon in which children are *perceived* as adult-like. They also expanded the latter form of *adultification* to include perceived social and sexual maturity, innocence, and/or chronological age. Given emerging consensus that *adultification* is a multi-faceted construct that includes, but is not specific to, inflated age perceptions, the current study retained a specific focus on APCA.

In a groundbreaking investigation, which can arguably be credited for popularizing APCA in both lay and academic circles, Goff and colleagues (2014) randomly assigned 123 college students to complete one of three surveys that asked about the innocence of Black children, white children, or racially unspecified children. Each

survey also asked participants to rate the innocence of Black, white, or non-specified children within each of the following age subgroups: 0-4, 5-9, 10-13, 14-17, 18-21, and 22-25.

> *At this point, participants began to think of Black children as significantly less innocent than other children at every age group, beginning at the age of 10. Interestingly, after the age of 10, the perceived innocence of Black children is equal to or less than the perceived innocence of non-Black children in the next oldest cohort. In other words, the perceived innocence of Black children age 10 –13 was equivalent to that of non-Black children age 14 –17, and the perceived innocence of Black children age 14 –17 was equivalent to that of non-Black adults age 18 –21.* (Goff et al., 2014, p. 529)

Building on this first study, Goff and colleagues reported two additional studies in this same paper that considered APCA explicitly. In these two studies, they asked 59 college students and 60 police officers to make various evaluations of children in a criminal justice context. Participants were asked to provide their assessments of age and culpability as applied to images of Black, Latino, and white boys ages 10-17. Participants were shown 24 pictures (eight of each race), which were matched on attractiveness and racial stereotypicality, along with a description of a crime the child in the picture had (reportedly) committed (i.e., misdemeanor or felony). Across eight unique photos and crime descriptions, participants were asked to guess the age of the boy in the picture, which was then used to calculate a difference score (i.e., perceived age – actual age) that denoted over- or under-estimation of the child's age. Among the 59 college students, there was a within-race crime difference for Black photos only, such that participants overestimated the age of Black felony child suspects as compared to Black misdemeanor child suspects. There was also a between-race difference such that college students rated

Black felony child suspects as older than white felony child suspects. Among the 60 police officers, there was a race effect such that Black and Latino boys were perceived as older than their chronological age, but officers did not perceive the age of white boys as significantly different from their chronological age. For Black boys only, there was also a crime effect such that the magnitude of age overestimation was greatest for purported felons with officers misperceiving 13-year-old Black boys who had reportedly committed a felony as adults.

Both non-empirical papers (Davis & Marsh, 2020; Dumas & Nelson, 2016) and empirical studies (Cooke & Halberstadt, 2021; Epstein et al., 2017) have built on the novel and impactful methods and findings of Goff and colleagues (2014). For example, in an online study of 325 adults, Epstein and colleagues (2017) asked participants to complete one of two surveys about imagined Black or white girls regarding various facets of adultification (including how much they seemed "older than their age") in each of the following age subgroups: 0-4, 5-9, 10-14, and 15-19. They found that Black girls were more likely to be perceived as being older than their stated age beginning at just 5 years of age. In contrast, in a study of 152 parents' age perceptions across 20 photos of Black children and 20 photos of white children from the ages of 10-13, Cooke and Halberstadt (2021) found no evidence that Black children (M = 10.69 years old) were perceived as older than white children (M = 10.62 years old). Lastly, as part of a pilot study from a new investigation of visual maturity (Koch et al., 2023), 44 undergraduate students were randomly shown four full-body images of 12-year-olds varying by sex (i.e., female versus male), race (Black versus white), and maturation (low versus high). Participants

were instructed to specify an age range indicating how old they thought each child was. Results revealed that, on average, high maturation Black females and males, as well as white females were all perceived as significantly older than their low maturation counterparts , but there was not a significant difference in APCA between high maturation white males and their low maturation peers.

Together, these studies provide important descriptive data regarding how APCA across different groups in terms of raters, child ethnicity-race, child sex assigned at birth, pubertal status, and purported child behaviors. However, significant methodological limitations have constrained the reach of prior data. For example, the absence of longitudinal data using the same child stimuli across all age groups has limited our understanding of if and how APCA may change over time and/or in different ways for different groups of children. Moreover, Epstein and colleagues' (2017) use of imagined girls as opposed to photos of girls to assess APCA raises additional concern given the documented influence of appearance features, such as eye size and skin tone, on age perceptions (Zebrowitz, 1997). Additionally, although it is not known how many stimuli are needed to obtain reliable perception estimates, certainly using more than eight images for each racial group (and just four for each behavior type within group) would have strengthened the conclusions of Goff and colleagues (2014). Indeed, even the 20 photos of each group used by Cook and Halbertstadt (2021) may have been insufficient to warrant firm conclusions regarding APCA across groups based on child ethnicity-race and/or sex.

Amidst growing interest in how adults perceive children's age (and other characteristics), there are concerns that some investigators have overreached the interpretive strength of their designs and resultant findings. For example, in a study of purported *adultification* in pediatric anesthesia decisions, Baetzel and colleagues (2019) found that, compared to their white peers, Black children were less likely to receive premedication in the perioperative period or to have family members present during inhalation induction, which are two anxiety-reducing strategies. Using regression models that stratified children's ages (i.e., less than 5 years, 5-9, 10-14, and 15-17), they found that Black children under the age of 15 were 31% less likely than white children to have a family member present at induction. Although these researchers suggested that the "significant difference in presence of a family member at induction and use of preoperative midazolam may also reflect the bias that Black children are more adult like and perceived to be biologically older than they really are" (Baetzel et al., 2019, p. 1122), the researchers never assessed APCA directly. In light of these and other limitations, there is a pressing need for empirical research to document APCA over time, and to identify factors that may predict the degree of accuracy between adults' perceptions and children's chronological age.

Predictors of APCA

Prior studies have examined APCA among boys (Black, Latino, and white; Goff et al., 2014), girls (Black and white; Epstein et al., 2017), and in samples of Black and white girls and boys (Cooke & Halberstadt, 2021). The current study extended these works and filled prominent gaps in the literature by evaluating 400 adults' age

perceptions across 245 child targets followed over time at ages 4, 6, 8, 10, and 12 (i.e., > 1,000 images and > 15,000 age ratings). In doing so, this investigation offered an unprecedented opportunity to examine APCA across childhood and in diverse groups of children.

Prior emphasis on ethnic-racial status is unsurprising given other racialized patterns of adult perception and interpretation. For example, racialized anger bias refers to the phenomenon of misperceiving anger in Black people substantially more than white people (Halberstadt et al., 2018), and has been documented in studies of adults who rated photos of other adults (Halberstadt et al., 2018), as well as of adults who rated photos of children (Halberstadt et al., 2020). Extant research on APCA has focused on comparisons between Black and white children (Cooke & Halberstadt, 2021; Epstein et al., 2017), with the exception of Goff and colleagues (2014) who also included Latino boys. This pattern mirrors broader research on ethnic-racial disproportionalities, which have accorded relatively less attention to Latine groups and even less to youth who identify with multiple ethnic-racial identities (Skiba et al., 2011). In light of these concerns, this investigation evaluated APCA across distinct groups of Latine, Multiracial, Black, and white children from ages 4 to 12. Moreover, amidst mounting concern regarding overreliance on ethnic-racial status as a unitary construct given its multidimensional nature (i.e., marked phenotypic heterogenity within ethic-racial groups; Saperstein et al., 2016), the current investigation evaluated skin tone effects, in addition to those associated with ethnic-racial group status, in recognition that skin tone may drive apparent ethnic-racial group differences (Roth, 2016).

Skin tone offers a continuous predictor of APCA that may afford unique insight into this phenomenon beyond categorical ethnic-racial group status. Individuals who identify with specific ethnic-racial categories (e.g., Black, Latine) represent vastly different appearances and experiences. For example, a Latine person with relatively light skin tone is often treated differently than a Latine person with darker skin tone by people inside and outside the Latine community (Gastelum et al., 2021). Of course, for individuals who identify with multiple ethnic-racial groups, skin tone affords a unifying metric of individual difference that transcends ethnic-racial categories. Many factors beyond skin tone may account for heterogenous experiences within ethnic-racial groups (e.g., racial stereotypicality, Hebl et al., 2012; nativity status, Córdova & Cervantes, 2010), but the current study focused on skin tone because it is readily perceived by others and was well-suited to current sample, which included a large proportion of youth who identify with multiple ethnic-racial groups.

Although there are no published investigations of skin tone and APCA, the abundance of research documenting associations between skin tone and differential treatment in varied structural systems supports its salience. For example, in the educational system, research suggests youth with darker skin tone are more likely to be suspended (Hannon et al., 2013), and receive significantly lower grades compared to their peers with lighter skin tone over and above sex, age, immigrant status, parental education, and family income (Thompson & McDonald, 2016). Of course, a child's skin tone must be considered alongside other individual characteristics, such as sex, since different constellations of these characteristics can yield meaningful differences. Thus,

the current study employed an intersectional lens of analysis to capture both the individual and interactive influences of child ethnicity-race or skin tone and sex on APCA. As but one example, the aforementioned findings by Hannon and colleagues (2013) regarding skin tone and school suspension were driven by the experiences of Black adolescents, particularly Black females. Indeed, the odds of suspension were roughly 3.4 times greater for Black females with the darkest skin tone compared to those with the lightest skin tone, whereas this difference was more muted at 2.5 times greater among males with darker versus lighter skin tone. Importantly, this finding was robust to various confounding factors including, but not limited to, parental socioeconomic status, child delinquency, and academic performance.

APCA may differ across girls and boys, but most research to date consists of within-group single-sex analyses (e.g., Epstein et al., 2017; Goff et al., 2014). Additionally, the studies that have measured APCA in samples of girls and boys have done so with small samples of visual stimuli (e.g., four images; Koch et al. 2023) and often using either collapsed (e.g., Goff et al., 2014) or dichotomized age ratings (e.g., Johnson & Collins, 1988). Indeed, the only study assessing age perceptions in a larger sample of girls and boys (a total of 40 images) and utilizing a continuous metric of perceived age, included sex as a covariate, which missed the opportunity to examine its potential influence on APCA (Cooke & Halberstadt, 2021). Studies documenting the sexualization of girls by the media (Lamb & Koven, 2019) and various people in their lives (e.g., family and friends; Zurbriggen et al., 2007) suggest that girls may be perceived as older than boys of the same chronological age. Indeed, given that girls

typically experience puberty earlier than boys (Brix et al., 2019), adults may be more likely to engage in earlier and greater age overestimation when rating female children as compared to male children. While the current study offered a novel examination of APCA among both girls and boys, a supplemental analysis also considered pubertal status effects on predicted sex differences at age 12 wherein girls were expected to be rated as older than boys of the same chronological age in early adolescence.

The Adaptive Implications of Age Perceptions

The ecological approach to social perception holds that perception informs social action (McArthur & Baron, 1983), while ecological approaches to child development show that social actions, particularly as executed by influential adults in a child's life (e.g., teachers, parents, officers), influence child adaptation (Bronfenbrenner, 1979; García Coll et al., 1996). Thus, APCA may influence children's educational and social adaptation.

Teachers are among the most salient adults in children's lives, second only to parents (Hamre & Pianta, 2001). Decisions made by teachers and other school staff greatly affect a child's developmental trajectory as evinced by the notorious school-to-prison pipeline (Barnes et al., 2018; Bryan, 2017). Although school personnel likely know the age of students, teachers, administrators, and school security staff may nevertheless act on biased age perceptions when interpreting and responding to a student's behavior in the moment. Indeed, one investigation revealed that, even when adults were shown the ages of children next to their yearbook photo, they were still more likely to assign more cognitively demanding chores to children with more mature looking

faces when compared to “baby-faced” children (Zebrowitz et al., 1991). The same trend emerged when participants made punishment judgements such that “baby-faced” children received less severe punishments for the same offenses. These findings show that explicit knowledge of a child’s chronological age does not eliminate the potential for problematic social actions driven by biased social perceptions to undermine children’s educational and socioemotional adaptation.

In a unique, experimental study (Carter et al., 2018), elementary school teachers were randomly presented with vignettes about children’s externalizing or academic behaviors that included drawings of Black or white 10-year-old girls in varying stages of pubertal development (i.e., early, on-time, or late). After the stimulus presentation, teachers rated each girl’s future academic and social functioning. Despite knowing the chronological age of the girls in the vignettes, teachers expected worse academic and social functioning for early-maturing girls. Moreover, compared to their early-maturing white peers, teachers expected early-maturing Black girls to have more problems interacting and relating to others, as well as increased difficulty with acquiring and using information in the academic context.

Beyond the school setting, researchers have suggested that children’s apparent age may influence their socioemotional adaptation in adolescence (e.g., internalizing symptoms, peer victimization, substance use; Bucci et al., 2021; Reynolds & Juvonen, 2011; Skoog & Kapetanovic, 2022). For example, several studies have demonstrated the importance of social factors, such as social competence, for subsequent substance use and internalizing symptoms among early-maturing girls and boys (Benoit et al., 2013;

Reynolds & Juvonen, 2011; Teunissen et al., 2011; Westling et al., 2012). Thus, the current study examined predictive relations from APCA to later educational and socioemotional adaptation in early adolescence (age 12) as indicated by 1) child reports of their school grades, 2.) child reports of their school disciplinary actions (e.g., number of detentions in the past year), 3) child reports of their externalizing behaviors (e.g., fighting), and 4) caregiver reports of the child's social competence (e.g., number of close friends).

The Current Study

Adults make important decisions that impact children's lives each and every day. In schools, adults decide which children get detention and which children get suspended. In the streets, adults decide who is a threat and who is not. APCA may drive disparities in adult's decision making and social actions that affect children's educational and socioemotional adaptation. Thus, the current study sought to document the expression of APCA over time, test if and how APCA patterns may vary based on child ethnicity-race, skin tone, and sex, and evaluate whether APCA growth patterns influenced children's educational and socioemotional adaptation.

Harnessing the power of a sociodemographically diverse sample of 250 children followed longitudinally across five data waves from the preschool period (age 4) through early adolescence (age 12), the current study addressed major gaps in our limited understanding of APCA by achieving three overarching goals. First, unconditional growth models documented APCA based on more than 1,000 photos of children from ages 4-12. I predicted that there would be significant variation in APCA over time and in

early adolescence at age 12. Specifically, I hypothesized that adults would perceive children's age as increasing over time (i.e., positive slope), but there would be significant variance in the slope such that some children would show steeper increases in perceived age ratings than others. Additionally, I expected that there would be significant variation in APCA at age 12 (i.e., intercept variance). Second, conditional growth models evaluated differences in the slope and intercept of APCA as a function of child ethnicity-race, skin tone, and sex. I hypothesized that Black children would be perceived as older than children from all other ethnic and racial groups. I also expected that children with darker skin tone would be perceived as older than children with lighter skin tone resulting in faster perceived age gains over time and higher intercept estimates at age 12. Regarding sex effects, I predicted that females would be perceived as older than males yielding steeper positive slopes over time and higher age estimates at age 12. Moreover, I expected a significant interaction such that females with darker skin tone would show both the steepest slope and the highest age 12 intercept. Third, regression analyses tested predictive relations from APCA to children's educational adjustment (i.e., child reports of grades and school disciplinary actions) and socioemotional adjustment (i.e., child reports of externalizing behaviors and parent reports of social competence) at age 12. In achieving these goals, this study filled prominent gaps in our understanding of APCA while building a more expansive foundation for future research.

Method

Participants

Participants were 250 caregiver-child dyads who were part of an ongoing, longitudinal study of child development that began in the preschool period (M_{age_wave1}= 49.05 months, *SD*= 2.95). Children were diverse with regard to child sex assigned at birth (50% female, 50% male), ethnicity-race (46% Latine, 24.8% Multi-ethnic/racial, 18% Black, and 11.2% white), and economic status (37.6% in poverty). The majority of caregivers were biological mothers (91.4%), followed by foster/adoptive mothers (3.6%), and grandmothers or other kin (5.0%). Regarding education levels, 19.6% of caregivers did not have a high school degree, 16% had a high school diploma or GED, 51.2% had some post-secondary education (e.g., vocational training or two- year degree), and 13.2% had a bachelor's degree or higher. At the time the study began, most caregivers were married (61.6%) or in a committed relationship (18.8%), and 56.4% were working outside the home in some capacity. Five dyads were excluded from this study because the caregiver did not consent for the use of the child's images at all waves. Across the five data waves used in these analyses (ages 4, 6, 8, 10, 12), 227 (92.7%) of the 245 child participants completed two or more assessments in the laboratory.

Raters were 400 adult (i.e., 18 or older) college students recruited from introductory psychology courses at a large university in Southern California from September 2022 to February 2023. Most raters were assigned female sex at birth (i.e., 65.7%) and identified as women (i.e., 63.6%). Raters were between the ages of 18 and 35 (*M* = 19.643 years old, *SD* = 1.845 years old) and were economically diverse with 41.8%

receiving Pell Grant support for low-income students. As displayed in Table 1, the rater sample was diverse with regard to ethnicity-race.

Table 1
Ethnic-Racial Composition of Raters

Ethnic-racial Category	Frequency	%	Self-Identified Ethnicity-Race	Frequency
Latine	114	28.50%	Central American	9
			Cuban	0
			Puerto Rican	0
			Spanish (from Spain)	1
			Mexican (American), Chicano	104
Asian	113	28.25%	Asian Indian	34
			Chinese	42
			Japanese	1
			Korean	23
			Other Asian	13
Bi-ethnic/racial	76	19.00%	2 groups selected	76
Pacific Islander & Native Hawaiian	34	8.50%	Filipino	16
			Guamanian or Chamorro	1
			Native Hawaiian	0
			Samoan	0
			Vietnamese	17
			Other Pacific Islander	0
white	21	5.25%	white	21
Middle Eastern or North African	19	4.75%	Middle Eastern or North African (e.g., Lebanese)	19
Multi-ethnic/racial	16	4.00%	3+ groups selected	16
African Descent	7	1.75%	African	1
			African American	5
			Afro-Caribbean	0
			Black	1
American Indian or Alaska Native	0	0.00%	American Indian or Alaska Native	0

Families were recruited via flyers advertising a “study of children's learning and development,” which were distributed to a variety of community-based childcare programs in Southern California. Caregivers completed a brief screening by phone to ensure the target child was 1) between 3.9 and 4.6 years of age, 2) proficient in English, and 3) not diagnosed with a developmental disability. At each wave, dyads completed a three-hour, video-recorded laboratory assessment, which consisted of measures with the child, the caregiver, and the caregiver and child interacting. Caregivers received $25 per each hour of assessment and children received an age-appropriate gift at the end of each assessment. Informed consent was obtained from the child's legal guardian at all waves and informed assent was collected from children beginning at age 8.

Rater data were collected by trained, undergraduate research assistants in small groups of ~10 raters in a university computer lab. To be eligible, raters had to be at least 18 years old and able to read English. To avoid the possibility that the now-grown child participants in the study would be asked to rate their own image and to minimize the likelihood that raters would recognize a participant image, raters were excluded if they or anyone in their family had ever participated in a study on the University campus before 2022. Following informed consent, the research assistant presented raters with a digital assessment tool that included 1) a pre-rating survey measuring basic sociodemographic characteristics (e.g., sex assigned at birth, major), 2) a training session to familiarize raters with images and rating prompts for 10 randomly selected, unique child participants, 3) a formal rating session using images of 50 randomly selected, unique child participants, and 4) a post-rating survey to measure raters’ social exposure to children

and other groups (e.g., frequency of contact with children under the age of 18, ethnic-racial intergroup contact). The digital assessment tool was created using Inquisit 6 (Millisecond software) and the full reproducible code is reported in Appendix B. Given the sensitive nature of the photographic stimuli, research assistants remained in the room for the duration of the assessment to ensure that participants did not take photos of the headshots. Raters received one course credit for their participation and were debriefed after they completed the post-survey. All procedures pertaining to the initial data collection and the subsequent rating protocol were approved by the human research review board of the participating university.

Measures

Image ratings. Adults' ratings of each child image were collected using headshots taken from video-recorded assessments at each data wave. Each headshot showed the child with a neutral expression and open eyes from the shoulders up to avoid clothing- and height-related age cues. Headshots were screened three times for i) initial selection, ii) lighting, and iii) image quality to ensure that the final stimuli were as uniform as possible. Each neutral, digital portrait (format is Portable Network Graphic; PNG) was 576 pixels tall, though width varied (~300 to 800 pixels) to preserve the quality of the image and the child's facial proportions.

To avoid potentially biasing ratings, raters were told that they were going to be rating "pictures of people," rather than "children". Following the 10-image training period, adult raters evaluated 50 child images in 5 sets of 10 images each. Images were drawn at random from each assessment wave and randomized in presentation such that

each adult rated 10 unique child images drawn from each of the five assessment waves and randomized over ages 4, 6, 8, 10, and 12. The algorithm ensured that no rater evaluated more than one image of a given child (i.e., if a child's image was randomly drawn at one data wave, it was excluded from that adult's rating at other waves). Raters were shown each headshot on a computer for a duration of 45 seconds. Following this presentation, a rating scale appeared just below the child's image and raters were asked to indicate the child's age from 1-20 years (with half ages), skin tone ("What is this person's skin tone?"; 1 = *very light* to 7 = *very dark;* Keith et al., 2010), ethnic-racial status ("What is this person's ethnicity-race? Choose all that apply."), friendliness ("How friendly do you think this person is with other people their own age?"; 1 = *very friendly* to 7 = *not at all friendly*; Stevens et al., 2008), attractiveness ("How would you rate this person's physical appearance?"; 1 = *very attractive* to 7 = *not at all attractive*), femininity/masculinity ("How feminine/masculine is this person?"; 1 = *very feminine* to 7 = *very masculine*), and photo quality ("Please rate the quality of this photo"; 1 = *very poor* to 7 = *excellent*). Following each batch of 10 ratings, participants received a mandatory 30-second break (N = 5) to minimize fatigue. Lastly, to prevent raters from spending too much time rating any single image, images automatically advanced after 45 seconds even if the ratings were not yet complete.

Rater characteristics. Prior to the rating task, adults provided basic sociodemographic information regarding their sex assigned at birth, gender identity, zip code, academic major, birth month, birth year, highest level of education completed by primary caregiver(s), Pell grant recipient status, number of children under the age of 18 in

their primary residence (i.e., where they lived before starting college), their ethnicity-race, the ethnicity-race of both biological parents (if known), and vision (i.e., whether they had corrected vision and if they were wearing their prescription glasses or contacts if needed at the time of the assessment). The post-rating survey contained items regarding street ethnicity-race (i.e., what ethnicity-race they think other people would assume they were based on their appearance; López et al., 2018), birthplace (i.e., if they were born in the United States), the age at which they migrated to the United States if they were not born here, parental status (i.e., if they were a parent), cross-ethnic-racial friendships using a network approach (Page-Gould, 2012; T. W. Smith, 2002), and self-rated skin tone using a 7-point scale from 1 (*very light*) to 7 (*very dark*). Raters also reported on their sleepiness (Stanford Sleepiness Scale; Hoddes et al., 1973) and affect using the 10-item short form of the Positive and Negative Affect Schedule (PANAS; Thompson, 2007) during both the pre-rating survey and post-rating survey. All survey and rating items are in Appendix A.

Child characteristics. Child ethnicity-race and sex assigned at birth were reported by the participating caregiver. Child skin tone was indicated by adults' ratings across the images. At age 12, children reported on their pubertal status using the Pubertal Development Scale (PDS; Petersen et al., 1988), which includes five items about growth in height, body hair, skin changes (e.g., pimples), breast development (girls only), voice changes (boys only), menstruation (girls only), and facial hair growth (boys only). The PDS has demonstrated strong reliability and validity in diverse samples (Stumper et al., 2020).

Child educational adjustment. At age 12, the child's cumulative GPA was indicated by the child's report of their current school grades in English, Math, Science, and History, as well as the number of detentions, suspensions, and visits to the principal they had experienced in the past year.

Child socioemotional adjustment. At age 12, children reported on their externalizing behaviors and caregivers reported on children's social competence. Children completed the externalizing subscale of the Youth Self-Report (YSR; Achenbach, 1991) which included 30 items (e.g., "I argue a lot.") rated on a 3-point scale from 0 (*not true)* to 2 (*very true)*. Caregivers completed the social competence subscale of the Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983), which included 5 items (e.g., "How well does your child get along with other kids?") rated on a 3-point scale from 0 (*not true)* to 2 (*very true*).

Data Analytic Plan

A multilevel growth modeling approach accommodated variation in the number of raters for each image across time, as well as other sources of variability among children and raters (i.e., child sex, skin tone, and photo quality). Prior to analyses, all variables were evaluated for distributional assumptions to support parametric statistics (i.e., skew, kurtosis; Affifi et al., 2007). Visual stimuli for select children were missing at ages 4 (n = 33, 13.47%), 6 (n = 47, 19.18%), 8 (n = 52, 21.22%), 10 (n = 49, 20.00%) and 12 (n = 71, 28.98%) due to recording errors, visit non-completion, or caregiver non-consent for the use of the child's images. At age 12, children's educational and socioemotional adjustment measures were missing for school grades (n = 59, 24.08%),

school disciplinary actions (n = 48, 19.60%), externalizing behavior (n = 49; 20.00%), and social competence (n = 52, 21.22%). Full Information Maximum Likelihood (FIML) estimation addressed missing data concerns, as supported by Little's (1998) MCAR test, χ (51) = 50.446, p = 0.496.

Multilevel growth curve models were computed in RStudio using the *lme4* package (Bates et al., 2014) with an unstructured covariance matrix and Satterthwaite degrees of freedom. The full reproducible code is available in Appendix C. Study goals and hypotheses were evaluated using a three-stage process to determine 1) the shape of growth, 2) the optimal number of random effects, and 3) significant predictors to and from growth parameters (i.e., slope and intercept). An unconditional no-growth model tested whether there were significant within- and between-person variances in age perceptions at age 12. The optimal shape of the growth curve was determined by considering polynomial functions assessing linear, quadratic, and cubic changes in APCA over time, as well as whether there were significant within- and between-person variances in these change parameters. In the event of a significant linear or quadratic growth model, the intercept was set to age 12. Superior model fit was defined as a significant Likelihood Ratio Test (LRT) as well as lower AIC and BIC values (Horváth & Plunkett, 2016). After identifying the best-fitting shape of growth, two unconditional models identified the appropriate number of random effects using LRTs to assess model fit. The rand function from the *lmerTest* package evaluated each random effect (i.e., random slope, skin tone, photo quality, child sex) individually to determine if removing the random effect significantly worsened the model fit. In the first model, the four

random rater effects were analyzed. In the second model, the four random child effects were analyzed. The third and final model combined significant random rater effects and the significant random child effects, as well as the significant intercept random effects.

A conditional growth model examined the significance of child ethnicity-race (effect coded), skin tone (mean-centered), sex assigned at birth, and their interactions as predictors of APCA. A supplemental, within-time analysis at age 12 evaluated the extent to which the model was impacted by the inclusion of puberty status. A post-hoc, within-time analysis at age 4 was conducted to further probe factors influencing APCA at that data wave. Finally, regression analyses evaluated relations between the slope and intercept parameters of APCA from the unconditional model and children's educational and socioemotional adaptation at age 12.

Results

Descriptive and Bivariate Analyses

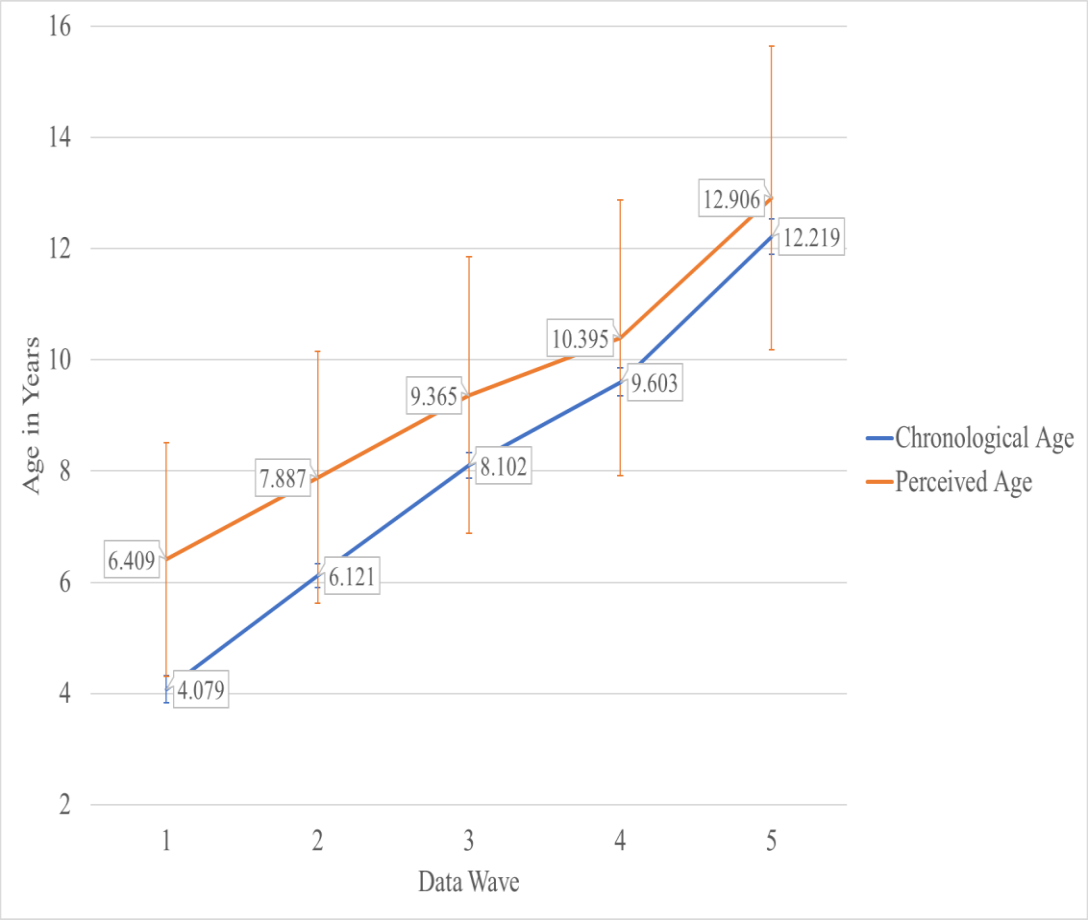
Each image of each child at each data wave received at least 6 unique ratings, yielding a total of 15,702 ratings ($M_{\text{ratings/photo/wave}}$ = 15.749-16.039; *SD* = 3.817-4.245). The number of raters at each wave ranged from 8-28 at age 4 (*M* = 16.005, *SD* = 3.942), 6-27 at age 6 (*M* = 16.039, *SD* = 3.817), 7-30 at age 8 (*M* = 16.005, *SD* = 4.045), 6-28 at age 10 (*M* = 15.886, *SD* = 3.965), and 7-28 at age 12 (*M* = 15.749, *SD* = 4.245).

Descriptive statistics and bivariate correlations are presented both by observation (*N*= 15,702) and by child (*N*= 245) for the primary study variables (i.e., chronological age, perceived age, skin tone ratings, photo quality ratings, and the age 12 adjustment variables). The multilevel growth models utilized all 15,702 ratings (i.e., long data) of all

available images of each child. The regression models examining age 12 educational and socioemotional adjustment outcomes on the perceived age slope and intercept parameters utilized child-level data (i.e., wide data) since each of the 245 children had their own set of parameters. Figure 1 provides a visual representation of children's average chronological age values and raters' perceived age estimates across all five data waves. As depicted, adults overestimated children's age at all waves with the greatest inaccuracies observed at age 4, followed by steady improvement up to age 12.

Figure 1

Average Chronological and Perceived Age Across Data Waves



Note. Vertical error bars represent the standard deviation for each average. Bar color corresponds to line color (i.e., the orange error bars refer to average perceived ages).

Descriptive statistics and bivariate correlations by observation are presented for data waves at age 4 (Tables 2 and 3), age 6 (Tables 4 and 5), age 8 (Tables 6 and 7), age 10 (Tables 8 and 9), and age 12 (Tables 10 and 11). At each data wave, a MANOVA evaluated differences across ratings of perceived age, skin tone, and photo quality by child sex assigned at birth, ethnicity-race, and their interaction. Bonferroni-corrected post-hoc comparisons probed pairwise comparisons for child ethnicity-race.

As shown in Table 2, the MANOVA for the age 4 ratings revealed no significant differences in ratings by child sex (Wilks' $\lambda = 0.999$, $p = .210$), but there were significant differences by ethnicity-race (Wilks' $\lambda = 0.448$, $p < .001$), and the interaction of child sex and ethnicity-race (Wilks' $\lambda = 0.957$, $p < .001$). Images of Black children were rated as older ($M = 6.744$) than images of Latine ($M = 6.448$), white ($M = 6.314$), and Multiracial children ($M = 6.164$). Regarding the significant interaction, boys were perceived as older than girls across all ethnic-racial groups, except the Multiracial group wherein girls were perceived as older than boys. Regarding skin tone ratings, images of Black children received the darkest skin tone ratings ($M = 5.896$), followed by images of Latine ($M = 3.045$), Multiracial ($M = 2.909$), and white children ($M = 1.923$). All post-hoc pairwise comparisons between ethnic-racial groups were significant. Regarding the significant interaction, boys were perceived as darker than girls across all ethnic-racial groups, except the Multiracial and white groups wherein girls were perceived as darker than boys. As shown in Table 3, chronological age was positively associated with perceived age and both chronological and perceived age were negatively associated with skin tone ratings such that older children were rated as lighter in skin tone. Perceived age was also positively associated with photo quality ratings.

Table 2

MANOVA for Age 4 Variables

Age Ratings					Skin Tone Ratings					Photo Quality Ratings				
Sex	Ethnicity-Race	*M*	*SD*	*N*	Sex	Ethnicity-Race	*M*	*SD*	*N*	Sex	Ethnicity-Race	*M*	*SD*	*N*
Female	Latine	6.333	1.902	675	Female	Latine	2.884	0.990	675	Female	Latine	3.287	1.205	675
	Multi	6.346	1.995	412		Multi	3.286	1.669	412		Multi	3.316	1.274	412
	Black	6.647	2.304	258		Black	5.767	0.900	258		Black	3.089	1.265	258
	white	6.187	2.030	243		white	1.926	0.700	243		white	3.202	1.205	243
	Total	6.365	2.018	1588		Total	3.310	1.642	1588		Total	3.249	1.234	1588
Male	Latine	6.534	2.156	894	Male	Latine	3.168	1.054	894	Male	Latine	2.989	1.223	894
	Multi	6.005	2.227	471		Multi	2.584	1.013	471		Multi	3.123	1.216	471
	Black	6.822	2.130	325		Black	5.997	0.735	325		Black	3.243	1.296	325
	white	6.494	2.090	172		white	1.919	0.970	172		white	3.291	1.246	172
	Total	6.447	2.180	1862		Total	3.398	1.596	1862		Total	3.095	1.241	1862
Total	Latine[b,c]	6.448	2.053	1569	Total	Latine[b-d]	3.046	1.037	1569	Total	Latine	3.117	1.224	1569
	Multi[a,c]	6.164	2.128	883		Multi[a,c,d]	2.912	1.403	883		Multi	3.213	1.246	883
	Black[b,c,d]	6.744	2.208	583		Black[a,b,d]	5.895	0.819	583		Black	3.175	1.283	583
	white[c]	6.314	2.058	415		white[a-c]	1.923	0.822	415		white	3.239	1.221	415
	Total	6.409	2.107	3450		Total	3.358	1.618	3450		Total	3.166	1.240	3450

[a]Significantly different from Latine

[b]Significantly different from Multi-ethnic/racial

[c]Significantly different from Black

[d]Significantly different from white

Table 3
Age 4 Correlations

	M	*SD*	1	2	3	4
1. Chronological Age (Years)	4.079	0.243	-			
2. Perceived Age (Years)	6.409	2.107	.075**	-		
3. Skin Tone Rating	3.360	1.618	-.083**	.093**	-	
4. Photo Quality Rating	3.170	1.240	.022	.051**	-0.013	-

Note. *p<.05. **p<.01.

As shown in Table 4, the MANOVA for the age 6 ratings revealed significant differences by child sex (Wilks' $\lambda = 0.994$, $p < .001$), ethnicity-race (Wilks' $\lambda = 0.422$, $p < .001$), and the interaction of child sex and ethnicity-race (Wilks' $\lambda = 0.983$, $p < .001$). Images of girls were rated as older ($M = 7.899$) compared to images of boys ($M = 7.875$). Regarding ethnicity-race, the only significant post-hoc comparison indicated that images of Black children ($M = 8.166$) were rated as being older than images of Latine children ($M = 7.771$). Regarding the significant interaction, girls were perceived as older than boys across all ethnic-racial groups, except the Black and white groups wherein boys were perceived as older than girls. Regarding skin tone ratings, images of girls received darker skin tone ratings ($M = 3.662$) than images of boys ($M = 3.572$). Additionally, images of Black children received the darkest skin tone ratings ($M = 6.130$), followed by images of Latine ($M = 3.282$), Multiracial ($M = 3.216$), and white children ($M = 1.861$). All post-hoc pairwise comparisons between ethnic-racial groups were significant. Regarding the significant interaction, girls were perceived as darker than boys across all ethnic-racial groups with the largest discrepancy among Multiracial children. As shown in Table 5, chronological age was positively associated with perceived age. Additionally, perceived age was positively associated with both skin tone and photo quality ratings.

Table 4
MANOVA for Age 6 Variables

Age Ratings					Skin Tone Ratings					Photo Quality Ratings				
Sex	Ethnicity-Race	*M*	*SD*	*N*	Sex	Ethnicity-Race	*M*	*SD*	*N*	Sex	Ethnicity-Race	*M*	*SD*	*N*
Female	Latine	7.968	2.329	667	Female	Latine	3.307	1.064	667	Female	Latine	2.981	1.166	667
	Multi	7.999	2.343	380		Multi	3.455	1.639	380		Multi	2.995	1.243	380
	Black	7.882	2.288	275		Black	6.149	0.670	275		Black	2.971	1.318	275
	white	7.524	2.315	209		white	1.900	0.743	209		white	2.856	1.285	209
	Total	7.899	2.326	1531		Total	3.662	1.707	1531		Total	2.965	1.230	1531
Male[1]	Latine	7.607	2.078	803	Male[1]	Latine	3.262	1.009	803	Male	Latine	2.809	1.195	803
	Multi	7.839	2.251	392		Multi	2.985	1.319	392		Multi	2.962	1.317	392
	Black	8.420	2.474	308		Black	6.114	0.692	308		Black	2.987	1.258	308
	white	8.228	1.925	173		white	1.815	0.842	173		white	2.988	1.267	173
	Total	7.875	2.203	1676		Total	3.572	1.640	1676		Total	2.896	1.245	1676
Total	Latine[c]	7.771	2.202	1470	Total	Latine[c,d]	3.282	1.034	1470	Total	Latine	2.887	1.185	1470
	Multi	7.918	2.297	772		Multi[c,d]	3.216	1.503	772		Multi	2.978	1.281	772
	Black[a]	8.166	2.401	583		Black[a,b,d]	6.130	0.681	583		Black	2.979	1.285	583
	white	7.843	2.173	382		white[a-c]	1.861	0.790	382		white	2.916	1.277	382
	Total	7.887	2.262	3207		Total	3.615	1.673	3207		Total	2.929	1.238	3207

[1]Significantly different from females
[a]Significantly different from Latine
[b]Significantly different from Multi-ethnic/racial
[c]Significantly different from Black
[d]Significantly different from white

Table 5
Age 6 Correlations

	M	*SD*	1	2	3	4
1. Chronological Age (Years)	6.121	0.220	-			
2. Perceived Age (Years)	7.887	2.263	.104**	-		
3. Skin Tone Rating	3.610	1.672	-.016	.045*	-	
4. Photo Quality Rating	2.930	1.238	-.030	.065**	-.011	-

Note. *p<.05. **p<.01.

As shown in Table 6, the MANOVA for the age 8 ratings revealed significant differences by child sex (Wilks' $\lambda = 0.996$, $p = .006$), ethnicity-race (Wilks' $\lambda = 0.473$, $p < .001$), and the interaction of child sex and ethnicity-race (Wilks' $\lambda = 0.957$, $p < .001$). There were no significant group differences for the age ratings. Regarding skin tone ratings, images of boys received darker skin tone ratings ($M = 3.964$) than images of girls ($M = 3.848$). Additionally, images of Black children received the darkest skin tone ratings ($M = 6.141$), followed by images of Latine ($M = 3.720$), Multiracial ($M = 3.533$), and white children ($M = 2.253$). All post-hoc pairwise comparisons between ethnic-racial groups were significant. Regarding the significant interaction, boys were perceived as darker than girls except in the Latine and Multiracial groups wherein girls were perceived as darker than boys. Regarding photo quality, photos of both Latine and Multiracial children received lower quality ratings than photos of Black children. As shown in Table 7, chronological age was positively associated with perceived age and skin tone ratings. Additionally, perceived age was positively associated with photo quality ratings.

Table 6
MANOVA for Age 8 Variables

Age Ratings					Skin Tone Ratings					Photo Quality Ratings				
Sex	Ethnicity-Race	*M*	*SD*	*N*	Sex	Ethnicity-Race	*M*	*SD*	*N*	Sex	Ethnicity-Race	*M*	*SD*	*N*
Female	Latine	9.508	2.729	587	Female	Latine	3.578	1.056	587	Female	Latine	2.516	1.124	587
	Multi	9.067	2.355	401		Multi	3.923	1.555	401		Multi	2.539	1.183	401
	Black	9.360	2.646	229		Black	6.096	0.688	229		Black	2.389	1.097	229
	white	9.318	2.552	247		white	2.287	0.921	247		white	2.360	1.191	247
	Total	9.332	2.592	1464		Total	3.848	1.599	1464		Total	2.476	1.149	1464
Male	Latine	9.368	2.383	832	Male[1]	Latine	3.821	0.963	832	Male	Latine	2.595	1.076	832
	Multi	9.334	2.509	364		Multi	3.104	1.174	364		Multi	2.453	1.240	364
	Black	9.642	2.378	317		Black	6.174	0.655	317		Black	2.215	1.163	317
	white	9.164	2.138	152		white	2.197	1.023	152		white	2.447	1.184	152
	Total	9.394	2.390	1665		Total	3.964	1.525	1665		Total	2.478	1.148	1665
Total	Latine	9.426	2.532	1419	Total	Latine[b-d]	3.720	1.009	1419	Total	Latine[c]	2.562	1.097	1419
	Multi	9.194	2.432	765		Multi[a,c,d]	3.533	1.445	765		Multi[c]	2.498	1.210	765
	Black	9.524	2.496	546		Black[a,b,d]	6.141	0.669	546		Black[a,b]	2.288	1.138	546
	white	9.259	2.401	399		white[a-c]	2.253	0.961	399		white	2.393	1.187	399
	Total	9.365	2.487	3129		Total	3.910	1.561	3129		Total	2.477	1.148	3129

[1]Significantly different from females
[a]Significantly different from Latine
[b]Significantly different from Multi-ethnic/racial
[c]Significantly different from Black
[d]Significantly different from white

Table 7
Age 8 Correlations

	M	*SD*	1	2	3	4
1. Chronological Age (Years)	8.102	0.224	-			
2. Perceived Age (Years)	9.365	2.487	.041*	-		
3. Skin Tone Rating	3.910	1.560	.052**	.028	-	
4. Photo Quality Rating	2.480	1.148	-.001	.067**	-.042	-

Note. *p<.05. **p<.01.

As shown in Table 8, the MANOVA for the age 10 ratings revealed significant differences by child sex (Wilks' $\lambda = 0.989$, $p < .001$), ethnicity-race (Wilks' $\lambda = 0.468$, $p < .001$), and the interaction of child sex and ethnicity-race (Wilks' $\lambda = 0.955$, $p < .001$). Images of girls were rated as older ($M = 10.654$) compared to images of boys ($M = 10.141$). Regarding the significant interaction, girls were perceived as older than boys in all ethnic-racial groups, except the Black group wherein boys were perceived as older than girls. Regarding skin tone ratings, images of boys received darker skin tone ratings ($M = 4.004$) than images of girls ($M = 3.956$). Additionally, images of Black children received the darkest skin tone ratings ($M = 6.116$), followed by images of Latine ($M = 3.748$), Multiracial ($M = 3.561$), and white children ($M = 2.509$). All post-hoc pairwise comparisons between ethnic-racial groups were significant. Regarding the significant interaction, boys were perceived as darker than girls in the Latine and white groups, but girls were perceived as darker than boys in the Black and Multiracial groups. As shown in Table 9, chronological age was positively associated with perceived age. Perceived age ratings were positively correlated with skin tone and photo quality ratings. Additionally, skin tone and photo quality ratings were negatively correlated.

Table 8
MANOVA for Age 10 Variables

Age Ratings					Skin Tone Ratings					Photo Quality Ratings				
Sex	Ethnicity-Race	*M*	*SD*	*N*	Sex	Ethnicity-Race	*M*	*SD*	*N*	Sex	Ethnicity-Race	*M*	*SD*	*N*
Female	Latine	10.614	2.634	10.614	Female	Latine	3.620	0.911	684	Female	Latine	2.342	1.118	684
	Multi	10.832	2.430	10.832		Multi	3.899	1.405	417		Multi	2.633	1.231	417
	Black	10.498	2.434	10.498		Black	6.129	0.598	255		Black	2.408	1.057	255
	white	10.617	2.915	10.617		white	2.458	0.911	201		white	2.403	1.078	201
	Total	10.654	2.588	10.654		Total	3.956	1.474	1557		Total	2.439	1.140	1557
Male[1]	Latine	10.030	2.299	10.030	Male[1]	Latine	3.861	0.899	775	Male[1]	Latine	2.325	1.031	775
	Multi	10.041	2.360	10.041		Multi	3.177	1.167	368		Multi	2.361	1.099	368
	Black	10.686	2.424	10.686		Black	6.104	0.790	299		Black	2.278	1.105	299
	white	9.872	2.056	9.872		white	2.577	0.953	149		white	2.295	1.056	149
	Total	10.141	2.329	10.141		Total	4.004	1.448	1591		Total	2.322	1.063	1591
Total	Latine	10.304	2.478	10.304	Total	Latine[b-d]	3.748	0.912	1459	Total	Latine[b]	2.333	1.072	1459
	Multi	10.461	2.428	10.461		Multi[a,c,d]	3.561	1.347	785		Multi[a,c]	2.506	1.178	785
	Black	10.599	2.428	10.599		Black[a,b,d]	6.116	0.707	554		Black[b]	2.338	1.084	554
	white	10.300	2.607	10.300		white[a-c]	2.509	0.929	350		white	2.357	1.068	350
	Total	10.395	2.473	10.395		Total	3.980	1.461	3148		Total	2.380	1.103	3148

[1]Significantly different from females
[a]Significantly different from Latine
[b]Significantly different from Multi-ethnic/racial
[c]Significantly different from Black
[d]Significantly different from white

Table 9
Age 10 Correlations

	M	*SD*	1	2	3	4
1. Chronological Age (Years)	9.603	0.256	-			
2. Perceived Age (Years)	10.395	2.473	.105**	-		
3. Skin Tone Rating	3.979	1.461	-.032	.046**	-	
4. Photo Quality Rating	2.379	1.102	-.016	.046**	-.038*	-

Note. *p<.05. **p<.01.

As shown in Table 10, the MANOVA for the age 12 ratings revealed significant differences by child sex (Wilks' $\lambda = 0.985$, $p < .001$), ethnicity-race (Wilks' $\lambda = 0.497$, $p < .001$), and the interaction of child sex and ethnicity-race (Wilks' $\lambda = 0.954$, $p < .001$). Images of girls were rated as older ($M = 13.251$) compared to images of boys ($M = 12.603$). Regarding the significant interaction, girls were perceived as older than boys in all ethnic-racial groups with the largest discrepancy observed in the white group. Regarding skin tone ratings, images of Black children received the darkest skin tone ratings ($M = 6.148$), followed by images of Latine ($M = 3.677$), Multiracial ($M = 3.482$), and white children ($M = 2.442$). All post-hoc pairwise comparisons between ethnic-racial groups were significant. Regarding the significant interaction, boys were perceived as darker than girls, except in the Multiracial group wherein girls were perceived as darker than boys. Photos of Multiracial children were rated as lower quality than photos of Latine children. Additionally, photos of Latine and Multiracial girls received lower quality ratings than those of Latine and Multiracial boys. However, images of Black and white girls received higher photo quality ratings than Black and white boys. As shown in Table 11, chronological age was positively associated with all ratings and perceived age was positively associated with photo quality ratings.

Table 10
MANOVA for Age 12 Variables

Age Ratings					Skin Tone Ratings					Photo Quality Ratings				
Sex	Ethnicity-Race	*M*	*SD*	*N*	Sex	Ethnicity-Race	*M*	*SD*	*N*	Sex	Ethnicity-Race	*M*	*SD*	*N*
Female	Latine	13.119	2.627	621	Female	Latine	3.551	0.955	621	Female	Latine	2.348	1.093	621
	Multi	13.716	2.722	306		Multi	3.843	1.562	306		Multi	2.624	1.357	306
	Black	12.758	2.513	229		Black	6.057	0.744	229		Black	2.677	1.264	229
	white	13.626	2.877	139		white	2.288	0.950	139		white	2.561	1.420	139
	Total	13.251	2.677	1295		Total	3.927	1.539	1295		Total	2.494	1.234	1295
Male[1]	Latine	12.765	2.733	746	Male	Latine	3.783	0.980	746	Male	Latine	2.674	1.120	746
	Multi	12.224	2.805	370		Multi	3.184	1.238	370		Multi	2.786	1.262	370
	Black	12.744	2.689	256		Black	6.230	0.745	256		Black	2.539	1.227	256
	white	12.431	2.547	101		white	2.653	1.072	101		white	2.515	1.154	101
	Total	12.603	2.739	1473		Total	3.980	1.491	1473		Total	2.668	1.180	1473
Total	Latine	12.926	2.690	1367	Total	Latine[b-d]	3.677	0.975	1367	Total	Latine[b]	2.526	1.119	1367
	Multi	12.899	2.864	676		Multi[a,c,d]	3.482	1.431	676		Multi[a]	2.713	1.308	676
	Black	12.751	2.605	485		Black[a,b,d]	6.148	0.749	485		Black	2.604	1.245	485
	white	13.123	2.801	240		white[a-c]	2.442	1.017	240		white	2.542	1.312	240
	Total	12.906	2.729	2768		Total	3.956	1.514	2768		Total	2.587	1.209	2768

[1]Significantly different from females
[a]Significantly different from Latine
[b]Significantly different from Multi-ethnic/racial
[c]Significantly different from Black
[d]Significantly different from white

Table 11
Age 12 Correlations

	M	*SD*	1	2	3	4
1. Chronological Age (Years)	12.219	0.321	-			
2. Perceived Age (Years)	12.906	2.729	.051**	-		
3. Skin Tone Rating	3.953	1.513	.047*	.031	-	
4. Photo Quality Rating	2.588	1.211	.089**	.039*	.023	-

Note. *p<.05. **p<.01.

Multilevel Growth Models

As shown in Table 12, a series of unconditional growth models identified the appropriate shape of growth for adults' perceived age ratings across unconditional means/no growth, linear, and quadratic models. The default optimizer was changed to *bobyqa* to facilitate model convergence given the complexity of the models (e.g., various random effects). The intraclass correlation from the unconditional means model indicated that 16.6% of the total variation in perceived age ratings was attributable to differences between the child images.

Table 12
Unconditional Growth Models: Fit

Fit Indices					Likelihood Ratio Test			
Model	AIC	BIC	Log-likelihood	Deviance	Superior Model	Chi-Square	*df*	*p*
No Growth	79947	79970	-39970	79941	-	-	-	-
Linear	69495	69541	-34742	69483	Linear	10458	3	<.001
Quadratic	69879	69917	-34934	69869	Linear	386	1	<.001

Likelihood ratio tests (LRTs) using the anova function from the *lavaan* package indicated that the linear model was the best fitting unconditional model (see Table 13). The pseudo R^2 for the linear model indicated that 49.7% of the within-person variance in

perceived age ratings was associated with linear time. With the intercept centered at age twelve, the fixed effects estimates indicated that the average predicted perceived age rating for the age twelve images was 12.481 years old. Further, on average, perceived age ratings increased by 0.776 years, annually. The random effects indicated that perceived age ratings at age 12 varied by 1.364 years and the rate of change varied by 0.187 years across the different images.

Table 13
Unconditional Linear Growth Model Parameters

Random Effects				Fixed Effects					
Group	Name	Variance	*SD*	Name	Estimate	*SE*	*df*	*t*	*p*
Images	Intercept	1.862	1.364	Intercept	12.481	0.098	220	127	<.001
	Slope	0.035	0.187	Slope	0.776	0.014	212	54	<.001
Residual		4.601	2.145						

Two unconditional models identified the appropriate number of random effects using LRTs to assess model fit (see Table 14). In the first model, the four random rater effects were analyzed. Results indicated that photo quality should be removed. In the second model, the four random image effects were analyzed. Results indicated that child sex should be removed. The third and final model combined the three significant random rater effects (i.e., random slope, child sex, and skin tone ratings) and the three significant random child effects (i.e., random slope, skin tone ratings, and photo quality ratings), as well as the significant intercept random effects. Model results revealed that both the slope and intercept were significant such that that the rate of change in APCA increased over time and that the intercept at age 12 was significantly difference from zero.

Table 14
Unconditional Linear Growth Models: Random Effects Analysis Results

Model	Effect	AIC	*p*
Raters	Slope	68980	<.001
	Skin Tone Ratings	68379	<.001
	Photo Quality Ratings	68373	.121
	Child Sex	68407	<.05
Images	Slope	69823	<.001
	Skin Tone Ratings	69444	<.001
	Photo Quality Ratings	69484	<.001
	Child Sex	69416	.710

A conditional linear multilevel growth model assessed the unique and interactive effects of child ethnicity-race (effect-coded with white as the reference group), sex (dummy coded; 1 = female), and skin tone ratings (mean-centered) on APCA from ages 4 to 12 (see Table 15). Since none of the ethnic-racial variables (nor their associated interactions) were significant predictors of APCA, the ethnic-racial variables were removed for a final, more parsimonious model.

Table 15

Conditional Linear Growth Model of APCA on Child Ethnicity-Race, Skin Tone, Sex, and Their Interaction

Fixed Effect	*B*	*b*	*SE*	*df*	*t*	*p*
Intercept	<.001	12.148	0.179	371.900	67.774	<.001
Age (linear slope)	0.618	0.720	0.025	290.700	29.139	<.001
Sex	0.108	0.704	0.227	276.400	3.105	0.002
Skin Tone	0.064	0.131	0.056	1293.500	2.325	0.020
Black	-0.006	-0.037	0.310	394.600	-0.118	0.906
Multi	0.006	0.033	0.254	237.400	0.131	0.896
Latine	0.022	0.108	0.209	243.300	0.516	0.606
Age*Sex	0.087	0.100	0.031	210.000	3.242	0.001
Age*Skin Tone	0.058	0.023	0.009	8051.600	2.476	0.013
Sex*Skin Tone	-0.026	-0.077	0.077	1228.200	-1.009	0.313
Age*Black	-0.065	-0.078	0.044	323.100	-1.763	0.079
Age*Multi	0.012	0.013	0.036	212.100	0.368	0.713
Age*Latine	0.030	0.027	0.029	207.900	0.925	0.356
Sex*Black	-0.020	-0.172	0.442	394.100	-0.389	0.698
Sex*Multi	0.006	0.049	0.350	238.500	0.140	0.889
Sex*Latine	-0.028	-0.181	0.297	243.900	-0.609	0.543
Skin Tone*Black	0.005	0.017	0.071	464.100	0.238	0.812
Skin Tone*Multi	0.029	0.096	0.057	294.900	1.672	0.096
Skin Tone*Latine	0.004	0.013	0.048	309.900	0.268	0.789
Age*Sex*Skin Tone	-0.021	-0.012	0.013	6724.800	-0.909	0.363
Age*Sex*Black	-0.007	-0.011	0.062	319.800	-0.181	0.856
Age*Sex*Multi	0.011	0.016	0.049	209.600	0.326	0.745
Age*Sex*Latine	-0.025	-0.032	0.042	210.200	-0.758	0.449
Sex*Skin Tone*Black	-0.021	-0.090	0.101	494.700	-0.888	0.375
Sex*Skin Tone*Multi	-0.031	-0.138	0.079	291.100	-1.743	0.082
Sex*Skin Tone*Latine	0.002	0.010	0.069	312.100	0.146	0.884

Note. Child sex assigned at birth was dummy coded (female = 1). Child ethnicity-race was effect coded using the smallest group (white) as the reference.

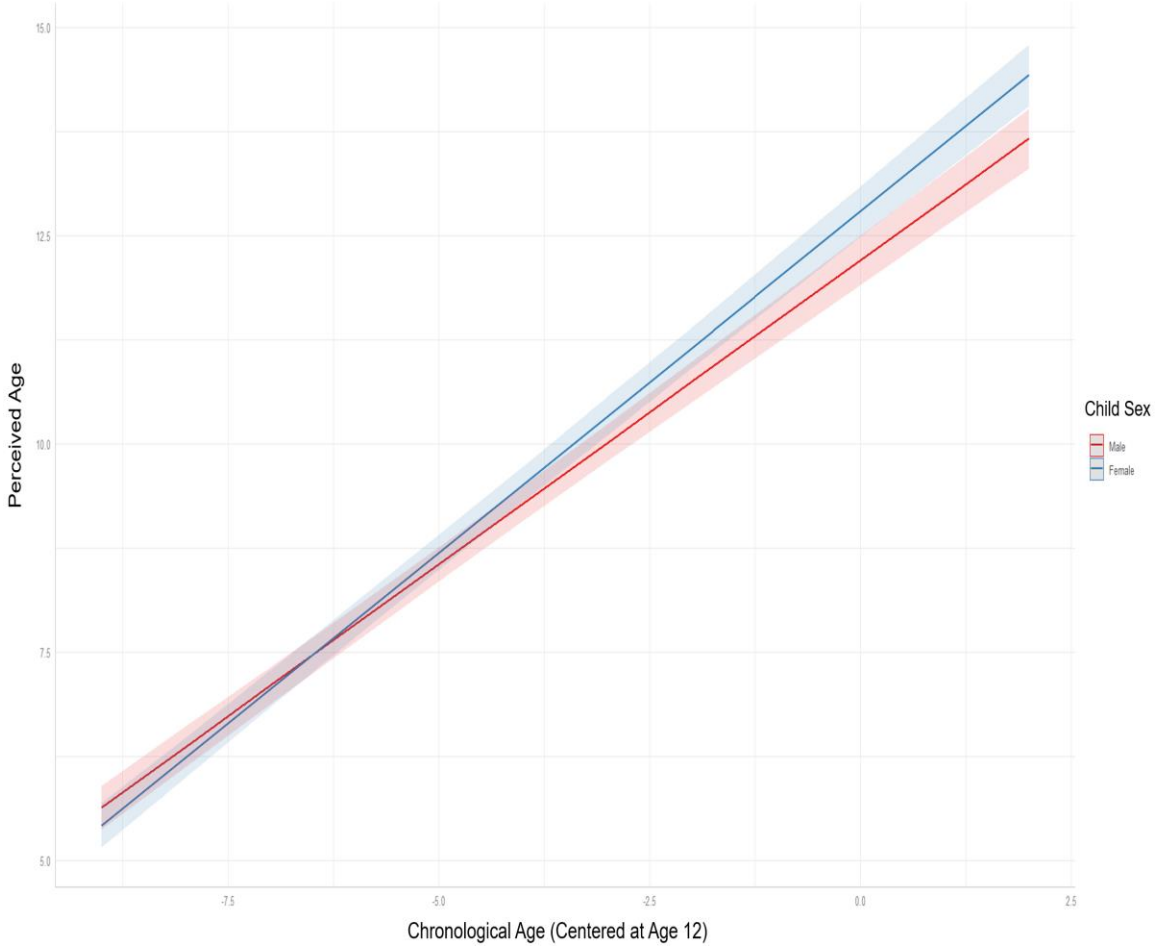
Table 16 displays the final model results. Female sex predicted higher APCA, but this effect was qualified by a significant interaction between chronological age (linear slope) and child sex (see Figure 2). Specifically, adult raters perceived boys as being older than girls from age 4 to approximately age 5.5, after which girls were perceived as older than boys. There was also a significant main effect of skin tone ratings such that children who were perceived as having darker skin tones were also perceived as being older at all data waves. The LRT indicated that this conditional model fit significantly better than the unconditional model.

Table 16
Conditional Linear Growth Model of APCA on Child Skin Tone, Sex, and Their Interaction

Fixed Effect	*B*	*b*	*SE*	*df*	*t*	*p*
Intercept	<.001	12.187	0.151	346.700	80.939	<.001
Age (linear slope)	0.622	0.724	0.021	307.000	33.686	<.001
Sex	0.093	0.606	0.190	222.800	3.197	0.002
Skin Tone	0.063	0.130	0.048	1015.800	2.712	0.007
Age*Sex	0.081	0.094	0.027	201.700	3.452	0.001
Age*Skin Tone	0.035	0.014	0.008	1598.800	1.707	0.088
Sex*Skin Tone	-0.036	-0.106	0.066	947.500	-1.596	0.111
Age*Sex*Skin Tone	-0.021	-0.012	0.011	1704.900	-1.061	0.289

Figure 2

Interaction between Chronological Age (Linear Slope) and Child Sex



Regression Analyses

Descriptive and Bivariate Analyses. Descriptive statistics and bivariate correlations among the study variables used to regress the age 12 educational and socioemotional adjustment outcomes on the perceived age rating growth model parameters are shown in Table 17. A MANOVA revealed significant differences among the age 12 variables by child sex (Wilks' $\lambda = 0.886$, $p = .012$) and race (Wilks' $\lambda = 0.287$, $p < .001$), but not their interaction (Wilks' $\lambda = 0.823$, $p = .113$). Specifically, girls had greater slope values ($M = 0.828$, $SD = 0.156$) and reported being further along in their puberty development ($M = 0.203$, $SD = 0.678$) than boys ($M_{slope} = 0.751$, $SD_{slope} = 0.165$; $M_{puberty} = -0.210$, $SD_{puberty} = 0.483$). The slope and intercept parameters for perceived age ratings over time were positively related to each other, as well as to the age 12 child reports of pubertal status (mean-centered). Additionally, slope values were negatively associated with perceived skin tone (mean-centered). School grades were negatively associated with externalizing symptoms and positively associated with social competence. School disciplinary actions were negatively associated with school grades and social competence and positively associated with externalizing symptoms. Externalizing symptoms were negatively associated with social competence and positively associated with pubertal status. Lastly, pubertal status was negatively associated with perceived skin tone such that youth with lighter skin tone reported more advanced pubertal status.

Table 17

Correlations between Growth Curve Parameters and Age 12 Child Outcomes

	M	*SD*	1	2	3	4	5	6	7	8
1. Perceived Age Rating Slope	0.786	0.165	-							
2. Perceived Age Rating Intercept	12.478	1.201	.703**	-						
3. School Grades	2.927	0.875	0.041	-0.073	-					
4. School Disciplinary Actions	2.556	7.999	-0.070	-0.011	-0.187*	-				
5. Externalizing Problems	44.100	9.747	0.084	0.133	-0.280**	0.264**	-			
6. Social Competence	43.350	8.691	0.071	0.031	0.235**	-0.154*	-0.244**	-		
7. Pubertal Status	-0.019	.615	0.328**	0.396**	0.001	0.023	0.210**	-0.053	-	
8. Skin Tone	-0.007	1.352	-0.083	-0.020	-0.067	0.129	0.100	-0.074	0.228**	-

Note. *p<.05. **p<.01.

Growth Model Parameters as Predictors. A fully saturated regression model evaluated the extent to which the growth model parameters predicted child adjustment outcomes at age 12 (See Table 18). The intercept and slope values for each child were extracted from the final unconditional growth model (with the significant random effects). These intercept and slope values were used as predictors of child-reported school grades, child-reported school disciplinary actions, child-reported externalizing symptoms, and caregiver-reported social competence while controlling for child sex, mean skin tone ratings (mean-centered), and child-reported pubertal status at age 12 (mean-centered). The intercept and slope values did not significantly predict any educational or socioemotional outcomes.

Table 18

Regression Analysis of Growth Parameters as Predictors of Children's Educational and Socioemotional Functioning at Age 12

Regressions	*B*	*b* *(Bootstrapped SE)*	*P* *(95% CI)*
Outcome: School Grades			
Intercept	-0.186	-0.133 (0.069)	0.053 (-0.265, 0.002)
Slope	0.130	0.672 (0.526)	0.202 (-0.329, 1.693)
Puberty	-0.019	-0.026 (0.121)	0.829 (-0.258, 0.213)
Sex	0.161	0.278 (0.133)	0.037 (0.020, 0.542)
Skin Tone	-0.051	-0.033 (0.059)	0.580 (-0.147, 0.084)
Outcome: School Disciplinary Actions			
Intercept	0.058	0.384 (0.650)	0.555 (-0.801, 1.753)
Slope	-0.091	-4.359 (3.445)	0.206 (-11.758, 1.812)
Puberty	0.049	0.631 (0.881)	0.474 (-1.116, 2.370)
Sex	-0.105	-1.681 (1.087)	0.122 (-3.895, 0.398)
Skin Tone	0.103	0.611 (0.478)	0.201 (-0.205, 1.661)
Outcome: Externalizing			
Intercept	0.081	0.657 (0.831)	0.429 (-0.934, 2.352)
Slope	-0.015	-0.880 (6.596)	0.894 (-14.632, 11.224)
Puberty	0.209	3.295 (1.278)	0.010 (0.810, 5.815)
Sex	-0.098	-1.920 (1.433)	0.180 (-4.646, 1.004)
Skin Tone	0.052	0.382 (0.617)	0.536 (-0.823, 1.607)
Outcome: Social Competence			
Intercept	0.003	0.021 (0.692)	0.976 (-1.367, 1.348)
Slope	0.085	4.411 (5.194)	0.396 (-5.510, 14.831)
Puberty	-0.092	-1.275 (1.332)	0.338 (-3.890, 1.392)
Sex	0.043	0.740 (1.469)	0.614 (-2.134, 3.574)
Skin Tone	-0.036	-0.230 (0.539)	0.670 (-1.289, 0.816)

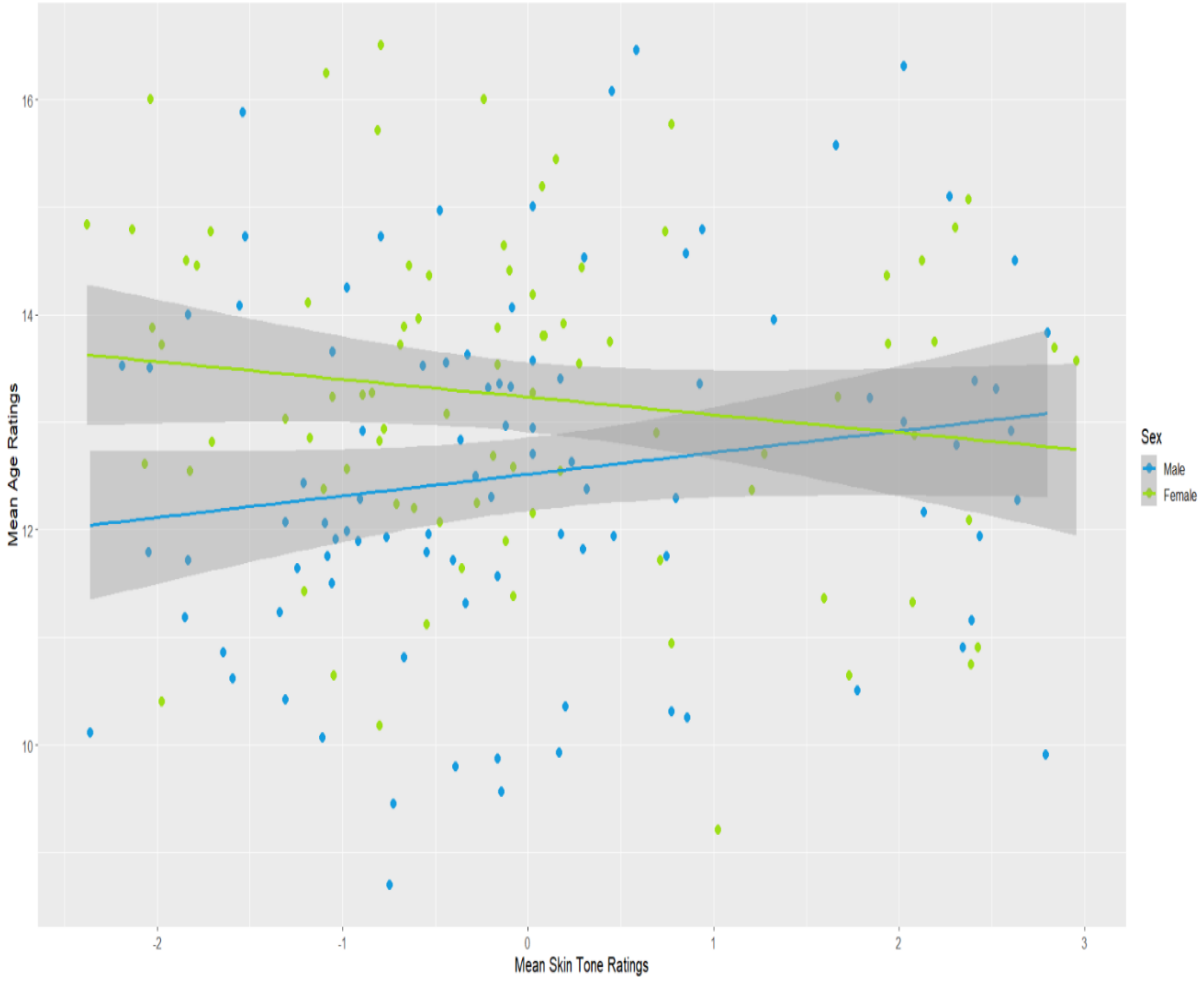
Supplemental Within-Time Analysis. A supplementary, within-time analysis at age 12 explored the extent to which the model was impacted by the inclusion of puberty. Table 19 depicts the parameter estimates and 95% bootstrapped confidence intervals (CI) across 10,000 resamples for each predictor. A fully saturated path model wherein perceived age ratings were regressed onto child sex, mean-centered skin tone ratings, mean-centered pubertal status, and their interactions revealed a significant main effect of pubertal status, such that adults' rated children who reported that they were further along in their pubertal development as older than their peers with lower child-reported PDS scores. Although there were no significant main effects of child sex or skin tone ratings, there was a significant interaction present in the girl group only. Simple slopes analyses indicated that adults perceived girls with lower/lighter skin tone ratings as significantly older than those with darker skin tone ratings (see Figure 3).

Table 19
Supplemental Analysis: Within-Time Regression Including Puberty as a Predictor of Age 12 Perceived Age

Predictors	*B*	*b* *(Bootstrapped SE)*	*P* *(95% CI)*
Sex	0.036	0.116 (0.246)	0.637 (-0.340, 0.618)
Skin Tone	0.078	0.094 (0.116)	0.420 (-0.136, 0.322)
Puberty	0.604	1.573 (0.300)	<.001 (0.964, 2.134)
Sex*Skin Tone	-0.240	-0.424 (0.187)	0.023 (-0.776, -0.040)
Sex*Puberty	-0.191	-0.655 (0.417)	0.116 (-1.466, 0.157)
Sex*Skin Tone*Puberty	0.021	0.050 (0.182)	0.784 (-0.311, 0.411)

Figure 3

Supplemental Analysis: Significant Interaction of Skin Tone and Child Sex at Age 12



Post-Hoc Within-Time Analysis

Intrigued by the dramatic age overestimation of nearly 2 years at the age 4 data wave, I conducted a post-hoc, within-time regression to examine potential predictors (i.e., child sex, skin tone, and their interaction) of APCA at this wave. Table 20 depicts the parameter estimates and 95% bootstrapped confidence intervals (CI) across 10,000 resamples for each predictor. Results show that skin tone was the only significant predictor such that children with darker skin tone were perceived as older.

Table 20
Post-Hoc Analysis: Within-Time Regression at Age 4

Predictors	*B*	*b* *(Bootstrapped SE)*	*P* *(95% CI)*
Sex	-0.045	-0.096 (0.144)	0.505 (-0.375, 0.186)
Skin Tone	0.234	0.174 (0.069)	0.012 (0.034, 0.307)
Sex*Skin	-0.107	-0.133 (0.098)	0.251 (-0.305, 0.085)

Discussion

This dissertation offers major contributions to the neophyte literature on APCA by documenting its expression from the preschool period into early adolescence, evaluating the degree to which children's sex assigned at birth and skin tone influence adults' age perceptions, and exploring the potential implications of APCA for children's educational and socioemotional adaptation. As predicted, there was significant variation in how adults perceived children's ages over time (i.e., slope) and at age 12 (i.e., intercept). That said, there were surprisingly few child effects on APCA, and no significant relations emerged between APCA and children's educational and socioemotional adjustment at age 12.

On average, adults perceived children as being older than their chronological age at every wave. However, this overestimation effect was most pronounced in early development with an average 2-year inflation of age 4 images followed by a gradual improvement in accuracy over time such that age estimates at age 12 were inflated by only ~8 months. The appearance of age overestimation in this study is somewhat in line with prior studies of adults' age ratings based on actual images of children. For example, Goff and colleagues (2014) found a general pattern of age overestimation across images of Black, Latino, and white males ages 10-17. However, since the pattern of findings was similar across ages, these authors collapsed the data to yield unitary age difference scores (i.e., perceived-chronological) by ethnic-racial group and crime type (e.g., Latino males who purportedly committed a misdemeanor versus a felony). In their studies, overestimations of children's age across ethnic-racial groups and crime types ranged

from ~ 2-4 years. Given that the current study suggests adults may be more accurate when estimating the ages of older children, it is not clear why Goff and colleagues (2014) found a comparatively larger overestimation effect when collapsing perceived age estimates across a broader and older range of child participants (i.e., 10-17). Indeed, even when collapsing across ages 10-12 for the current study, the difference score indicated that raters only overestimated children's ages by about 9 months. A major difference is that the current study presented raters with a community sample of child participants, whereas Goff's (2014) studies presented purported perpetrators of misdemeanor and felony crimes. Cooke and Halberstadt (2021) examined parents' age ratings of images of Black and white males and females, but similarly grouped across ages 10-13, yielding an average perceived age of 10.5 years old, which is lower than the average perceived age of 11.569 years obtained in the current study when collapsing across ages 10-12. Ultimately, due to the use of differing age ranges in prior studies, it is difficult to directly compare the current findings with prior works. The newest study by Koch and colleagues (2023) provides the best comparison to the current findings because they only used images of 12-year-olds. Although the average perceived age of their participants ranged from 10.68 for low maturation white males to 14.27 for high maturation white females, the overall mean across conditions was 12.13 years old which is comparable to the average perceived age of 12.91 years old in the current study.

When examining child sex assigned at birth, skin tone, and their interaction in the prediction of APCA slope and intercept values across time, study hypotheses were partially confirmed. Originally, I expected that girls would be perceived as older than

boys across the entire developmental period assessed in this dissertation (i.e., ages 4-12). However, during early development (i.e., ages 4 to ~5.5), boys were perceived as older than girls. The significance of sex as a predictor for perceived age, particularly at later ages, is consistent with well-established patterns of earlier maturation among girls than boys (Brix et al., 2019). Indeed, the supplemental, within-time analysis at age 12 showed that adults perceived children who reported being further along in their pubertal development at age 12 as older than their less advanced peers. Given the significance of pubertal timing and tempo (Beltz et al., 2014), future studies with time-varying measures of puberty at all waves will be best-suited to support a comprehensive investigation of puberty effects on APCA.

As predicted, these findings suggest that adults perceived children with darker skin tones as older than children with lighter skin tones. Indeed, a post-hoc, within-time analysis at age 4 revealed that the robust age overestimation of nearly 2 years during the preschool period was solely predicted by skin tone ratings such that children with darker skin tone were perceived as older. In contrast to my hypothesis that perceived age overestimation effects would be greatest for girls with darker skin tone, the interaction between skin tone and child sex did not attain significance. Indeed, contrary to my hypotheses, the supplemental, within-time analysis at age 12 revealed a significant interaction between sex and skin tone such that female sex predicted older age estimates, but only for girls with lighter skin tone ratings. Although skin tone varies within and across ethnic-racial groups, the descriptive MANOVA analyses at each wave demonstrated that white children received the lightest skin tone ratings across time and

Black children received the darkest skin tone ratings. Thus, ethnicity-race may be contributing to this finding. Of note, these findings are consistent with the recent pilot data reported by Koch and colleagues (2023), which showed the greatest magnitude of age overestimation among white (high maturation) females.

The expression of APCA across time and as a function of child sex and skin tone must be considered in light of the ethnic-racial composition of the children in the current study images, as well as of the adult raters. Both groups were predominantly non-white with only 11.2% of children being rated and 5.2% of the adults providing the ratings identifying as white. This uneven ethnic-racial composition could, in part, explain why none of the ethnic-racial group effects (nor their associated interactions) attained statistical significance as predictors in the conditional growth model of APCA. It may be that predominantly non-white raters in this study were more familiar with and better able to accurately evaluate non-white child targets as compared to white children (i.e., a cross-race effect; Sporer, 2001). That said, this familiarity effect would not explain the apparent sex patterns, particularly given that the preponderance of raters were female (65.7%) and identified as women (63.6%), which, by extension, would support more accurate age perceptions for female children.

Given extant social and developmental psychological theory suggesting that APCA can influence later functioning, I was surprised to find no significant associations between APCA trajectories and children's educational and socioemotional functioning. That said, this finding rests not only on the theoretical rationale that adults' social perceptions inform their social actions in ways that impact the children in their care, but

also on the assumption that the adult raters in this study are reflective of the adults who interface with the children in this sample. Despite being diverse in many ways (e.g., ethnicity-race, sex, socioeconomic status), the rater sample for the current study was quite young and only two participants (0.5%) reported having children. A natural extension of this work will involve examining these associations in other adult samples that are more diverse with respect to parental status (i.e., having children), profession (e.g., teachers and law enforcement), and/or level of education (e.g., no college degree, graduate degree, etc.).

In summary, the primary findings of this dissertation concerned how APCA changes over time, predictors of this change, and the extent to which APCA is associated with children's functioning at age 12. APCA increased over time in a linear fashion across ages 4, 6, 8, 10, and 12 revealing an overarching pattern of age overestimation (i.e., children being perceived as older than they actually are). Interestingly, the greatest age overestimations occurred early in development and gradually decreased over time such that adults' age ratings were the most accurate at age 12, though they still varied significantly. Regarding predictors of APCA over time, child sex assigned at birth and skin tone emerged as the only significant predictors of APCA. In general, girls were perceived as older than boys, but this pattern was reversed in early development (i.e., 4 to ~5.5 years old) when boys were perceived as older than girls. Regarding skin tone, darker skin tone ratings were associated with being perceived as older. The supplementary within-time analysis at age 12 introduced additional complexity as child sex effects became non-significant once pubertal status was included in the model and a significant

emerged such that girls who received lighter skin tone ratings were perceived as older than girls who received darker skin tone ratings. Lastly, APCA growth parameters (i.e., slope and intercept) were not significantly associated with children's educational or socioemotional functioning at age 12.

Strengths & Limitations

The current study featured several major strengths. First, longitudinal data afforded images of the same children to support the examination of APCA over a period of nine years. This design dramatically extends extant studies spanning four (Cooke & Halberstadt, 2021) and seven years (Goff et al., 2014), particularly given that both prior studies collapsed ratings across age, rather than examining chronological age as a meaningful factor in its own right. Furthermore, our ability to provide images of the same children at different ages reduced numerous confounds seen in prior studies that featured variability in both the age and the identity of the target child. Second, the current study included over 1,000 distinct images of 245 children across 5 data waves spanning ages 4 to 12. Further, these images were evaluated by 400 adult raters who provided more than 15,000 independent ratings of APCA. Thus, this study constitutes the largest dataset used in an APCA investigation to date. Third, both the adult raters and the child targets were diverse with regard to sex assigned at birth and ethnicity-race, which extends beyond prior studies that have focused on single-sex samples (Goff et al., 2014) or Black-white differences in child targets (e.g., Cooke & Halberstadt, 2021) with minimal or no consideration given to the sociodemographic characteristics of the adult raters. Fourth, the use of multilevel modeling in this study yielded more accurate parameter estimates by

appropriately accounting for variation between both raters *and* images (Smith & DeFrates-Densch, 2016). Fifth, the current study is the first to consider both traditional ethnic-racial group membership designations and a continuous metric of skin tone when evaluating their unique and interactive effects by sex on APCA. The explicit consideration of skin tone in this study is of crucial importance given well-documented effects of differential treatment of children by skin tone *within* various ethnic-racial groups (Adams et al., 2016). Lastly, by adopting a sociodevelopmental perspective on APCA, the current study was able to ask and answer questions that prior studies have not been able to consider, including how APCA changes over time, what predicts these changes, and the extent to which APCA may be associated with child functioning. Despite these notable strengths, however, several limitations warrant consideration when interpreting the current findings. Importantly, these limitations also illuminate promising directions for future research in this newly emerging area.

First, as noted earlier, a central premise of this study centers on the extent to which the rater sample can be seen as representative of other adult raters. This is concerning as raters in this study consisted of undergraduate students completing an introductory psychology course. Although diverse with respect to ethnicity-race, sex, and socioeconomic status, the rater sample was much less diverse in other areas, such as parental status. Prior APCA studies have considered raters that are important stakeholders in children's lives, such as police officers (Goff et al., 2014) and parents (Cooke & Halberstadt, 2021). Continuing this trend, future APCA investigations should strive to incorporate additional, influential raters including teachers, school security personnel,

and other adult professionals who work directly with children (e.g., pediatricians). However, no research to date, including the current study, has examined APCA among adults who have the potential to actually interact with (and impact) the children depicted in the images they are rating. Future studies using teacher ratings of students from the same school district, but in different grades or schools, or police officers rating children who live in a neighborhood that is part of the area they patrol may address some of these limitations. Moving forward, it will be important to obtain ratings from a variety of stakeholders in children's lives to understand the perceptions of adults who work with children in general, and the implications of APCA on the children with whom those adults work directly.

Second, given that advanced pubertal development is associated with more mature physical features, I expected that puberty would be an important predictor of APCA. However, due to limited pubertal status data, the impact of puberty could not be assessed in the current growth models. Although the supplemental, within-time analysis at age 12 demonstrated the power and importance of pubertal status, future research must incorporate puberty as a time-varying predictor in growth models to assess its influence across time.

Third, because the photos of the children were extracted from video footage, they could not be standardized for image quality and child apparel, among other factors. However, these variations may have strengthened this study to the degree that they rendered the target images more ecologically valid as reflective of real-life situations. Indeed, even the current standardization of images to headshots of children with neutral

expressions may have influenced APCA. We rarely view other people as static entities from only the shoulders up. Photos showing the entire child have been used in prior studies of visual maturity (e.g., Koch et al., 2023) and perceived maturity (e.g., Johnson et al., 1988), and would provide additional information that would likely shape APCA. Likewise, video recordings of children may afford more realistic and dynamic information than static photographs. Although there is some support for the validity of photo-based ratings (e.g., attractiveness ratings obtained from static photos) as being largely equivalent to those obtained from video clips (e.g., Kościński, 2013; Rhodes et al., 2011), future research on APCA will benefit from careful replication studies across visual stimuli with varied features.

Fourth, the current study utilized one measure of perceived skin tone (i.e., a 7-point Likert scale), but there are numerous methods for measuring skin tone (Campbell et al., 2020). Further, there is marked variation both across and within different skin tone assessment methods. For example, one way to measure perceived skin tone is using a Likert scale (e.g., Laidley et al., 2019) which typically relies on descriptive anchor points (e.g., 1 = "very light" as in the current study). However, skin tone can also be measured using color tiles or charts that rely on visual depictions of varying skin tones (Telles, 2014). Even when looking within the Likert scale method, variable wording to describe each data point may shape the obtained ratings. For instance, when measuring skin color via examiner ratings, Laidley and colleagues (2019) used a 5-point Likert scale from "white" to "black," whereas Keith and colleagues (2010) used a 7-point Likert scale from

"very dark" to "very light". Future APCA research will benefit from nuanced replications across and within differing skin tone measurements.

Fifth, the absence of significant ethnicity-race effects in the conditional growth model of APCA over time may be due, in part, to the rather unbalanced ethnic-racial demographics of the children featured in the photographic stimuli. Indeed, just 18% of the children were Black and only 11.2% were white. In total, there were four ethnic-racial groups of children represented in the current study (i.e., Latine, Multiracial, Black, and white) which renders this not only the largest, but also the most diverse database to date in APCA research. However, future research should strive to incorporate more balanced representation across different ethnic-racial groups of children featured in visual rating stimuli to better evaluate potential ethnicity-race effects.

Implications & Future Directions

The current study provides a foundation for future research on the development and adaptive implications of APCA. Specifically, this study documented patterns of APCA across ages of 4, 6, 8, 10, and 12, revealing both a robust overestimation effect of nearly 2 years during the preschool period, as well as a gradual shift toward improved accuracy across development. Second, this study also identified salient predictors of patterns of change in APCA over time (i.e., slope) and in early adolescence (i.e., age 12 intercept) as a function of child ethnicity-race, skin tone, and sex assigned at birth, as well as within-time assessments of pubertal status at age 12. Finally, this study offered a novel test of relations between APCA and educational and socioemotional functioning in early adolescence, though no associations attained significance in this sample. In

attempting to fill prominent gaps in the extant literature on APCA, the current study also identified promising avenues for future advances in our understanding of the development and adaptative implications of APCA.

First, the relatively modest child effects on APCA highlight the need to identify if and how adult rater characteristics may shape APCA, whether in isolation or in combination with characteristics of the child perceptual target. Although previous studies have examined APCA among homogeneous samples of adults (e.g., parents, Cooke & Halberstadt, 2021; police officers, Goff et al., 2014), more research is needed to understand if and how variability within adult rater groups may influence APCA. Several rater factors may influence APCA, including rater's own ethnicity-race, skin tone, and sex assigned at birth, as well as their familiarity with individuals outside their own ethnic-racial groups (e.g., cross-group friendships) and with children beyond their own households. Given known patterns of in-group/out-group bias (Gray et al., 2008), we might expect that APCA would be most accurate for targets who share sociodemographic features with the rater and for raters who have relatively more experience interacting with sociodemographic groups that differ from their own. Of note, it is important to consider that different rater characteristics may be more or less salient in different samples of adults. For instance, frequency of interaction with children would not be salient in a sample of teachers due to ceiling effects, but this same characteristic may be very influential in samples of adults who work outside school settings but nevertheless interface with children (e.g., police officers).

Second, the current study represents the largest single investigation of APCA across 1,000 photographic images, but there remains a pressing need to consider if and how rating stimuli (e.g., photographs, vignettes, videos) may influence APCA. It is unclear if APCA may vary when adults are presented with perceptual stimuli that are static versus dynamic (e.g., still images versus video clips), partial versus complete (e.g., headshots versus full-body images), and standardized versus naturally occurring (e.g., holding facial expression, apparel, or other factors constant versus allowing for random variation across targets). For example, new studies could address these questions by having adults complete age ratings of the same children across randomized stimuli conditions. Such investigations would help determine the extent to which APCA may be influenced by variation in visual rating stimuli.

Lastly, this study did not incorporate indicators of children's self-other perceptions of skin tone (i.e., how a child thinks others would rate their skin tone), ethnic-racial status (i.e., what ethnic-racial category a child thinks others would categorize them as), or age (i.e., what age a child thinks others might perceive them as based on their appearance). Including self-other perceptions in APCA research would be informative and justified by Spencer and colleagues' (1997) Phenomenological Variant of Ecological Systems Theory (PVEST) as a major influence on children's self-development. Indeed, PVEST posits self-appraisal processes as setting the stage for later child functioning both directly and indirectly. As such, there may be indirect associations between APCA growth parameters and children's functioning via shifts in children's self-perceptions.

Overall, the current investigation elevates APCA as a construct that justifies further investigation and innovation. Is APCA a factor driving the mistreatment of Black and Brown children at the hands of adults in community and school settings? In time, I hope that research evidence will catch up to anecdotal evidence in an effort to help answer this and other important questions.

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Appendix A

Survey & Rating Items

Survey Items (Pre-rating rask)

1. Have you or someone in your family EVER participated in a research study at UCR before 2022?

   Response Options:

   -Yes

   -No

2. What was your sex assigned at birth?

   Response Options:

   -Female

   -Male

   -Intersex

3. What is your gender identity?

   Response Options:

   -Woman

   -Man

   -Transgender woman

   -Transgender man

   -Gender nonbinary

   -Other

4. What is the zip code of your primary permanent residence (i.e., where you lived before attending UCR)?
5. What is your major?
6. What month were you born?

   Response Options:

   -January

   -February

   -March

   -April

   -May

   -June

   -July

   -August

   -September

   -October

   -November

   -December
7. What year were you born?
8. What is/was the highest level of education of your primary caregiver?

   Response Options:

   -8th grade or less

   -Some highschool, but no diploma or GED

-Highschool diploma or GED

-Some college, but no degree

-Certificate from a trade school

-AA degree

-4-year degree (B.A. or B.S.)

-Master's degree

-Doctoral degree (e.g., PhD, M.D., JD)

-Not applicable, I had no primary caregiver

9. What is/was the highest level of education of your other primary caregiver?

   Response Options:

   -8th grade or less

   -Some highschool, but no diploma or GED

   -Highschool diploma or GED

   -Some college, but no degree

   -Certificate from a trade school

   -AA degree

   -4-year degree (B.A. or B.S.)

   -Master's degree

   -Doctoral degree (e.g., PhD, M.D., JD)

   -Not applicable, I do not have a second primary caregiver

10. Are you a Pell Grant recipient?

    Response Options:

-Yes

-No

-I don't know

11. How many children under the age of 18 reside in your primary home (i.e., where you lived before attending UCR)?
12. If known, what is the ethnicity-race of your biological mother? (Please select all that apply)

    Response Options:

    -African

    -African American

    -Afro-Caribbean

    -American Indian or Alaska Native

    -Asian Indian

    -Black

    -Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)

    -Chinese

    -Cuban

    -Filipino

    -Guamanian or Chamorro

    -Japanese

    -Korean

-Mexican, Mexican American, Chicano

-Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)

-Native Hawaiian

-Other Asian

-Other Pacific Islander

-Puerto Rican

-Samoan

-Spanish (from Spain)

-Vietnamese

-White

-I don't know the ethnicity-race of my biological mother

13. If known, what is the ethnicity-race of your biological father? (Please select all that apply)

Response Options:

-African

-African American

-Afro-Caribbean

-American Indian or Alaska Native

-Asian Indian

-Black

-Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)

-Chinese

-Cuban

-Filipino

-Guamanian or Chamorro

-Japanese

-Korean

-Mexican, Mexican American, Chicano

-Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)

-Native Hawaiian

-Other Asian

-Other Pacific Islander

-Puerto Rican

-Samoan

-Spanish (from Spain)

-Vietnamese

-White

-I don't know the ethnicity-race of my biological father

14. What is your ethnic-racial identity? (Please select all that apply)

Response Options:

-African

-African American

-Afro-Caribbean

-American Indian or Alaska Native

-Asian Indian

-Black

-Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)

-Chinese

-Cuban

-Filipino

-Guamanian or Chamorro

-Japanese

-Korean

-Mexican, Mexican American, Chicano

-Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)

-Native Hawaiian

-Other Asian

-Other Pacific Islander

-Puerto Rican

-Samoan

-Spanish (from Spain)

-Vietnamese

-White

15. Do you have corrected vision (i.e., wear prescription glasses and/or contacts)?

    Response Options:

    -Yes

    -No

16. Are you currently wearing your prescription glasses and/or contacts if needed?

    Response Options:

    -Yes

    -No

    -Not applicable because I do not have corrected vision

17. Please indicate your current level of sleepiness.

    Response Options:

    -Feeling active, vital, alert, or wide awake

    -Functioning at high levels, but not at peak; able to concentrate

    -Awake, but relaxed; responsive but not fully alert

    -Somewhat foggy, let down

    -Foggy; losing interest in remaining awake; slowed down

    -Sleepy, woozy, fighting sleep; prefer to lie down

    -No longer fighting sleep, sleep onset soon having dream-like thoughts

18. Please indicate to what extent you feel UPSET right now, that is, at the present moment.

    Response Options:

        -Very slightly or not at all

        -A little

        -Quite a bit

        -Extremely

19. Please indicate to what extent you feel HOSTILE right now, that is, at the present moment.

    Response Options:

        -Very slightly or not at all

        -A little

        -Quite a bit

        -Extremely

20. Please indicate to what extent you feel ALERT right now, that is, at the present moment.

    Response Options:

        -Very slightly or not at all

        -A little

        -Quite a bit

        -Extremely

21. Please indicate to what extent you feel ASHAMED right now, that is, at the present moment.

    Response Options:

        -Very slightly or not at all

        -A little

        -Quite a bit

        -Extremely

22. Please indicate to what extent you feel INSPIRED right now, that is, at the present moment.

    Response Options:

        -Very slightly or not at all

        -A little

        -Quite a bit

        -Extremely

23. Please indicate to what extent you feel NERVOUS right now, that is, at the present moment.

    Response Options:

        -Very slightly or not at all

        -A little

        -Quite a bit

        -Extremely

24. Please indicate to what extent you feel DETERMINED right now, that is, at the present moment.

    Response Options:

        -Very slightly or not at all

        -A little

        -Quite a bit

        -Extremely

25. Please indicate to what extent you feel ATTENTIVE right now, that is, at the present moment.

    Response Options:

        -Very slightly or not at all

        -A little

        -Quite a bit

        -Extremely

26. Please indicate to what extent you feel AFRAID right now, that is, at the present moment.

    Response Options:

        -Very slightly or not at all

        -A little

        -Quite a bit

        -Extremely

27. Please indicate to what extent you feel ACTIVE right now, that is, at the present moment.

    Response Options:

        -Very slightly or not at all

        -A little

        -Quite a bit

        -Extremely

Rating Items

1. How old is this person?

   Response Options: 1-20 with half ages presented

2. What is this person's skin tone?

   Response Options:

        -Very light

        -Light

        -Somewhat light

        -Medium

        -Somewhat dark

        -Dark

        -Very dark

3. How friendly do you think this person is with other people their own age?

   Response Options:

        -Very friendly (1)

-2

-3

-4

-5

-6

-Not at all friendly (7)

4. How would you rate this person's physical appearance?

   Response Options:

   -Very attractive (1)

   -2

   -3

   -4

   -5

   -6

   -Not at all attractive (7)

5. How feminine/masculine is this person?

   Response Options:

   -Very feminine (1)

   -2

   -3

   -4

   -5

-6

-Very masculine (7)

6. Please rate the quality of this photo.

   Response Options:

   -Very poor (1)

   -2

   -3

   -4

   -5

   -6

   -Excellent (7)

7. Do you know this person?

   Response Options:

   -Yes

   -No

8. What is this persons's ethnicity-race (CHOOSE ALL THAT APPLY; groups are intentionally broad)?

   Response Options:

   -Hispanic/Latin [e.g., Mexican, Cuban, Puerto Rican, Central American]

   -White

   -Black/African American

   -Asian [e.g., Chinese, Filipino, Korean, Japanese, etc.]

-Hawaiian/Pacific Islander [e.g., Native Hawaiian, Samoan, Guamanian, etc.]

-Middle Eastern [e.g., Armenian, Iraqui, Lebanese, Iranian, Yemeni]

-American Indian or Alaska Native

Survey Items (Post-rating task)

1. If you were walking down the street, what race do you think other Americans who do not know you personally would assume you were based on what you look like? (Please select all that apply)

   Response Options:

   -African

   -African American

   -Afro-Caribbean

   -American Indian or Alaska Native

   -Asian Indian

   -Black

   -Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)

   -Chinese

   -Cuban

   -Filipino

   -Guamanian or Chamorro

   -Japanese

-Korean

-Mexican, Mexican American, Chicano

-Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)

-Native Hawaiian

-Other Asian

-Other Pacific Islander

-Puerto Rican

-Samoan

-Spanish (from Spain)

-Vietnamese

-White

2. Were you born in the U.S?

   Response Options:

   -Yes

   -No

3. If you were not born in the U.S., when did you first move to the U.S?

   Response Options:

   -Less than 1 year ago

   -1-2 years ago

   -3-4 years ago

   -5-6 years ago

-7-8 years ago

-9-10 years ago

-More than 10 years ago

-Not applicable- I was born in the U.S

4. What is your frequency of contact with children under the age of 18?

   Response Options:

   -Very frequent (e.g., Children under the age of 18 live in my primary household or I work with children regularly)

   -Somewhat frequent (e.g., occasional interactions with children under the age of 18)

   -Not very frequent (e.g., I rarely, if ever, interact with children under the age of 18)

5. Are you a parent?

   Response Options:

   -Yes

   -No

6. What is your skin tone?

   Response Options:

   -Very light

   -Light

   -Somewhat light

   -Medium

-Somewhat dark

-Dark

-Very dark

7. Please indicate your current level of sleepiness.

   Response Options:

   -Feeling active, vital, alert, or wide awake

   -Functioning at high levels, but not at peak; able to concentrate

   -Awake, but relaxed; responsive but not fully alert

   -Somewhat foggy, let down

   -Foggy; losing interest in remaining awake; slowed down

   -Sleepy, woozy, fighting sleep; prefer to lie down

   -No longer fighting sleep, sleep onset soon having dream-like thoughts

8. Please indicate to what extent you feel UPSET right now, that is, at the present moment.

   Response Options:

   -Very slightly or not at all

   -A little

   -Quite a bit

   -Extremely

9. Please indicate to what extent you feel HOSTILE right now, that is, at the present moment.

   Response Options:

-Very slightly or not at all

-A little

-Quite a bit

-Extremely

10. Please indicate to what extent you feel ALERT right now, that is, at the present moment.

    Response Options:

    -Very slightly or not at all

    -A little

    -Quite a bit

    -Extremely

11. Please indicate to what extent you feel ASHAMED right now, that is, at the present moment.

    Response Options:

    -Very slightly or not at all

    -A little

    -Quite a bit

    -Extremely

12. Please indicate to what extent you feel INSPIRED right now, that is, at the present moment.

    Response Options:

    -Very slightly or not at all

-A little

-Quite a bit

-Extremely

13. Please indicate to what extent you feel NERVOUS right now, that is, at the present moment.

    Response Options:

    -Very slightly or not at all

    -A little

    -Quite a bit

    -Extremely

14. Please indicate to what extent you feel DETERMINED right now, that is, at the present moment.

    Response Options:

    -Very slightly or not at all

    -A little

    -Quite a bit

    -Extremely

15. Please indicate to what extent you feel ATTENTIVE right now, that is, at the present moment.

    Response Options:

    -Very slightly or not at all

    -A little

-Quite a bit

-Extremely

16. Please indicate to what extent you feel AFRAID right now, that is, at the present moment.

    Response Options:

    -Very slightly or not at all

    -A little

    -Quite a bit

    -Extremely

17. Please indicate to what extent you feel ACTIVE right now, that is, at the present moment.

    Response Options:

    -Very slightly or not at all

    -A little

    -Quite a bit

    -Extremely

18. Please type the initials of your closest/best friend (First and last initials only).
19. Please type the initials of your SECOND closest friend (First and last initials only).
20. Please type the initials of your THIRD closest friend (First and last initials only).
21. How close do you feel to [Initials of closest/best friend]?

Response Options:

- Not at all close

-Not close

-A little close

-Somewhat close

-Slightly close

-Close

-Extremely close

22. How old (in years) is [Initials of closest/best friend]?

23. What was the sex assigned at birth of [Initials of closest/best friend]?

Response Options:

-Female

-Male

-Intersex

24. What is the gender identity of [Initials of closest/best friend]?

Response Options:

-Woman

-Man

-Transgender woman

-Transgender man

-Gender nonbinary

25. What is the ethnicity-race of [Initials of closest/best friend]?

Response Options:

-African

-African American

-Afro-Caribbean

-American Indian or Alaska Native

-Asian Indian

-Black

-Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)

-Chinese

-Cuban

-Filipino

-Guamanian or Chamorro

-Japanese

-Korean

-Mexican, Mexican American, Chicano

-Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)

-Native Hawaiian

-Other Asian

-Other Pacific Islander

-Puerto Rican

-Samoan

-Spanish (from Spain)

-Vietnamese

-White

26. How close do you feel to [Initials of second closest friend]?

Response Options:

- Not at all close

-Not close

-A little close

-Somewhat close

-Slightly close

-Close

-Extremely close

27. How old (in years) is [Initials of second closest friend]?

28. What was the sex assigned at birth of [Initials of second closest friend]?

Response Options:

-Female

-Male

-Intersex

29. What is the gender identity of [Initials of second closest friend]?

Response Options:

-Woman

-Man

-Transgender woman

-Transgender man

-Gender nonbinary

30. What is the ethnicity-race of [Initials of second closest friend]?

Response Options:

-African

-African American

-Afro-Caribbean

-American Indian or Alaska Native

-Asian Indian

-Black

-Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)

-Chinese

-Cuban

-Filipino

-Guamanian or Chamorro

-Japanese

-Korean

-Mexican, Mexican American, Chicano

-Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)

-Native Hawaiian

-Other Asian

-Other Pacific Islander

-Puerto Rican

-Samoan

-Spanish (from Spain)

-Vietnamese

-White

31. How close do you feel to [Initials of third closest friend]?

Response Options:

- Not at all close

-Not close

-A little close

-Somewhat close

-Slightly close

-Close

-Extremely close

32. How old (in years) is [Initials of third closest friend]?

33. What was the sex assigned at birth of [Initials of closest/best friend]?

Response Options:

-Female

-Male

-Intersex

34. What is the gender identity of [Initials of third closest friend]?

Response Options:

-Woman

-Man

-Transgender woman

-Transgender man

-Gender nonbinary

35. What is the ethnicity-race of [Initials of third closest friend]?

Response Options:

-African

-African American

-Afro-Caribbean

-American Indian or Alaska Native

-Asian Indian

-Black

-Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)

-Chinese

-Cuban

-Filipino

-Guamanian or Chamorro

-Japanese

-Korean

-Mexican, Mexican American, Chicano

-Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)

-Native Hawaiian

-Other Asian

-Other Pacific Islander

-Puerto Rican

-Samoan

-Spanish (from Spain)

-Vietnamese

-White

Appendix B

Digital Assessment Tool Code

```
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        Editable Instructions
**************************************


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<page intro>
<h1>Welcome!</h1><hr>
If you would like to participate in this study, please make sure you have signed the
consent form. Today you will be
answering some questions, completing a rating task, and then answering a set of final
questions.
```


Please begin the study by pressing SPACEBAR <SPACEBAR> when you are ready.
</page>

<page pre>

Please call over the research assistant in the room.

</page>

<page introtask>
Thank you for answering those questions. You will now be presented with pictures of people. You will rate one picture at a time. Please respond based on your first impression of the picture. Do not spend too much time rating any one picture. The next picture will be presented after 45 seconds even if you are not finished rating.

YOUR IDENTITY IS NOT LINKED TO YOUR RESPONSES. Please respond honestly and quickly. If you see a visual that says "NO IMAGE- DO NOT RATE", you can just skip the ratings
and move on until you see another picture of a person. Lastly, please remember that none of the people in the photos are in a medical or hospital setting.

Press SPACEBAR <SPACEBAR> to continue on to 10 practice trials.

</page>

<page practiceend>

<h1>End of the Practice</h1><hr>

You have reached the end of practice and the actual task is about to begin.

The actual task is just like the practice task, but with more pictures:

You will be presented with 50 pictures. The next picture will be presented after 45 seconds even if you are not finished rating.

Please just give your immediate, first impression.

Again, we will have no way to connect your identity to your responses at all so please respond honestly and quickly.

There will be a mandatory 30-second break after every 10 pictures (i.e., 5 breaks total).

After you finish the rating task, you will be presented with a brief set of final questions.

Lastly, please remember that none of the people in the photos are in a medical or hospital setting.

To start the rating task, press SPACEBAR <SPACEBAR>

</page>

<page endtask>

You have reached the end of the rating task.

Press the SPACEBAR <SPACEBAR> to answer some final questions.

</page>

<page end>

You have reached the end of the study. Thank you so much for your participation! Please make sure to give your signed consent form to the research assistant in the room.

The purpose of this study is to understand how adults perceive children over time and as a function of various attributes, such as gender, race, age, clothing, lighting, and body type.

Although a lot of research has shown that how adults perceive adults influences social action, less is known about how adults perceive children. Because adult perceptions of children inform

how they act toward them, it is very important to understand these processes so that we can help parents, teachers, and other adults who interact with children to understand the power of their

perceptions. Interested in the findings from this study? Check the UCR Ad Lab website for a publication of this study's results on December 31, 2023!

 To maintain the integrity of the study, we ask that you please not share the goal of the study with anyone, especially other students signed up for this study!

Thank you again for taking the time to participate:)

Press the SPACEBAR <SPACEBAR> to end your session.

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DEFAULTS

****

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raw data

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summary data

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VALUES: automatically updated

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/attract: Stores the selected attractiveness rating

/fem: Stores the selected femininity/masculinity rating

/qual: Stores the selected photo quality rating

/know: Stores info on whether participant recognizes the child from the photo

/eth: Stores selected race/ethnicity rating

/stimulusitem: Stores the current stimulus (picture)

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/ select = list.mylist.nextindex

/ position = (50%, 20%)

</picture>

****

Pre-rating Survey Items

****

<radiobuttons pre>

/ caption = "Have you or someone in your family EVER participated in a research study at UCR before 2022?"

/ options = ("Yes", "No")

/ optionvalues = ("1", "2")

/orientation = vertical

/ defaultresponse = "0"

/ required = true

</radiobuttons>

<radiobuttons sex>

/ caption = "What was your sex assigned at birth?"

/ options = ("Female", "Male", "Intersex")

/ optionvalues = ("1", "2", "3")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons gender>

/ caption = "What is your gender identity?"

/ options = ("Woman", "Man", "Transgender woman", "Transgender man", "Gender nonbinary", "Other")

/ optionvalues = ("1", "2", "3", "4","5", "6")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<textbox zip>

/ caption= "What is the zip code of your primary permanent residence (i.e., where you lived before

attending UCR)?"

/ mask =positiveinteger

/ required = false

</textbox>

<textbox major>

/ caption= "What is your major?"

/ mask =alphabetic

/ required = false

</textbox>

<dropdown agem>

/ caption= "What month were you born?"

/ options= ("January", "February", "March", "April", "May", "June", "July", "August", "September", "October", "November", "December")

/ required= false

</dropdown>

<textbox agey>

/ caption= "What year were you born?"

/ mask= positiveinteger

/ required = false

</textbox>

<radiobuttons ed1>

/ caption = "What is/was the highest level of education of your primary caregiver?"

/ options = ("8th grade or less", "Some highschool, but no diploma or GED", "Highschool diploma or GED", "Some college, but no degree", "Certificate from a trade school", "AA degree",

"4-year degree (B.A. or B.S.)", "Master’s degree", "Doctoral degree (e.g., PhD, M.D., JD)", "Not applicable, I had no primary caregiver")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7", "8", "9", "10")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons ed2>

/ caption = "What is/was the highest level of education of your other primary caregiver?"

/ options = ("8th grade or less", "Some highschool, but no diploma or GED", "Highschool diploma or GED", "Some college, but no degree", "Certificate from a trade school", "AA degree",

"4-year degree (B.A. or B.S.)", "Master's degree", "Doctoral degree (e.g., PhD, M.D., JD)", "Not applicable, I do not have a second primary caregiver")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7", "8", "9", "10")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons pell>

/ caption = "Are you a Pell Grant recipient?"

/ options = ("Yes", "No", "I don't know")

/ optionvalues = ("1", "2", "3")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<textbox agekids>

/ caption= "How many children under the age of 18 reside in your primary home (i.e., where you lived

before attending UCR)?"

/ required = false

/ range = (0,20)

</textbox>

<checkboxes ethpmom>

/ caption = "If known, what is the ethnicity-race of your biological mother? (Please select all that apply)"

/ options = ("African", "African American", "Afro-Caribbean", "American Indian or Alaska Native", "Asian Indian", "Black", "Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)",

"Chinese", "Cuban", "Filipino", "Guamanian or Chamorro", "Japanese", "Korean",

"Mexican, Mexican American, Chicano",

"Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)", "Native Hawaiian", "Other Asian",

"Other Pacific Islander", "Puerto Rican", "Samoan", "Spanish (from Spain)",
"Vietnamese", "White", "I don’t know the ethnicity-race of my biological mother")
/ optionvalues = ("1", "2", "3", "4", "5", "6", "7", "8", "9", "10", "11", "12", "13", "14",
"15", "16", "17", "18", "19", "20", "21", "22", "23", "24")
/ defaultresponse = "0"
/ required = false
</checkboxes>

<checkboxes ethpdad>
/ caption = "If known, what is the ethnicity-race of your biological father? (Please select all that apply)"
/ options = ("African", "African American", "Afro-Caribbean", "American Indian or Alaska Native", "Asian Indian", "Black", "Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)",
"Chinese", "Cuban", "Filipino", "Guamanian or Chamorro", "Japanese", "Korean",
"Mexican, Mexican American, Chicano",
"Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)", "Native Hawaiian", "Other Asian",
"Other Pacific Islander", "Puerto Rican", "Samoan", "Spanish (from Spain)",
"Vietnamese", "White", "I don’t know the ethnicity-race of my biological father")
/ optionvalues = ("1", "2", "3", "4", "5", "6", "7", "8", "9", "10", "11", "12", "13", "14",
"15", "16", "17", "18", "19", "20", "21", "22", "23", "24")

/ defaultresponse = "0"

/ required = false

</checkboxes>

<checkboxes ethp>

/ caption = "What is your ethnic-racial identity? (Please select all that apply)"

/ options = ("African", "African American", "Afro-Caribbean", "American Indian or Alaska Native", "Asian Indian", "Black", "Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)",
"Chinese", "Cuban", "Filipino", "Guamanian or Chamorro", "Japanese", "Korean",
"Mexican, Mexican American, Chicano",
"Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)", "Native Hawaiian", "Other Asian",
"Other Pacific Islander", "Puerto Rican", "Samoan", "Spanish (from Spain)",
"Vietnamese", "White")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7", "8", "9", "10", "11", "12", "13", "14", "15", "16", "17", "18", "19", "20", "21", "22", "23")

/ defaultresponse = "0"

/ required = false

</checkboxes>

<radiobuttons vision>

/ caption = "Do you have corrected vision (i.e., wear prescription glasses and/or contacts)?"

/ options = ("Yes", "No")

/ optionvalues = ("1", "2")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons glassesnow>

/ caption = "Are you currently wearing your prescription glasses and/or contacts if needed?"

/ options = ("Yes", "No", "Not applicable because I do not have corrected vision")

/ optionvalues = ("1", "2", "3")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons sleepy>

/ caption = "Please indicate your current level of sleepiness."

/ options = ("Feeling active, vital, alert, or wide awake", "Functioning at high levels, but not at peak; able to concentrate", "Awake, but relaxed; responsive but not fully alert",

"Somewhat foggy, let down", "Foggy; losing interest in remaining awake; slowed down", "Sleepy, woozy, fighting sleep; prefer to lie down", "No longer fighting sleep, sleep onset soon;
having dream-like thoughts")
/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")
/ defaultresponse = "0"
/ required = false
</radiobuttons>

<radiobuttons upset>
/ caption = "Please indicate to what extent you feel UPSET right now, that is, at the present moment."
/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")
/ optionvalues = ("1", "2", "3", "4", "5")
/ defaultresponse = "0"
/ required = false
</radiobuttons>

<radiobuttons hostile>
/ caption = "Please indicate to what extent you feel HOSTILE right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons alert>

/ caption = "Please indicate to what extent you feel ALERT right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons ashamed>

/ caption = "Please indicate to what extent you feel ASHAMED right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons inspired>

/ caption = "Please indicate to what extent you feel INSPIRED right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons nervous>

/ caption = "Please indicate to what extent you feel NERVOUS right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons determined>

/ caption = "Please indicate to what extent you feel DETERMINED right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons attentive>

/ caption = "Please indicate to what extent you feel ATTENTIVE right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons afraid>

/ caption = "Please indicate to what extent you feel AFRAID right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons active>

/ caption = "Please indicate to what extent you feel ACTIVE right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

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Picture Rating Items

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<radiobuttons age>

/ caption = "How old is this person?"

/ fontstyle = ("Arial", 2%, true, false, false, false, 5, 1)

/ responsefontstyle = ("Arial", 2%, false, false, false, false, 5, 1)

/ subcaption = "

Age in years"

/ options= ("1", "1.5", "2", "2.5", "3", "3.5", "4", "4.5", "5", "5.5", "6", "6.5", "7",

"7.5", "8", "8.5", "9", "9.5", "10", "10.5", "11", "11.5", "12", "12.5", "13", "13.5",

"14", "14.5",

"15", "15.5", "16", "16.5", "17", "17.5", "18", "18.5", "19", "19.5", "20")

/ optionvalues = ("1", "1.5", "2", "2.5", "3", "3.5", "4", "4.5", "5", "5.5", "6", "6.5", "7",

"7.5", "8", "8.5", "9", "9.5", "10", "10.5", "11", "11.5", "12", "12.5", "13","13.5", "14",

"14.5",

"15", "15.5", "16", "16.5", "17", "17.5", "18", "18.5", "19", "19.5", "20")

/orientation = horizontalequal

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons skin>

/ caption = "What is this person's skin tone?"

/ fontstyle = ("Arial", 2%, true, false, false, false, 5, 1)

/ responsefontstyle = ("Arial", 2%, false, false, false, false, 5, 1)

/ options = ("Very light", "Light", "Somewhat light", "Medium", "Somewhat dark",

"Dark", "Very dark")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")

/orientation = horizontalequal

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons friendly>

/ caption = "How friendly do you think this person is with other people their own age?"

/ fontstyle = ("Arial", 2%, true, false, false, false, 5, 1)

/ responsefontstyle = ("Arial", 2%, false, false, false, false, 5, 1)

/ options = ("Very friendly (1)~t~t~t", "2", "3", "4", "5", "6", "Not at all friendly (7)~t~t")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")

/orientation = horizontalequal

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons attract>

/ caption = "How would you rate this person's physical appearance?"

/ fontstyle = ("Arial", 2%, true, false, false, false, 5, 1)

/ responsefontstyle = ("Arial", 2%, false, false, false, false, 5, 1)

/ options = ("Very attractive (1)","2","3","4","5","6","Not at all attractive (7)")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")

/orientation = horizontalequal

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons fem>

/ caption = "How feminine/masculine is this person?"

/ fontstyle = ("Arial", 2%, true, false, false, false, 5, 1)

/ responsefontstyle = ("Arial", 2%, false, false, false, false, 5, 1)

/ options = ("Very feminine (1)~t~t~t~t ", "2", "3", "4", "5", "6", "Very masculine (7)")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")

/orientation = horizontalequal

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons qual>

/ caption = "Please rate the quality of this photo."

/ fontstyle = ("Arial", 2%, true, false, false, false, 5, 1)

/ responsefontstyle = ("Arial", 2%, false, false, false, false, 5, 1)

/ options = ("Very poor (1)~t~t~t~t~t~t~t~t~t~t~t~t~t~t~t", "2", "3", "4", "5", "6",

"Excellent (7)~t")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")

/orientation = horizontalequal

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons know>

/ caption = "Do you know this person?"

/ fontstyle = ("Arial", 2%, true, false, false, false, 5, 1)

/ responsefontstyle = ("Arial", 2%, false, false, false, false, 5, 1)

/ options = ("Yes", "No")

/ optionvalues = ("1", "2")

/orientation = horizontalequal

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<checkboxes eth>

/ caption = "What is this persons's ethnicity-race (CHOOSE ALL THAT APPLY; groups are intentionally broad)?"

/ fontstyle = ("Arial", 2%, true, false, false, false, 5, 1)

/ responsefontstyle = ("Arial", 2%, false, false, false, false, 5, 1)

/ options = ("Hispanic/Latin [e.g., Mexican, Cuban, Puerto Rican, Central American]", "White", "Black/African American", "Asian [e.g., Chinese, Filipino, Korean, Japanese, etc.]",

"Hawaiian/Pacific Islander [e.g., Native Hawaiian, Samoan, Guamanian, etc.]", "Middle Eastern [e.g., Armenian, Iraqui, Lebanese, Iranian, Yemeni]", "American Indian or Alaska Native")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")

/ defaultresponse = "0"

/ required = false

</checkboxes>

****

Post-rating Survey Items

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<checkboxes ethpperc>

/ caption = "If you were walking down the street, what race do you think other Americans who do not know you personally would assume you were based on what you look like? (Please select all that apply)"

/ options = ("African", "African American", "Afro-Caribbean", "American Indian or Alaska Native", "Asian Indian", "Black", "Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)",
"Chinese", "Cuban", "Filipino", "Guamanian or Chamorro", "Japanese", "Korean",
"Mexican, Mexican American, Chicano",
"Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)", "Native Hawaiian", "Other Asian",
"Other Pacific Islander", "Puerto Rican", "Samoan", "Spanish (from Spain)",
"Vietnamese", "White")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7", "8", "9", "10", "11", "12", "13", "14", "15", "16", "17", "18", "19", "20", "21", "22", "23")

/ defaultresponse = "0"

/ required = false

</checkboxes>

<radiobuttons usbirth>

/ caption = "Were you born in the U.S?"

/ options = ("Yes", "No")

/ optionvalues = ("1", "2")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons usbirthf>

/ caption = "If you were not born in the U.S., when did you first move to the U.S?"

/ options = ("Less than 1 year ago", "1-2 years ago", "3-4 years ago", "5-6 years ago", "7-8 years ago", "9-10 years ago", "More than 10 years ago", "Not applicable- I was born in the U.S")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7", "8")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons childcon>

/ caption = "What is your frequency of contact with children under the age of 18?"

/ options = ("Very frequent (e.g., Children under the age of 18 live in my primary household or I work

with children regularly)", "Somewhat frequent (e.g., occasional interactions with children under the age of 18)",

"Not very frequent (e.g., I rarely, if ever, interact with children under the age of 18)")

/ optionvalues = ("1", "2", "3")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons parent>

/ caption = "Are you a parent?"

/ options = ("Yes", "No")

/ optionvalues = ("1", "2")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons skinp>

/ caption = "What is your skin tone?"

/ options = ("Very light", "Light", "Somewhat light", "Medium", "Somewhat dark",

"Dark", "Very dark")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons sleepypost>

/ caption = "Please indicate your current level of sleepiness."

/ options = ("Feeling active, vital, alert, or wide awake", "Functioning at high levels, but not at peak; able to concentrate", "Awake, but relaxed; responsive but not fully alert", "Somewhat foggy, let down", "Foggy; losing interest in remaining awake; slowed down", "Sleepy, woozy, fighting sleep; prefer to lie down", "No longer fighting sleep, sleep onset soon;
having dream-like thoughts")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons upsetpost>

/ caption = "Please indicate to what extent you feel UPSET right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons hostilepost>

/ caption = "Please indicate to what extent you feel HOSTILE right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons alertpost>

/ caption = "Please indicate to what extent you feel ALERT right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons ashamedpost>

/ caption = "Please indicate to what extent you feel ASHAMED right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons inspiredpost>

/ caption = "Please indicate to what extent you feel INSPIRED right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons nervouspost>

/ caption = "Please indicate to what extent you feel NERVOUS right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons determinedpost>

/ caption = "Please indicate to what extent you feel DETERMINED right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons attentivepost>

/ caption = "Please indicate to what extent you feel ATTENTIVE right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons afraidpost>

/ caption = "Please indicate to what extent you feel AFRAID right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons activepost>

/ caption = "Please indicate to what extent you feel ACTIVE right now, that is, at the present moment."

/ options = ("Very slightly or not at all", "A little", "Moderately", "Quite a bit", "Extremely")

/ optionvalues = ("1", "2", "3", "4", "5")

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<textbox 1finitials>

/ caption= "Please type the initials of your closest/best friend (First and last initials only)"

/ mask =alphabetic

/ required = false

/ maxchars = 2

/ minchars= 2

</textbox>

<textbox 2finitials>

/ caption= "Please type the initials of your SECOND closest friend (First and last initials only)"

/ mask =alphabetic

/ required = false

/ maxchars = 2

/ minchars= 2

</textbox>

<textbox 3finitials>

/ caption= "Please type the initials of your THIRD closest friend (First and last initials only)"

/ mask =alphabetic

/ required = false

/ maxchars = 2

/ minchars= 2

</textbox>

<radiobuttons 1fclose>

/ caption = "How close do you feel to <%toupper(textbox.1finitials.response)%>?"

/ options = ("Not at all close", "Not close", "A little close", "Somewhat close", "Slightly close", "Close", "Extremely close")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")

/orientation = horizontalequal

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<textbox 1fage>

/ caption= "How old (in years) is <%toupper(textbox.1finitials.response)%>?"

/ mask =positiveinteger

/ required = false

/ range = (5,110)

</textbox>

<radiobuttons 1fsex>

/ caption = "What was the sex assigned at birth of

<%toupper(textbox.1finitials.response)%>?"

/ options = ("Female", "Male", "Intersex")

/ optionvalues = ("1", "2", "3")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons 1fgender>

/ caption = "What is the gender identity of <%toupper(textbox.1finitials.response)%>?"

/ options = ("Woman", "Man", "Transgender woman", "Transgender man", "Gender nonbinary")

/ optionvalues = ("1", "2", "3", "4" "5")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<checkboxes 1feth>

/ caption = "What is the ethnicity-race of <%toupper(textbox.1finitials.response)%>?

(Check all that apply)"

/ options = ("African", "African American", "Afro-Caribbean", "American Indian or

Alaska Native", "Asian Indian", "Black", "Central American (e.g., Belizean, Costa Rican,

Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)",

"Chinese", "Cuban", "Filipino", "Guamanian or Chamorro", "Japanese", "Korean",

"Mexican, Mexican American, Chicano",

"Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian,

Saudi Arabian, Iranian, and Yemeni)", "Native Hawaiian", "Other Asian",

"Other Pacific Islander", "Puerto Rican", "Samoan", "Spanish (from Spain)",

"Vietnamese", "White")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7", "8", "9", "10", "11", "12", "13", "14",

"15", "16", "17", "18", "19", "20", "21", "22", "23")

/ defaultresponse = "0"

/ required = false

</checkboxes>

<radiobuttons 2fclose>

/ caption = "How close do you feel to <%toupper(textbox.2finitials.response)%>?"

/ options = ("Not at all close", "Not close", "A little close", "Somewhat close", "Slightly close", "Close", "Extremely close")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<textbox 2fage>

/ caption= "How old (in years) is <%toupper(textbox.2finitials.response)%>?"

/ mask =positiveinteger

/ required = false

/ range = (5,110)

</textbox>

<radiobuttons 2fsex>

/ caption = "What was the sex assigned at birth of <%toupper(textbox.2finitials.response)%>?"

/ options = ("Female", "Male", "Intersex")

/ optionvalues = ("1", "2", "3")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons 2fgender>

/ caption = "What is the gender identity of <%toupper(textbox.2finitials.response)%>?"

/ options = ("Woman", "Man", "Transgender woman", "Transgender man", "Gender nonbinary")

/ optionvalues = ("1", "2", "3", "4" "5")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<checkboxes 2feth>

/ caption = "What is the ethnicity-race of <%toupper(textbox.2finitials.response)%>? (Check all that apply)"

/ options = ("African", "African American", "Afro-Caribbean", "American Indian or Alaska Native", "Asian Indian", "Black", "Central American (e.g., Belizean, Costa Rican, Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)",

"Chinese", "Cuban", "Filipino", "Guamanian or Chamorro", "Japanese", "Korean",
"Mexican, Mexican American, Chicano",
"Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian, Saudi Arabian, Iranian, and Yemeni)", "Native Hawaiian", "Other Asian",
"Other Pacific Islander", "Puerto Rican", "Samoan", "Spanish (from Spain)",
"Vietnamese", "White")
/ optionvalues = ("1", "2", "3", "4", "5", "6", "7", "8", "9", "10", "11", "12", "13", "14", "15", "16", "17", "18", "19", "20", "21", "22", "23")
/ defaultresponse = "0"
/ required = false
</checkboxes>

<radiobuttons 3fclose>
/ caption = "How close do you feel to <%toupper(textbox.3finitials.response)%>?"
/ options = ("Not at all close", "Not close", "A little close", "Somewhat close", "Slightly close", "Close", "Extremely close")
/ optionvalues = ("1", "2", "3", "4", "5", "6", "7")
/orientation = vertical
/ defaultresponse = "0"
/ required = false
</radiobuttons>

<textbox 3fage>

/ caption= "How old (in years) is <%toupper(textbox.3finitials.response)%>?"

/ mask =positiveinteger

/ required = false

/ range = (5,110)

</textbox>

<radiobuttons 3fsex>

/ caption = "What was the sex assigned at birth of

<%toupper(textbox.3finitials.response)%>?"

/ options = ("Female", "Male", "Intersex")

/ optionvalues = ("1", "2", "3")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<radiobuttons 3fgender>

/ caption = "What is the gender identity of <%toupper(textbox.3finitials.response)%>?"

/ options = ("Woman", "Man", "Transgender woman", "Transgender man", "Gender nonbinary")

/ optionvalues = ("1", "2", "3", "4", "5")

/orientation = vertical

/ defaultresponse = "0"

/ required = false

</radiobuttons>

<checkboxes 3feth>

/ caption = "What is the ethnicity-race of <%toupper(textbox.3finitials.response)%>?

(Check all that apply)"

/ options = ("African", "African American", "Afro-Caribbean", "American Indian or

Alaska Native", "Asian Indian", "Black", "Central American (e.g., Belizean, Costa Rican,

Salvadoran, Guatemalan, Honduran, Nicaraguan, and Panamanian)",

"Chinese", "Cuban", "Filipino", "Guamanian or Chamorro", "Japanese", "Korean",

"Mexican, Mexican American, Chicano",

"Middle Eastern or North African (e.g., Armenian, Iraqi, Lebanese, Algerian, Jordanian,

Saudi Arabian, Iranian, and Yemeni)", "Native Hawaiian", "Other Asian",

"Other Pacific Islander", "Puerto Rican", "Samoan", "Spanish (from Spain)",

"Vietnamese", "White")

/ optionvalues = ("1", "2", "3", "4", "5", "6", "7", "8", "9", "10", "11", "12", "13", "14",

"15", "16", "17", "18", "19", "20", "21", "22", "23")

/ defaultresponse = "0"

/ required = false

</checkboxes>

```
*****************************************
        SURVEYPAGES
*****************************************

<surveypage elig>
/ questions = [1= pre]
/ recorddata = true
/ showpagenumbers = false
</surveypage>


<surveypage presurvey>
/ questions = [1=sex; 2=gender; 3=zip; 4=major; 5=agem; 6=agey; 7=ed1; 8=ed2; 9=pell;
10=agekids; 11=ethpmom; 12=ethpdad; 13=ethp; 14=vision; 15=glassesnow; 16=sleepy;
17=upset;
18=hostile; 19=alert; 20=ashamed; 21=inspired; 22=nervous; 23=determined;
24=attentive; 25=afraid; 26=active]
/ itemspacing = 5%
/ showbackbutton = false
/ showpagenumbers = false
/ recorddata = true
```

</surveypage>

<surveypage T1>

/ ontrialend = [

values.latency = surveypage.T1.latency;

values.stimulusnumber = list.mylist.nextindex;

values.stimulusitem = item.t1_pics.item(values.stimulusnumber);

]

/ stimulusframes = [1= pict1]

/ questions = [1-8= spacer; 9-16= noreplacenorepeat(age, attract, eth, fem, friendly, qual, skin, know)]

/ itemspacing = 5%

/ showbackbutton = false

/ showpagenumbers = false

/ recorddata = false

/ branch = [

trial.logdata;

]

</surveypage>

<surveypage T3>

/ ontrialend = [

values.latency = surveypage.T3.latency;

values.stimulusnumber = list.mylist.nextindex;

values.stimulusitem = item.t3_pics.item(values.stimulusnumber);

]

/ stimulusframes = [1= pict3]

/ questions = [1-8= spacer; 9-16= noreplacenorepeat(age, attract, eth, fem, friendly, qual, skin, know)]

/ itemspacing = 5%

/ showbackbutton = false

/ showpagenumbers = false

/ timeout = 45000

/ recorddata = false

/ branch = [

trial.logdata;

]

</surveypage>

<surveypage T5>

/ ontrialend = [

values.latency = surveypage.T5.latency;

values.stimulusnumber = list.mylist.nextindex;

```
        values.stimulusitem = item.t5_pics.item(values.stimulusnumber);
]
/ stimulusframes = [1= pict5]
/ questions = [1-8= spacer; 9-16= noreplacenorepeat(age, attract, eth, fem, friendly, qual,
skin, know)]
/ itemspacing = 5%
/ showbackbutton = false
/ showpagenumbers = false
/ timeout = 45000
/ recorddata = false
/ branch = [
        trial.logdata;
]
</surveypage>

<surveypage T7>
/ ontrialend = [
        values.latency = surveypage.T7.latency;
        values.stimulusnumber = list.mylist.nextindex;
        values.stimulusitem = item.t7_pics.item(values.stimulusnumber);
]
/ stimulusframes = [1= pict7]
```

/ questions = [1-8= spacer; 9-16= noreplacenorepeat(age, attract, eth, fem, friendly, qual, skin, know)]

/ itemspacing = 5%

/ showbackbutton = false

/ showpagenumbers = false

/ timeout = 45000

/ recorddata = false

/ branch = [

trial.logdata;

]

</surveypage>

<surveypage T12>

/ ontrialend = [

values.latency = surveypage.T12.latency;

values.stimulusnumber = list.mylist.nextindex;

values.stimulusitem = item.t12_pics.item(values.stimulusnumber);

]

/ stimulusframes = [1= pict12]

/ questions = [1-8= spacer; 9-16= noreplacenorepeat(age, attract, eth, fem, friendly, qual, skin, know)]

/ itemspacing = 5%

/ showbackbutton = false

/ showpagenumbers = false

/ timeout = 45000

/ recorddata = false

/ branch = [

trial.logdata;

]

</surveypage>

// logs single row of data

<trial logdata>

/ validresponse = (0)

/ trialduration = 0

</trial>

<surveypage break>

/ caption = "Please enjoy this 30-second break before the next 10 ratings :) "

/ timeout = 30000

/ shownextbutton = false

/ showpagenumbers = false

/ fontstyle = ("Arial", 15%, false, false, false, false, 5, 1)

/ txcolor = black

/ recorddata = false

</surveypage>

<surveypage postsurvey1>

/ questions = [1=ethpperc; 2=usbirth; 3=usbirthf; 4=childcon; 5=parent; 6=skinp;

7=sleepypost; 8=upsetpost; 9=hostilepost; 10=alertpost; 11=ashamedpost;

12=inspiredpost; 13=nervouspost;

14=determinedpost; 15=attentivepost; 16=afraidpost; 17=activepost]

/ itemspacing = 5%

/ showbackbutton = false

/ showpagenumbers = false

/ recorddata = true

</surveypage>

<surveypage postsurvey2>

/ caption= "These final questions will be about your 3 closest friends."

/ questions= [1= 1finitials; 2=2finitials; 3=3finitials]

/ showbackbutton = false

/ showpagenumbers = false

</surveypage>

<surveypage postsurvey3>

/ questions = [1=1fclose; 2=1fage; 3=1fsex; 4=1fgender; 5=1feth; 6=2fclose; 7=2fage; 8=2fsex; 9=2fgender; 10=2feth; 11=3fclose; 12=3fage; 13=3fsex; 14=3fgender; 15=3feth]

/ showbackbutton = false

/ showpagenumbers = false

</surveypage>

****

BLOCKS

****

<block eligibility>

/ trials= [1=elig]

/ branch = [

if (radiobuttons.pre.response == "1") {

block.pre;

} else if (radiobuttons.pre.response == "2") {

block.presurvey;

};

]

</block>

<block pre>

/ preinstructions = (page.pre)

/ onblockend = [

script.abort(true);

]

</block>

<block presurvey>

/ trials= [1=presurvey]

</block>

<block practice>

/ preinstructions = (page.introtask)

/ postinstructions = (page.practiceend)

/ trials = [1-10 = noreplace(T1,T3,T5,T7,T12)]

</block>

<block formalrating1>

/ trials = [1-10 = noreplace(T1,T3,T5,T7,T12); 11= surveypage.break]

</block>

<block formalrating2>

/ trials = [1-10 = noreplace(T1,T3,T5,T7,T12); 11= surveypage.break]

</block>

<block formalrating3>

/ trials = [1-10 = noreplace(T1,T3,T5,T7,T12); 11= surveypage.break]

</block>

<block formalrating4>

/ trials = [1-10 = noreplace(T1,T3,T5,T7,T12); 11= surveypage.break]

</block>

<block formalrating5>

/ trials = [1-10 = noreplace(T1,T3,T5,T7,T12); 11= surveypage.break]

</block>

<block postsurvey>

/ trials= [1=postsurvey1; 2=postsurvey2; 3=postsurvey3]

</block>

<block endtask>

/ postinstructions = (page.endtask)

</block>

```
****************************************
        OVERALL TASK
****************************************

<expt>
/ preinstructions = (intro)
/ postinstructions = (end)
/ blocks = [
        1 = eligibility;
        2 = practice;
        3 = formalrating1;
        4 = formalrating2;
        5 = formalrating3;
        6 = formalrating4;
        7 = formalrating5;
        8 = endtask;
        9 = postsurvey;
]

</expt>

****************************************************************************
```

End of File

****

Appendix C

R Code

```
#################################################################
Unconditional Models
###Unconditional Means/No growth/Intercept Only Model

options(scipen = 999, digits = 3)
unconmean<-lmer(AgeRating ~ 1 + (1 | TC_ID), Ratings_LongFormat_FullFinalR3,
REML = FALSE)
summary(unconmean)
rand(unconmean)

#####Models using actual age (Centering at age 12)

###Unconditional Linear Growth Model Centered @ Age 12
#Had to add the optimizer stuff since my tolerance was 0.00770035 and max tolerance is
0.002

uncongrowthaa.c12<-lmer(AgeRating ~ AgeC12aa + (AgeC12aa | TC_ID),
Ratings_LongFormat_FullFinalR3, REML = FALSE,
                control=lmerControl(optimizer="bobyqa",optCtrl=list(maxfun=2e5)))
summary(uncongrowthaa.c12)
```

```
rand(uncongrowthaa.c12)


###Unconditional Quadratic Growth Model
uncongrowthaa.q12<-lmer(AgeRating ~ AgeC12aa + AgeC12.2aa + (1| TC_ID),
Ratings_LongFormat_FullFinalR3, REML = FALSE,
                control=lmerControl(optimizer="bobyqa",optCtrl=list(maxfun=2e5)))
summary(uncongrowthaa.q12)

#LRT between unconditional growth model centered at Age 12 and unconditional
quadratic model
anova(uncongrowthaa.q12,uncongrowthaa.c12)

##########Overall, findings suggest that the linear model is the best unconditional
model

#################################################################
Unconditional Models- Testing Random Effects

##Unconditional Linear Growth Model Centered @ Age 12- Random rater effects only
#Results suggest the removal of photo quality
```

```
options(scipen = 999, digits = 4)
RandRater <-lmer(AgeRating ~ AgeC12aa +
                 ( AgeC12aa|TC_ID) + ( AgeC12aa + ChildSex + SkinRating_MC +
Photoq_MC |Rater_ID), data = Ratings_LongFormat_FullFinalR3, REML = FALSE,
                 control=lmerControl(optimizer="bobyqa",optCtrl=list(maxfun=2e5)))
rand(RandRater)
summary(RandRater)

#LRT

anova(uncongrowthaa.c12,RandRater)

##Unconditional Linear Growth Model Centered @ Age 12- Random child effects only
#This model failed to converge, but the random effects output indicated child sex should
be removed so going to re-run without child sex

RandChi <-lmer(AgeRating ~ AgeC12aa +
                 ( AgeC12aa + ChildSex + SkinRating_MC + Photoq_MC |TC_ID) + (
AgeC12aa |Rater_ID), data = Ratings_LongFormat_FullFinalR3, REML = FALSE,
                 control=lmerControl(optimizer="bobyqa",optCtrl=list(maxfun=2e5)))
rand(RandChi)
summary(RandChi)
```

```
#LRT

anova(uncongrowthaa.c12,RandChi)


##Unconditional Linear Growth Model Centered @ Age 12- Random child effects only
(excluding sex)
#This model ran without any errors and all random effects were sig/retained!

RandChi2 <-lmer(AgeRating ~ AgeC12aa +
                ( AgeC12aa + SkinRating_MC + Photoq_MC |TC_ID) + ( AgeC12aa
|Rater_ID), data = Ratings_LongFormat_FullFinalR3, REML = FALSE,
              control=lmerControl(optimizer="bobyqa",optCtrl=list(maxfun=2e5)))
rand(RandChi2)
summary(RandChi2)

#LRT

anova(uncongrowthaa.c12,RandChi2)
```

```
##Unconditional Linear Growth Model Centered @ Age 12- Random rater AND child effects

options(scipen = 999, digits = 4)
RandFinal <-lmer(AgeRating ~ AgeC12aa +
                   ( AgeC12aa + SkinRating_MC + Photoq_MC|TC_ID) + ( AgeC12aa + ChildSex + SkinRating_MC |Rater_ID), data = Ratings_LongFormat_FullFinalR3,
REML = FALSE,
                control=lmerControl(optimizer="bobyqa",optCtrl=list(maxfun=2e5)))
rand(RandFinal)
summary(RandFinal)

#LRT

anova(uncongrowthaa.c12,RandFinal)

##Grabbing the unstandardized coefficients from the final unconditional model

mlmvalues_unconfinal_unstand<-coef(RandFinal)
write.csv(mlmvalues_unconfinal_unstand[["TC_ID"]],
"mlmvalues_unconfinal_unstand.csv")
```

```
################################################################## Conditional Models

###Sex, skin ratings (mean-centered), and effect-coded ethnicity as predictors with all relevant interactions

options(scipen = 999, digits = 4)
congrowthaa.c12.rater2.sexskinsme2 <-lmer(AgeRating ~
AgeC12aa*ChildSex*SkinRating_MC+Blk+Multi+Lx+
                                Blk:AgeC12aa+Multi:AgeC12aa+Lx:AgeC12aa+
                                Blk:ChildSex+Multi:ChildSex+Lx:ChildSex+

Blk:SkinRating_MC++Multi:SkinRating_MC+Lx:SkinRating_MC+

Blk:ChildSex:AgeC12aa+Multi:ChildSex:AgeC12aa+Lx:ChildSex:AgeC12aa+

Blk:ChildSex:SkinRating_MC+Multi:ChildSex:SkinRating_MC+Lx:ChildSex:SkinRating_MC+
                                ( AgeC12aa + SkinRating_MC + Photoq_MC|TC_ID) + (
AgeC12aa + ChildSex + SkinRating_MC |Rater_ID),
```

```
                                    data = Ratings_LongFormat_FullFinalR3, REML = FALSE,
control=lmerControl(optimizer="bobyqa",optCtrl=list(maxfun=2e5)))

summary(congrowthaa.c12.rater2.sexskinsme2)


##Getting standardized coefficients

options(scipen = 999, digits = 4)
stdCoefsexskine2<- function(object) {
  sdy <- sd(getME(object,"y"))
  sdx <- apply(getME(object,"X"), 2, sd)
  sc <- fixef(object)*sdx/sdy
  se.fixef <- coef(summary(object))[,"Std. Error"]
  se <- se.fixef*sdx/sdy
  return(data.frame(stdcoef=sc, stdse=se)) }

resultsd2 <- stdCoefsexskine2(congrowthaa.c12.rater2.sexskinsme2)


##Extracting model summary parameters and putting them into a data frame
```

```
# Extract fixed effects estimates
fixed_effects <- summary(congrowthaa.c12.rater2.sexskinsme2)$coefficients

# Create a data frame for estimates
estimates_df <- as.data.frame(fixed_effects)

# Add a column indicating the type of effects (Fixed)
estimates_df$Effect <- rep("Fixed", nrow(estimates_df))

# Print the data frame
print(estimates_df)

###Sex and skin ratings (mean-centered) as predictors (All possible interactions)
options(scipen = 999, digits = 4)
congrowthaa.c12.rater2.sexskinsm1 <-lmer(AgeRating ~
AgeC12aa*ChildSex*SkinRating_MC +  ( AgeC12aa + SkinRating_MC +
Photoq_MC|TC_ID) +
                                ( AgeC12aa + ChildSex + SkinRating_MC |Rater_ID), data =
Ratings_LongFormat_FullFinalR3, REML = FALSE,

control=lmerControl(optimizer="bobyqa",optCtrl=list(maxfun=2e5)))
```

```
summary(congrowthaa.c12.rater2.sexskinsm1)

##Getting standardized coefficients

options(scipen = 999, digits = 4)
stdCoefsexskin<- function(object) {
  sdy <- sd(getME(object,"y"))
  sdx <- apply(getME(object,"X"), 2, sd)
  sc <- fixef(object)*sdx/sdy
  se.fixef <- coef(summary(object))[,"Std. Error"]
  se <- se.fixef*sdx/sdy
  return(data.frame(stdcoef=sc, stdse=se)) }

resultsd <- stdCoefsexskin(congrowthaa.c12.rater2.sexskinsm1)


##LRT between model with sex + skin mc & uncon
anova(RandFinal,congrowthaa.c12.rater2.sexskinsm1)


##Extracting model summary parameters and putting them into a data frame
```

```
# Extract fixed effects estimates
fixed_effects1 <- summary(congrowthaa.c12.rater2.sexskinsm1)$coefficients

# Create a data frame for estimates
estimates_df1 <- as.data.frame(fixed_effects)

# Add a column indicating the type of effects (Fixed)
estimates_df1$Effect <- rep("Fixed", nrow(estimates_df))

# Print the data frame
print(estimates_df1)


##Plots the final model
#Plot for the sig slope:ChildSex interaction
ggpredict(congrowthaa.c12.sex, c("AgeC12aa", "ChildSex")) %>% plot()


########################################################################## Intercept &
Slope as Predictors Model
```

```
###Outcomes at age 12 & intercept + slope variables from unconditional linear model
centered at age 12 with all random effects
ISmod12 <- '

#regressions

TotGrade_12~1 + Intercept + Slope + PDSc12_MC + Sex + MeanSkin12_MC
ysrextt_age12~1 + Intercept + Slope + PDSc12_MC + Sex + MeanSkin12_MC
cbcsoccomt_12~1 + Intercept + Slope + PDSc12_MC + Sex + MeanSkin12_MC
SchoolDis12.2~1 + Intercept + Slope + PDSc12_MC + Sex + MeanSkin12_MC



'
ISmod12fit <- sem(ISmod12, data=Ratings_WideFullr, missing = "fiml.x",
meanstructure = TRUE, se = "bootstrap", bootstrap = 10000)
summary(ISmod12fit, fit.measures=TRUE, standardized=TRUE, ci=TRUE)

#################################################################
Supplemental analysis looking at age 12 (including puberty) within time

# Create interaction term in the data frame
```

```
Ratings_WideFullr$InteractionTerm <- with(Ratings_WideFullr, MeanSkin12_MC *
PDSc12_MC * Sex)

# Specify the model formula
supp2 <- "
  MeanAge12 ~ Sex + MeanSkin12_MC + PDSc12_MC + Sex:MeanSkin12_MC +
Sex:PDSc12_MC + InteractionTerm
"

# Fit the model
suppfit2 <- sem(supp2, data = Ratings_WideFullr, missing = "fiml.x", meanstructure =
TRUE, se = "bootstrap", bootstrap = 10000)
summary(suppfit2, fit.measures=TRUE, standardized=TRUE, ci=TRUE)

# Load the required package for simple slopes so I can probe the significant
Sex:MeanSkin12_MC interaction
library(reghelper)

# Convert variables to numeric and factor
Ratings_WideFullr$MeanAge12 <- as.numeric(Ratings_WideFullr$MeanAge12)
Ratings_WideFullr$MeanSkin12_MC <-
as.numeric(Ratings_WideFullr$MeanSkin12_MC)
```

```
Ratings_WideFullr$PDSc12_MC <- as.numeric(Ratings_WideFullr$PDSc12_MC)
Ratings_WideFullr$Sex <- as.factor(Ratings_WideFullr$Sex)

# Fit the model- only including the significant interaction
model2 <- lm(MeanAge12 ~ Sex + MeanSkin12_MC + PDSc12_MC +
Sex:MeanSkin12_MC, data = Ratings_WideFullr)

# Test simple slopes
simple_slopes(model2, levels = list(Sex=c(0,1,'sstest')), confint = TRUE, ci.width = 0.95)

#Plot the significant Sex:MeanSkin12_MC interaction

library(ggplot2)

Ratings_WideFullr$MeanSkin12_MC <-
as.numeric(Ratings_WideFullr$MeanSkin12_MC)
Ratings_WideFullr$MeanAge12 <- as.numeric(Ratings_WideFullr$MeanAge12)
Ratings_WideFullr$Sex <- as.factor(Ratings_WideFullr$Sex)

# Create the plot
ggplot(Ratings_WideFullr, aes(x = MeanSkin12_MC, y = MeanAge12, color = Sex)) +
  geom_point(size = 3) +
```

```
  geom_smooth(method="lm")+
  xlab("Mean Skin Tone Ratings") +
  ylab("Mean Age Ratings") +
  ggtitle("Supplemental Age 12 Analysis: Significant Interaction") +
  scale_color_manual(values = c("#149cdf",
                                "#9cdf14"), labels = c("Male", "Female"))+
  theme(text=element_text(size=14))

################################################################## Post-Hoc
Within Time Analysis at Age 4

# Specify the model formula
supp3 <- "
  MeanAge4 ~ Sex + MeanSkin4_MC + Sex:MeanSkin4_MC
"

# Fit the model
suppfit3 <- sem(supp3, data = Ratings_WideFullr, missing = "fiml.x", meanstructure =
TRUE, se = "bootstrap", bootstrap = 10000)
summary(suppfit3, fit.measures=TRUE, standardized=TRUE, ci=TRUE)
```