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Children's and Adults' Beliefs about the Stability of Traits from Infancy to Adulthood: Contributions of Age and Executive Function

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Abstract

We examined developmental differences and sources of variability in trait reasoning. Four- to 10-year-olds and adults (*N*=198) rated how mean or nice "medium-mean" and "medium-nice" babies, kids, and teenagers were earlier in their lifetime and would be at older ages. Participants expected nice-labeled characters to be nice throughout their lives (participant age effects were null). In contrast, we documented age-related differences in judgments about meanness. With increasing participant age, individuals expected that meanness present in infancy, childhood, and adolescence would persist into adulthood. We discovered a curvilinear pattern in assessments of whether meanness originates during infancy: Four- to 5-year-olds and adults expected mean-labeled kids and teenagers to have been nicer as babies than did 6- to 10-year-olds. Controlling for age and working memory, participants with better inhibitory control more frequently expected mean-labeled individuals to remain mean across the lifespan, but inhibitory control was unrelated to judgments about nice-labeled individuals.

Keywords

trait reasoning; executive function; development; individual differences; positivity bias

A person's future actions are uncertain, but it is possible to use that individual's traits (e.g., how mean or nice they are) to make informed predictions about how they will behave later in time (e.g., whether they will harm others or act prosocially). Furthermore, even when we are not privy to a person's past, we frequently rely on their current traits to make assumptions about how they likely behaved earlier in time. Although adults make these types of inferences with ease (Asch, 1946; Skowronski & Carlston, 1989; Uleman et al., 2008), children take a long time, developmentally, to endorse these same beliefs about trait stability (see Heyman, 2009 for a review). Instead, individuals younger than 7 years often exhibit a positivity bias by endorsing that people possess positive (versus negative) traits

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which only improve over time (Boseovski, 2010; Heyman & Giles, 2004). Indeed, compared to older children and adults, children younger than 7 years more generally expect positive behaviors, mental states, and outcomes (Bamford & Lagattuta, 2020; Lagattuta & Sayfan, 2013; Lagattuta & Kramer, 2019). Here, we examined 4- to 10-year-olds' and adults' beliefs about the lifetime stability of people's positive and negative traits. We measured whether and how the age of a particular individual (i.e., a baby vs. a kid vs. a teenager) currently labeled with a trait (i.e., mean vs. nice) shapes children's and adults' predictions of what that individual will be like at older ages (e.g., what a mean kid will be like as a grownup) as well as their inferences about what they were like earlier in life (e.g., what a mean kid was like as a baby). We further explored a potential cognitive mechanism of the positivity bias in trait reasoning: executive function (inhibitory control and verbal working memory).

Research on children's trait reasoning has primarily adhered to two kinds of paradigms. Some work has focused on children's spontaneous descriptions of themselves and other people. In these studies, children younger than 7 or 8 years typically refer to external features of themselves (e.g., their hair color, possessions), rather than internal, stable traits (e.g., whether they are friendly, outgoing, or smart; Livesley & Bromley, 1973; Peevers & Secord, 1973). In other methods related to assessing essentialist beliefs—that traits are immutable, present at birth, and biologically based (see Gelman, 2003)—researchers use hypothetical vignettes to determine whether children's predictions of how an individual will behave in various situations or across time reflects the assumption that traits are stable characteristics that drive external behavior. For example, children could be told about someone acting brave in one context, and then judge whether that person would behave fearlessly in other situations or at different time points. These studies show that children younger than 7 to 8 years have more sophisticated trait representations than was concluded when only description paradigms were used, but older children and adults are still more likely to make trait-consistent predictions or endorse coherent essentialist views (Gelman et al., 2007; Gnepp & Chilamkurti, 1988; Liu et al., 2007; Rholes & Ruble, 1984).

One prominent feature of young children's trait reasoning is that they show a strong positivity bias (Boseovski, 2010). For example, Lockhart and colleagues (2002) found that 5- to 6-year-olds anticipated more extreme positive change in people's "negative traits" than did older children and adults. Importantly, it is not the case that the younger participants simply predict major fluctuations in people's lives: When 5- to 6-year-olds were told about someone who had a "positive trait," they did not expect that person to develop extreme negative traits. This suggests that their anticipation of substantial within-person change in the future is confined to improvement from negative attributes. Three- to 7-year-olds also weight prior negative and positive behaviors differently when making trait attributions. That is, young children require that an individual has behaved negatively across several occasions before they will label them as "mean," but a single positive event is sufficient for them to make a "nice" judgment (Boseovski & Lee, 2006). In addition, even when someone has done two negative actions in the past, 4- to 5-year-olds do not expect this person to do something bad in the future (Lagattuta & Sayfan, 2013). Indeed, whereas 6-year-olds view positive information as more diagnostic about a person than negative information, the opposite is true for 10-year-olds and adults (Newman, 1991). Thus, part of what limits children's thinking about person-specific and person-consistent ways of behaving is their general bias to assume that people have positive traits that only get better as people grow older.

At the same time that children move towards a more realistic view of their own and others' traits (i.e., away from a positivity bias; recognizing the potential for trait stability; Schuster et al., 1998), they also exhibit improvements in their executive function skills, or control of higher-order cognitive processes (Diamond, 2013). In particular, the ability to inhibit dominant responses (inhibitory control) and to mentally manipulate multiple pieces of information (working memory) develop between 3 and 7 years of age (Best & Miller, 2010), with continued improvement in these abilities into later childhood and adulthood (Conklin et al., 2007; Gathercole et al., 2004; Kramer et al., 2015; Williams et al., 1999). Despite this parallel developmental timetable, little research has considered the cognitive processes that may support trait reasoning (Miller & Aloise-Young, 2018), including whether improvement in executive function may relate to the ability to overcome a positivity bias when inferring traits over time.

Although no work has directly examined connections between executive function and trait reasoning, some relevant research informs possible predictions. For example, Lagattuta et al. (2018) found that age, inhibitory control, and working memory each independently predicted 4- to 10-year-olds' and adults' knowledge that people's past experiences bias their future thoughts, emotions, and decisions. In that study, appreciating that past experiences shape future reactions (e.g., that a person could feel worried seeing someone who had previously harmed them twice), required participants to override assumptions that people will think, feel, and act positively. Relatedly, Boseovski and Thurman (2014) documented that 6- to 7-year-olds with higher (versus lower) parent-reported inhibitory control more often endorsed newly learned negative information about unknown animals (e.g., that a "quoll" is "dirty and smelly"). Potentially, then, executive function may also relate to trait reasoning, especially awareness that a person's current negative trait could have originated earlier in their lifetime and continue as they grow older. That is, inhibitory control could help individuals overcome a positivity bias and attend to evidence that a given person may have negative traits. Working memory could further bolster the ability to keep in mind relevant information for making trait attributions and facilitate response consistency when questioned about multiple time points across an individual's lifetime.

Current Research

To extend scientific knowledge about age-related changes in trait reasoning, including sources of individual variability, we examined 4- to 10-year-olds' and adults' judgments about babies', children's, and teenagers' traits (meanness and niceness) at different points in the characters' lives. We explicitly told participants that various characters were either "medium mean" or "medium nice," and then participants made predictions about whether each character would be mean or nice (including intensity: little, medium, very) at other points in their life. More specifically, participants reasoned about (1) what babies would be like as children, teenagers, and adults; and (2) what children and teenagers were like as babies, younger children, and adults. Participants reasoned about trait labels rather than behaviors because the trait-relevant actions that mean and nice individuals could perform would differ across age (e.g., a mean baby's actions would differ from a mean adult's actions). In addition to measuring beliefs about the stability of traits through time, we also administered metrics of executive function (working memory, inhibitory control). This novel approach comprehensively addressed several aspects of trait reasoning: Children's and adults' beliefs about *starting state traits* (i.e., traits as an infant), *ending state traits* (i.e., traits as a grownup), and *valence stability* across multiple points in the lifetime, including whether these inferences varied by participant age and trait valence. We further explored contributions of executive function independent of participant age.

Longitudinal studies on human temperament and personality reveal that some traits appear biologically inherited and present since birth, with significant predictive stability over time (Buss & Plomin, 2014; Eysenck & Eysenck, 2013). Indeed, researchers are highly motivated to understand when in development certain traits are reliably observable (Bedford et al., 2015; Wagner et al., 2016). We acknowledge, however, that there are still strong debates in the field about whether personality traits are truly stable, as well as the degree to which they are genetically influenced and shaped by the environment (Bleidorn, 2015; Bleidorn et al., 2018; Borghuis et al., 2017; Briley & Tucker-Drob, 2014; Caspi et al., 2005). Regardless of ground truth, it is important to study beliefs about trait origins and stability because such beliefs shape expectations about oneself and other people. For example, adults' lay theories about the origins of criminal behavior (genetic versus environmental) influence moral and legal decisions about culpability and sentencing (see Dar-Nimrod & Heine, 2011). Children's and adults' beliefs about the fixedness of traits (e.g., intelligence) also affect motivation and performance (Dweck, 2008).

Given these debates and real-world consequences, we reasoned that measuring children's and adults' past-oriented trait inferences (e.g., what a mean-labeled adolescent was like as a younger child and infant) would be particularly intriguing as they tap into assumptions about the origin and early stability of traits. Gelman et al. (2007) investigated 6- to 11-year-olds' and adults' judgments of whether several characteristics present in childhood (e.g., "George is shy") were inborn (e.g., "Do you think that George was born shy?"). Participants infrequently assumed backward stability: Across age, participants only expected characteristics to have been inborn on about a third of trials. Although informative about children's and adults' beliefs about trait origins, Gelman et al. (2007) did not analyze judgments by type (e.g., skill vs. personality trait vs. emotion) or valence, and answer choices were binary (yes/no) instead of scaled in intensity. Importantly, perhaps participants (especially younger children) endorse that positive traits originate in infancy, but that negative traits only emerge later in development; reflective of Rousseau's argument (1712–1778) that individuals are born good but corrupted by society. By having participants reason about what both "mean" characters and "nice" characters were like as babies, the current study directly tested the impact of trait valence on origin beliefs.

We further examined participants' future-oriented trait attributions. Although several studies have examined children's inferences as to whether a trait exhibited in childhood or adulthood would continue to be present at an older age (Diesendruck & Lindenbaum, 2009; Heyman & Giles, 2004; Liu et al., 2007; Lockhart et al., 2002, 2009), our methods went beyond the prior work. First, we uniquely investigated children's and adults' beliefs about the future stability of inborn traits (i.e., present as a baby) compared to traits evident in childhood or adolescence. This enabled us to test whether children and adults believe that traits expressed in childhood or adolescence align more closely with what that individual will be like as a grownup compared to traits expressed in infancy (e.g., will a "mean" baby and a "mean" teenager end up equivalently mean as adults?), as well as whether inferences about starting state traits depends on the age for which the information is given (e.g., did a "nice" kid and "nice" teenager start out equally nice as babies?). By having participants rate both trait valence and intensity, we could measure these beliefs more precisely. Second, because children and adults made trait inferences at three time points for each of six characters, we could further measure within-participant beliefs about the overall stability of negative and positive traits from infancy to adulthood (i.e., the proportion of valence-stable trait judgments, including comparisons to chance). Past work has typically only asked participants to reason about one or two time points per character per trait (e.g., Lockhart et al., 2002, 2009), limiting researchers' ability to use this more fine-grained, individual-level approach to measuring beliefs about trait stability.

Hypotheses

We anticipated developmental differences in trait reasoning. Given the age-related positivity bias, however, we predicted that such variations would be stronger, or perhaps only apparent, when participants reasoned about mean-labeled (versus nice-labeled) characters. That is, we expected 4- to 7-year-olds to provide similar trait ratings to older children and adults for nice-labeled characters because a "nice" prediction aligns with their tendency to presume positive traits. In contrast, we hypothesized that younger children, compared to older participants, would expect that mean-labeled kids and teenagers had been nicer as babies, would be nicer as grownups, and would exhibit less consistent meanness over time. We also tested how the age of the character possessing the trait (baby, young kid, teenager) influenced participants' beliefs about their starting state and ending state traits. Finally, we explored relations between beliefs about trait stability and executive function. Similar to our age-related predictions, executive function may be more relevant for reasoning about the stability of meanness because higher executive function skills could enable participants to inhibit a positivity bias and provide more consistent negative trait judgments. Overriding a positivity bias is not necessary when reasoning about the stability of niceness in "nice" people.

Method

Participants

Four- to 10-year-olds and adults (N = 198) were divided into four age groups: 48 4.5- to 5-year-olds (M = 5 years; 4 months, SD = 5 months; 24 females, 24 males), 52 6- to 7-year-olds (M = 7 years; 1 month, SD = 7 months; 25 females, 27 males), 50 8- to 10-year-olds (M = 9 years; 5 months, SD = 9 months; 24 females, 26 males), and 48 adults (M = 21 years; 2 months, SD = 1 year; 11 months; 24 females, 24 males). Of the child participants, 2% were Asian, 10% Hispanic or Latino, 66% White, 19% multiracial, and 3% some other race or ethnicity. Of the adult participants, 6% were African American, 21% Asian, 2% Hawaiian or

Pacific Islander, 19% Hispanic or Latino, 2% Native American, 33% White, 6% multiracial, and 10% some other race or ethnicity. Child participants were recruited from local farmers markets, a list of past research participants, and participant referral. Adults were recruited from undergraduate psychology courses. We determined sample size *a priori* based on the rule of thumb of about 50 participants per age group (Wilson VanVoorhis & Morgan, 2007) as well as the resources required to recruit and test children and adults individually.

Materials and Procedure

Trait Reasoning Measure—The experimenter showed participants six characters and labeled each with their current trait, including intensity (i.e., “medium nice” or “medium mean”). Characters included two babies (one nice, one mean; no gender information), two kids (one nice, one mean; one male, one female), and two teenagers (one mean, one nice; one male, one female). To aid comprehension, characters were depicted pictorially with facial features that either indicated niceness (a smile) or meanness (eyebrows slanted down). We selected the traits “nice” and “mean” because they are positive and negative trait labels that are understood and frequently used by children of this age range (e.g., Giles & Heyman, 2005; Liu et al., 2007). Figure 1 provides examples of study stimuli, script, and test questions. Participants decided if each character was (or would be) nice or mean at three different time points (i.e., when the kid or teenager was a “baby,” “a littler kid,” and “all grown up”; when the baby was a “kid,” “teenager,” and “all grown up”). We chose these timepoints to represent a wide range of time and to have several forward and backward predictions. That is, for the kid and teenager characters we had two past-oriented and one future-oriented prediction, and for baby characters we had three future-oriented judgments. After judging the character’s trait (nice or mean), participants then rated the trait’s intensity (a little, medium, or very nice/mean). We used the intensity labels “little,” “medium,” and “very” based on previous trait reasoning (e.g., Liu et al., 2007) and emotion understanding research (e.g., Lagattuta & Sayfan, 2013; Lagattuta & Kramer, 2019), pilot testing indicating that children readily understood these intensity differences, and because participants in this research had previously received training and answered questions for a separate study that had them rate people’s emotions using “little,” “medium,” and “very” intensity labels (Lara et al., 2019).

Counterbalancing and Randomization.: Children and adults were randomly assigned to one of two sets of characters. Set one included a mean female teenager, a nice male teenager, a mean male kid, a nice female kid, a mean baby, and a nice baby ($n = 102$). Set two included a mean male teenager, a nice female teenager, a mean female kid, a nice male kid, a mean baby, and a nice baby ($n = 96$). All participants reasoned about kids and teenagers before reasoning about the babies so that we would not contaminate their answers about potential starting state traits (i.e., that a baby could be labeled as mean). Before each participant, the experimenter shuffled the four kid and teenager character images together and then the two baby images together to establish random orders. The experimenter also randomized the order in which the different timepoints were presented. Twenty-four participants (3 4- to 5-year-olds, 10 6- to 7-year-olds, 6 8- to 10-year-olds, 5 adults) did not reason about the future traits of mean and nice babies because the baby trials were added to the paradigm after they had completed their participation.[1] Thus, for analyses involving the babies, we used a reduced sample (N = 174).

Coding and Scoring.

Trait rating.: To examine what children and adults expected "medium nice" and "medium mean" kids and teenagers to be like as babies as well as to assess what children and adults anticipated "medium nice" and "medium mean" babies, kids, and teenagers would be like as adults, we created trait rating scores for each character at each time point (e.g., what the "medium mean" kid was like as a baby): −3 = "very mean," −2 = "medium mean," −1 = "a little mean," 1 = "a little nice," 2 = "medium nice," 3 = "very nice." Thus, higher trait rating scores indicate more intense "niceness" whereas lower scores reflect more intense "meanness."

Valence stability.: We further analyzed the consistency at which children and adults expected stability in the valence of characters' traits during their lifetimes. To test this, we created valence stability scores. For the nice-labeled characters, we calculated the proportion of judgments (i.e., three timepoints for each of three characters: nine total) that the participant inferred that the "medium nice" character would stay some level of nice throughout their lifetime. For the mean-labeled characters, we calculated the proportion of judgments (i.e., three timepoints for each of three characters: nine total) that the participant reasoned that the "medium mean" character would stay some level of mean throughout their lifetime. Thus, higher valence stability scores indicate more consistent expectations that traits remain immutable over time.

Executive Function

Inhibitory Control.: Participants completed *Up-Down* and *Happy-Sad* inhibitory control tasks (Kramer et al., 2015; Lagattuta et al., 2011). Participants were instructed to label the image they saw (e.g., a happy face) with the opposite label (e.g., sad). Each task contained 24 test trials and was completed on an eyetracker. Before the test trials, participants completed six practice trials where the experimenter pointed at random to each image (e.g., happy, happy, sad, happy, sad, sad). If participants erred then the experimenter corrected them, and the practice trials started over until they reached 100% accuracy. Participants were not instructed on how fast they should complete the tasks, but the experimenter advanced to the next trial (with a mouse click) as soon as the participant provided their response. We used error rates and average reaction time for a single trial. The eyetracker recorded trial-by-trial reaction time. Two trained research assistants coded accuracy. Participants were counted as correct if their first response was accurate (e.g., saying "happy" to a sad face); self-corrections (e.g., saying "happy-no-sad") were considered incorrect. One research assistant coded 100% of the data and the other research assistant independently coded approximately 18% of the data. They exhibited high interrater reliability (Happy-Sad: ICC3k = .97, 95% Confidence level [CI][.95, .99]; Up-Down: ICC3k = .94, 95% CI[.89, .97]). For analyses, we used the proportion of incorrect responses.[2] These tasks produce variability even in

[1]The inclusion of baby trials was inspired by an "aha" moment ("What about a mean baby!" What would they think a mean baby would be like at older ages?") when one of the authors was discussing this paradigm with another researcher in the field.

adulthood and have been used when assessing links between executive function and mental state reasoning (Lagattuta et al., 2010, 2014, 2016, 2018).

Verbal Working Memory.: To measure verbal working memory, we administered the Memory for Sentences Task (Thorndike et al., 1986). Participants were read statements, and they were asked to repeat each statement back verbatim. For example, if the sentence were, “The dog chased the cat down the hill” (this is not an actual test item; the task is copyrighted), participants would only be counted as correct if they said exactly, “The dog chased the cat down the hill.” If the participant stated any part of the sentence incorrectly, they were counted as incorrect (e.g., if they said “road” instead of “hill” or “a” instead of “the”). Before beginning, participants received simple warm-ups with two- or three-word utterances to make sure they understood the task. The experimenter then read increasingly complex statements until the participant missed four in a row (participants did not receive feedback). Possible scores on this standardized measure range from 0 to 42. To excel on this verbal working memory task, the participant must keep in mind and mentally manipulate increasing amounts of phonemes, morphemes, meaning, and syntactical complexity as the task progresses. This verbal working memory elicits variability across a wide age range, and has been shown to relate to mental state reasoning in children and adults (Kramer et al., 2017; Lagattuta et al., 2010, 2014, 2016, 2018).

General Procedure—Participants were tested individually in a quiet room by a female experimenter at a university laboratory. This study was part of a larger project on social-cognitive reasoning (children completed three 1- to 1.5-hour sessions; adults completed two sessions, the first was about 1 hour and the second was 2- to 2.5-hours). Participants completed the trait reasoning measure near the end of their third visit for child participants or second session for adults, the verbal working memory during their first visit, and the inhibitory control measures during their second or third visits (counterbalanced; adults completed the inhibitory control measure during the beginning or end of their second visit, counterbalanced). For participating, children received $30.00 and a small prize (valued at less than $5.00). Adults received course credit. Participants from this study also participated in (Lara et al., 2019). No measures presented in those studies are included in this manuscript (i.e., all analyses presented here are novel).

Results

Results are divided into four sections. In the first section, we analyzed participants’ beliefs about starting state traits (e.g., what mean-labeled kids and teenagers had been like as babies). In the second section, we examined children’s and adults’ beliefs about ending state traits (e.g., what mean-labeled babies, kids, and teenagers will be like as adults). In the third section, we assessed the valence stability of participants’ trait ratings (e.g., how consistently participants assumed that a “medium mean” character would remain “mean” across multiple time points). Finally, we explored links between trait reasoning and executive function. We set alpha = .05, and conducted analyses in RStudio (version 3.6.1; RStudio Team, 2019).

[2]Analyses of eye movements during the inhibitory control tasks will be presented in a separate paper.

Due to some missing data for beliefs about babies (see Method), sample sizes differ slightly across analyses.

Starting State Traits: Traits as Babies

Participants ($N = 198$) judged what each mean-labeled and nice-labeled kid and teenager had been like as babies. We analyzed whether these inferences about starting state traits varied by the age of the character (kid vs. teenager) and the experimenter provided trait label (i.e., "medium nice" vs. "medium mean"). We conducted a 4 (age: 4/5 years, 6/7 years, 8/10 years, adults) × 2 (trait: nice, mean) × 2 (character: kid, teenager) repeated measures ANOVA on baby trait ratings. Age was a between-subjects factor; trait and character were within-subjects factors. This analysis resulted in main effects for age, $F(3, 194) = 5.86$, $p < .001$, $\eta p^2 = .08$, and trait, $F(1, 194) = 83.68$, $p < .001$, $\eta p^2 = .30$, qualified by an Age × Trait interaction, $F(3, 194) = 7.04$, $p < .001$, $\eta p^2 = .10$ (see Table 1 and Figure 2; Table 2 presents binary data). There were no effects for character: Predicting the starting state trait did not differ by whether the trait was currently being expressed by a young kid or teenager (Fs < 3.86, ps > .051, ηp^2s < .02).

Six- to 10-year-olds and adults anticipated that nice-labeled characters had been nicer as babies than mean-labeled characters (ps < .009). Four- to 5-year-olds trended in the same direction ($p = .063$). There were no participant age-related differences in expectations about what nice-labeled characters had been like as babies (ps > .060), except that adults expected babies to have been nicer than 4- to 5-year-olds ($p = .006$). We documented a developmental u-shaped curve in reasoning about the starting state trait of mean-labeled characters. Four- to 5-year-olds and adults assumed a more positive starting state for mean-labeled characters as babies than did 6- to 10-year-olds (ps < .025; as well, 4/5s < adults, $p = .034$).

Ending State Traits: Traits as Grownups

Participants ($N = 174$) predicted how nice or mean each character would be as a grownup. We further assessed beliefs about whether this ending state trait varied by the age at which the experimenter labeled the character (baby vs. kid vs. teenager) as nice or mean. We ran a 4 (age) × 2 (trait) × 3 (character: baby, kid, teenager) repeated measures ANOVA on grownup trait ratings, with age as a between-subjects factor and trait and character as within-subjects factors. This yielded a main effect for trait, $F(1, 170) = 356.07$, $p < .001$, $\eta p^2 = .68$, qualified by an Age × Trait, $F(3, 170) = 18.88$, $p < .001$, $\eta p^2 = .25$, and Age × Trait × Character interactions, $F(6, 340) = 2.16$, $p = .046$, $\eta p^2 = .04$ (see Table 1 and Figure 3; Table 2 presents binary data).

All age groups preserved the nice-mean hierarchy: They expected nice-labeled babies, kids, and teenagers to be nicer as grownups than mean-labeled babies, kids, and teenagers (ps < .001; but for 4/5-year-olds: nice teenagers = mean teenagers, $p = .448$). Moreover, there were no developmental differences in evaluations of what nice individuals would be like as grownups (ps > .074; but 4/5-year-olds < older participants for nice teenagers, ps < .006). As predicted and consistent with prior work, there was an age-related positivity bias for characters described as mean: Four- to 7-year-olds expected mean-labeled characters to be nicer as grownups than did 8-to 10-year-olds and adults (ps < .027; but 6/7-year-olds =

adults for mean babies as grownups, $p = .422$). Although the age of the trait-labeled character (baby vs. kid vs. teenager) did not reliably affect ratings for ending state traits (ps > .080), adults thought mean-labeled babies (vs. mean-labeled kids) would be less mean as grownups ($p = .007$), and 4- to 5-year-olds judged that nice-labeled teenagers (vs. nice-labeled babies or kids) would be less nice as adults (ps < .010). Thus, only for adults, the inductive potential of meanness in infancy was weaker than that of meanness in childhood. Still, 67% of adults judged that a mean baby would become a mean grownup (see Table 2).[3]

Valence Stability Over the Lifetime

We examined the overall valence stability of participants' past-oriented and future-oriented trait ratings by measuring the proportion of judgments that participants anticipated that nice-labeled characters would have been or would continue to be "nice" and mean-labeled characters would have been or continue to be "mean" during their lifetimes. Because children and adults made three trait judgments for each of six characters, proportion scores are out of a total of 18 judgments (i.e., three timepoint judgments × six characters = 18; nine judgments for each trait valence). For these analyses, we used the reduced sample size ($N = 174$) to ensure that all participants provided judgments for babies.[4]

We conducted a 4 (age) × 2 (trait) repeated measures ANOVA on valence stability scores, with age as a between-subjects factor and trait as a within-subjects factor. This resulted in main effects for age, $F(3, 170) = 21.21$, $p < .001$, $\eta p^2 = .27$, and trait, $F(1, 170) = 163.31$, $p < .001$, $\eta p^2 = .49$ (see Table 3 and Figure 4). The Age × Trait interaction was not significant, $F(3, 170) = 2.40$, $p = .069$, $\eta p^2 = .04$. As predicted, 4- to 5-year-olds had lower valence stability scores than did 6-to 10-year-olds and adults (ps < .001; 6- to 7-year-olds < 8- to 10-year-olds, $p = .007$). All age groups expected greater stability for niceness versus meanness (ps < .001).

We also tested how these valence stability scores compared to chance responding (.50). All age groups inferred valence-stable lifetime traits more frequently than would be expected by chance for nice-labeled characters (4/5 years: $t[44] = 8.34$, $p < .001$, $d = 1.24$; 6/7 years: $t[41] = 11.96$, $p < .001$, $d = 1.84$; 8/10 years: $t[43] = 21.24$, $p < .001$, $d = 3.20$, adults: $t[42] = 46.86$, $p < .001$, $d = 7.15$). In contrast, when reasoning about mean-labeled characters, 4- to 5-year-olds ($t[44] = -1.95$, $p = .058$, $d = 0.29$) and 6- to 7-year-olds ($t[41] = 1.79$, $p = .080$, $d = 0.28$) responded at chance, but 8- to 10-year-olds ($t[43] = 6.73$, $p < .001$, $d = 1.01$) and adults ($t[42] = 4.05$, $p < .001$, $d = 0.62$) were still more likely than expected by chance to provide valence-stable trait judgments for mean characters across their lifetime.

Links to Executive Function

To examine the influence of executive function on children's and adults' trait reasoning, we conducted two hierarchical linear regressions. For both analyses, we entered participants' age (exact) in the first step, verbal working memory (VWM) in the second step, inhibitory control (errors and reaction time; IC errors and IC RT) in the third step, and Age × VWM,

[3]Note: 71% of 4- to 5-year-olds thought a nice teenager would become a nice grownup (see Table 2).
[4]The findings hold when we used the complete sample.

Age × IC RT, and Age × IC errors in the final step. We mean-centered the predictors before entering them. Because we were particularly interested in how executive function relates to reasoning about stability in traits over time, we used the valence stability scores for mean and nice characters (proportion of judgments out of three characters × three timepoints for each valence that they predicted a valence-stable trait) as our dependent variables. We excluded three participants due to missing inhibitory control data (experimenter error), and we only used participants who had complete trait reasoning data ($N = 171$). Table 4 displays the means and standard deviations for the independent variables and Table 5 shows bivariate correlations.

Nice Characters.—The first ($F[1, 169] = 20.33$, $p < .001$), second ($F[2, 168] = 11.96$, $p < .001$), third ($F[4, 166] = 6.81$, $p < .001$), and fourth models ($F[7, 163] = 4.44$, $p < .001$) were all significant, but the second, third, and fourth models did not result in significant increases in R^2 (Model 2: $\Delta R^2 = .02$, $F[1, 168] = 3.34$, $p = .070$; Model 3: $\Delta R^2 = .02$, $F[2, 166] = 1.58$, $p = .210$; Model 4: $\Delta R^2 = .02$, $F[3, 163] = 1.24$, $p = .298$). The first model, including only age, accounted for 11% of the variance. Older participants more often assumed than younger participants that nice-labeled characters would also have been nice earlier in their lives and will continue to be nice later in their lifetimes ($b = 0.06$, $SE = 0.01$, $\beta = .33$, $p < .001$).

Mean Characters.—The first ($F[1, 169] = 4.64$, $p = .033$), second ($F[2, 168] = 5.96$, $p = .003$), third ($F[4, 166] = 5.63$, $p < .001$), and fourth models ($F[7, 163] = 4.09$, $p < .001$) were all significant. Both the second ($\Delta R^2 = .04$, $F[1, 168] = 7.58$, $p = .007$) and third models ($\Delta R^2 = .05$, $F[2, 166] = 5.09$, $p = .007$) also resulted in significant increases in R^2 (fourth model: $\Delta R^2 = .03$, $F[3, 163] = 1.92$, $p = .128$). The third model accounted for 12% of the variance. In that model, after controlling for age ($b = -0.03$, $SE = 0.03$, $\beta = -.12$, $p = .256$) and verbal working memory ($b = 0.03$, $SE = 0.03$, $\beta = .12$, $p = .267$), participants who completed the inhibitory control tasks more quickly ($b = -0.06$, $SE = 0.02$, $\beta = -.23$, $p = .010$) and those who made fewer errors provided more valence-stable trait ratings ($b = -0.05$, $SE = 0.02$, $\beta = -.19$, $p = .040$). That is, individuals with higher inhibitory control more often inferred that mean-labeled characters had also been mean earlier in life and would maintain their meanness as they grew older.[5]

Discussion

The current study revealed similarities and differences in children's and adults' beliefs about starting state traits (i.e., traits as a baby) and ending state traits (i.e., traits as a grownup), as well as the valence stability of people's traits over the lifespan. Four- to 5-year-olds, as with older children and adults, expected nice-labeled individuals to be nicer than mean-labeled individuals across multiple ages (baby, kid, teenager, grownup). Still, significant

[5]The same pattern of results held when we used average trait ratings as the DV (i.e., the average trait rating from "very mean" to "very nice" of nice-labeled characters across timepoints and the average trait rating from "very mean" to "very nice" of mean-labeled characters across timepoints). That is, there was no effect of executive function (verbal working memory, inhibitory control) on participants' average trait ratings for nice-labeled characters. In contrast, after controlling for age and working memory, individuals higher (versus lower) in inhibitory control (faster response times, lower error rates), rated mean-labeled characters as meaner. Thus, the significant relation between executive function and reasoning about negative (but not positive) traits was not specific to valence stability scores; it was also present when assessing participants' trait ratings averaged across timepoints.

developmental differences emerged. Consistent with an age-related positivity bias, 4- to 7-year-olds expected mean-labeled babies, kids, and teenagers to grow up to be nicer adults than did 8- to 10-year-olds and adults. Moreover, between 4 and 10 years of age, children anticipated greater stability in people's traits during their lifetimes, with all age groups expecting greater immutability in niceness versus meanness over time. Findings also revealed an intriguing u-shaped developmental curve when reasoning about starting state traits: Four- to five-year-olds and adults (compared to 6- to 10-year-olds) inferred that a mean-labeled child or teenager had started out less mean as an infant. Finally, controlling for age and verbal working memory, individuals higher in inhibitory control endorsed greater lifetime stability of meanness, with no relation between executive function and beliefs about the stability of niceness over time. The following sections delve further into these findings and provide future research directions.

Age-Related Differences in Reasoning about Traits

Consistent with prior work on trait reasoning and essentialism, we documented age-related improvements in recognizing that a person's current traits are indicative of what they will be like in the future (Gelman, 2003; Gelman et al., 2007; Gnepp & Chilamkurti, 1988; Liu et al., 2007; Rholes & Ruble, 1984). We further replicated prior work illustrating that developmental differences in thinking about the stability of traits over time are more pronounced for beliefs about negative versus positive traits (Boseovski, 2010; Boseovski & Lee, 2006; Lagattuta & Sayfan, 2013; Lockhart et al., 2002, 2009; Newman, 1991). For example, whereas all age groups (even 4-to 5-year-olds) expected valence stability (versus valence instability) most frequently for nice characters, only 8- to 10-year-olds and adults also expected valence stability for mean characters. In contrast, 4- to 7-year-olds only provided valence-stable predictions about half of the time when reasoning about mean characters, with 4- to 5-year-olds actually trending towards anticipating valence instability (i.e., shifting to niceness) for mean characters. This imbalance in age-related differences for negative versus positive traits was also apparent in participants' future-oriented trait ratings (i.e., what mean and nice babies, kids, and teenagers will be like as grownups). That is, 4- to 10-year-olds and adults provided comparable judgments for what nice individuals would be like as grownups (i.e., all hovering around medium nice). For mean individuals, however, judgments of meanness as grownups intensified with participant age; though, it is notable that even adults anticipated that "medium mean" babies, children, and teenagers would eventually improve and be less intensely mean as grownups.

One interpretation of these findings is that young children's positivity bias enables more advanced reasoning about the stability of positive versus negative traits. This more precocious thinking about positive traits is especially intriguing when contrasted with related work showing that young children typically show stronger knowledge about the causes of negative versus positive emotions. For example, 3- to 6-year-olds exhibit greater appreciation that thinking negatively can lead to negative emotions (even in a positive situation) than that positive thinking can yield positive emotions (even in a negative situation; Bamford & Lagattuta, 2012; Lagattuta & Wellman, 2001). Four- to 10-year-olds also exhibit better knowledge about the connections between expectations and emotions (i.e., that low expectations can have emotional benefits and high expectations can have emotional costs) when something bad happens versus when something good occurs (Lara et al., 2019). Thus, future work disentangling why certain aspects of children's knowledge are more attuned to positive versus negative information in some contexts could be revealing. This variation could in part derive from differences in the relative duration of emotions versus traits. That is, children may be motivated to understand the causes of negative emotions because since they are short-lived, they end, and can be avoidable in the future. In contrast, awareness that people can have stable negative traits could create greater fear, wariness, or discomfort in social interactions. Thus, young children may be less motivated to endorse negative trait stability, especially at ages when they are building social networks and are more dependent on others for survival (see Lagattuta et al., 2018).

Developmental u-shaped curves—where younger and older individuals exhibit higher performance than participants in a middle age range—are common across several domains. For example, when English-speaking children first start talking in the past tense, they correctly use some irregular forms of verbs (e.g., saying "*went*" instead of "*goed*"), but as they start to better master the grammar rules around 3 to 5 years of age, they overapply them (e.g., saying "*goed*" instead of "*went*"); only later in development do children incorporate the exceptions into the rules (Kuczaj, 1977; Marcus et al., 1992). Similarly, when children first start to appreciate that two people can differ in their interpretations of the same situation around 6 to 7 years of age (Lalonde & Chandler, 2002), they more often overextend this assumption (compared to younger and older age groups) by failing to appreciate when people should think alike; by 8 to 10 years of age children better recognize situations that elicit mental diversity and those that elicit common ground (Lagattuta et al., 2010; Lagattuta et al., 2014). In the present research, we document a curvilinear pattern in participants' reasoning about starting state traits: Four- to 5-year-olds and adults expected mean-labeled kids and teenagers to have been nicer as babies than did 6- to 10-year-olds. Thus, at the age when children develop stronger knowledge that people can have negative traits that are stable across time—around 6 to 10 years of age—they appear to more often overextend this assumption about trait stability to starting state traits compared to other age groups.[6] This pattern did not replicate for judgments of nice characters. Predictions of what "medium nice" kids and teenagers were like as babies varied minimally by participant age.

Different processes and conceptual understandings likely underlie this surface-level similarity in the youngest and oldest participants. Four- to 5-year-olds may have judged "nicer" starting states for mean-labeled characters than did 6- to 10-year-olds because younger children have a stronger positivity bias (e.g., Boseovski, 2010) and weaker beliefs about trait stability (e.g., Gelman et al., 2007). Four- to 5-year-olds may have judged "nicer" starting states for mean-labeled characters than did 6- to 10-year-olds because younger children have a stronger positivity bias (e.g., Boseovski, 2010) and weaker beliefs about trait stability (e.g., Gelman et al., 2007). In contrast, adults' starting state trait ratings may have differed from 6- to 10-year-olds due to their contrasting beliefs about the nature of babies. Adults more frequently endorse interactional nature-nurture models of development than do

[6]Recall that participants reasoned about what kids and teenagers would be like as babies before they responded to the trials about what babies would be like in the future. Thus, we measured all participants' judgments about the traits of babies before introducing the "nice" and "mean" baby characters in the testing protocol.

children (Johnson & Solomon, 1997); thus, believing that individuals may have an innate genetic predisposition for antisocial traits but their expression later in life depends upon the environment. Adults may have also been more likely to consider base rates of population traits (i.e., how many mean babies are there in the world) or used other cognitive shortcuts such as a representativeness heuristic (i.e., relying on their beliefs about prototypical babies) or availability heuristic (i.e., relying on the first baby that comes to mind) when judging what a kid or teenager might have been like as a baby (Jacobs & Potenza, 1991; Tversky & Kahneman, 1973, 1982). It should not be overlooked, however, that adults did infer that mean-labeled individuals had been less nice as babies compared to nice-labeled individuals. Moreover, most adults (67%) predicted that a mean baby would turn out to be a mean grownup (see Table 2). So, adults do appear to assume that expressed traits are informative for backwards and forwards trait attributions, even when considering a baby.

Executive Function and Beliefs about Trait Stability

The current research is the first to document a link between children's and adults' beliefs about the stability of traits and executive function. Controlling for age and verbal working memory, participants with higher inhibitory control more consistently judged that someone who was mean right now had also been mean earlier in their lifetime and would continue to be mean as they grow older (valence stability score). This significant relation also held when considering average trait ratings for mean-labeled individuals (average trait rating score). In contrast, we found no evidence of a relation between executive function and reasoning about nice-labeled individuals over time. These results suggest that inhibitory control may help participants set aside a positivity bias (i.e., the assumption that people are nice) to instead rely on relevant evidence that would yield the opposite prediction (i.e., that a mean person is, was, and will continue to be mean). Further supporting this interpretation, prior work shows that superior executive function relates to children's ability to overcome positivity biases in other domains (i.e., trust in testimony, future thinking; Lagattuta et al., 2018; Boseovski & Thurman, 2014).

Evidence that individual differences in executive function relate to beliefs about the stability of negative traits over time complements research on sources of variability in children's and adults' mental state reasoning, or theory of mind (Wellman, 2014). Higher inhibitory control and verbal working memory relate to 3- to 5-year-olds' ability to set aside their own knowledge when reasoning from a naïve perspective (Carlson & Moses, 2001; Devine & Hughes, 2014; Sabbagh et al., 2006), as well as to more general social competence (Caporaso et al., 2019; Razza & Blair, 2009). Higher executive function also predicts advanced social-cognitive reasoning and more accurate perspective-taking during middle childhood and adulthood (Apperly et al., 2009; Hughes & Devine, 2015; Lagattuta et al., 2010; Lagattuta et al., 2014; Lecce et al., 2017; Wang et al., 2016). Although children and adults utilize both mental states and traits to predict and explain their own and others' behaviors, traits are assumed to be more stable across time and situation than mental states, potentially lowering executive demands. For example, whereas a person may need to frequently update a person's beliefs (e.g., inhibiting what I know to think about whether or not you know it too), traits are presumably more constant (i.e., if I believe you're mean, then I do not have to continuously update expectations for your behavior). Still, because beliefs about trait stability are less crystalized in young children versus older individuals, improvements in executive function may help children keep in mind a general theory of trait stability and overcome positivity biases.

Ground Truth: Are Traits Really Stable?

Results of the current study replicate and extend prior research showing age-related increases in beliefs about trait stability, implying that this is the most "correct" or sophisticated way to conceptualize traits: Currently nice people were and always will be nice; currently mean people were and always will be mean. Still, older children and adults' overconfidence in trait stability can contribute to biased, incorrect assumptions about the causes of people's behaviors that neglect environmental and structural influences (i.e., the fundamental attribution error; Jones, 1979). Developmental and personality scientists are still trying to determine the actual stability and predictability of traits over the lifespan (Bleidorn, 2015; Bleidorn et al., 2018; Borghuis et al., 2017; Briley & Tucker-Drob, 2014; Caspi et al., 2005). For example, people's personality traits are subject to change during major life transitions (e.g., parenthood, graduation, first job, retirement; e.g., Jokela et al., 2009; Löckenhoff et al., 2009; Specht et al., 2011). Some evidence suggests that aspects of psychopathy (e.g., antisocial behavior) decrease in late adulthood (Harpur & Hare, 1994). Thus, conclusions about which age group is more reality-congruent should be tempered. Indeed, 4- to 5-year-olds' comparatively weaker endorsement of trait stability, especially for negative traits, may arguably be more accurate.

Limitations and Future Directions

This research presents an initial attempt at understanding the relation between executive function and trait reasoning, but direct and conceptual replications are necessary. For example, it would be interesting to assess whether the link between executive function and beliefs about meanness are specific to that particular trait or whether this relation would also hold for other negative, but less morally relevant traits (e.g., messiness). Relatedly, although we did not find links between executive function and niceness, this does not prohibit the possibility that beliefs about the stability of other positive traits, particularly those that are more distinctive or diagnostic about a person (e.g., being very generous) might be related to verbal working memory and inhibitory control. The limited variability in people's beliefs about the stability of niceness may have reduced our power to detect an effect in positive trait ratings. As well, it will be important to assess whether individual variability in executive function correlates with broader essentialist thinking (e.g., reasoning about the immutability of biological and physical characteristics; see Gelman, 2003; Gelman et al., 2007).

Employing a richer battery of executive function tasks, including more measures of inhibitory control and working memory, as well as other components of executive function (e.g., planning, task switching) would be informative. It would also be revealing to test links between executive function and trait reasoning when participants are provided with greater contextual details. Under such circumstances, the opposite connection between executive function and trait reasoning might emerge: People higher (versus lower) in executive function may be less likely to expect trait consistency when individuals experience situational or structural constraints. Whereas here we measured whether executive function correlates with beliefs in trait stability over time, it would also be important to assess how executive function may facilitate reasoning about more unstable or fluctuating mental states, such as desires or emotions. Indeed, children and adults with higher verbal working memory are better able to recognize that their current desires are not necessarily indicative of what they will want in the future (Kramer et al., 2017).

Future studies could also make this trait reasoning task more reflective of real life by using photographs or actual people instead of cartoon illustrations. Additionally, it would be fascinating to explore why children and adults more easily endorse that babies can be nice versus that babies can be mean when both traits involve *intentional* prosocial (or antisocial) behavior. Indeed, while newborn babies have a limited repertoire of behaviors and presumably lack the intentionality required to be “mean,” the same could be said for a baby to be “nice.” And, yet, participants, especially adults, were more willing to attribute starting state “niceness” versus “meanness.” Whereas our ending state trait was a “grownup,” it would be informative to assess beliefs about trait stability across multiple time points from early to late adulthood. Given evidence of an “end of history illusion” (adults’ belief that their personalities, values, and preferences will be stable as they age; Quoidbach, Gilbert, & Wilson, 2013), having both aging adults and young adults complete multiple forward and backward trait assessments during adulthood would be intriguing. Work that incorporates explanations would also improve clarity in age-related differences in beliefs about starting state and ending state traits. More generally, addressing these questions with larger samples and longitudinal designs would be valuable.

Conclusions

We documented developmental continuities and differences in judgments about the lifetime stability of negative and positive traits. Across age, participants inferred that mean-labeled individuals used to be and would continue to be meaner than nice-labeled individuals throughout their lifetime. This endorsement of the lifespan valence stability of traits increased with participant age, with all age groups expecting greater stability for niceness than meanness. A novel u-shaped developmental curve occurred for inferences about the starting state of mean-labeled kids and teenagers: Four- to 5-year-olds and adults expected these individuals to have started out nicer as babies than did 6- to 10-year-olds. Finally, we provided the first empirical evidence that inhibitory control may be a potential cognitive mechanism that facilitates beliefs about the stability of negative traits over time. We look forward to further research that broadens trait reasoning away from an emphasis on what changes with age to a deeper understanding of the cognitive and social factors that contribute to age-related shifts and individual differences.

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Highlights

- Participants included 4- to 10-year-old children and adults
- They reasoned about trait stability and completed measures of executive function
- No age differences or links to executive function for judgments about positive traits
- Expectations for negative trait stability increased with age and executive function
- Developmental u-shaped curve for beliefs about negative traits starting in infancy

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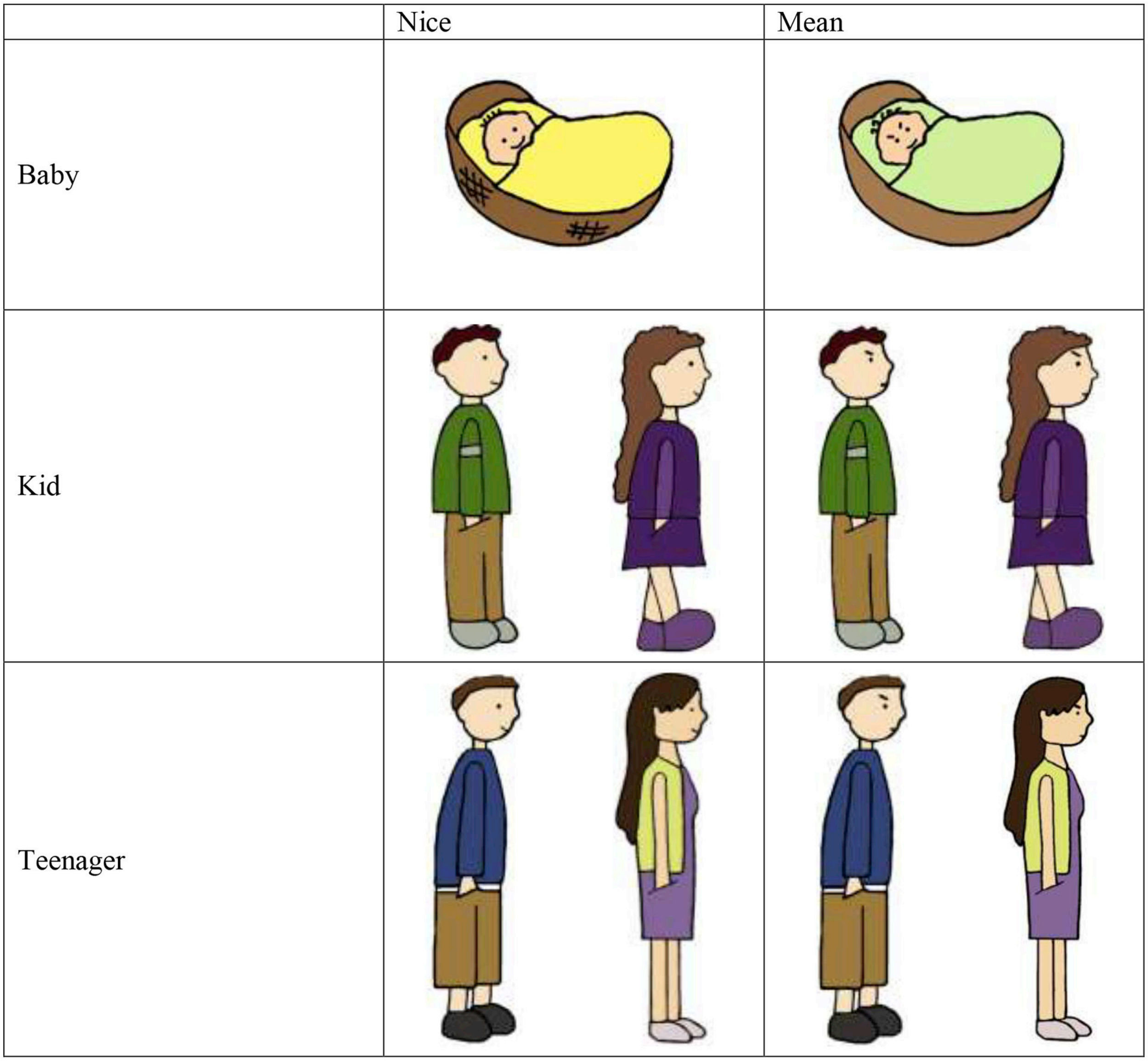

Figure 1.

Trait reasoning stimuli.

Note. For half of the participants, the gender of the nice kid was male, the gender of the mean kid was female, the gender of the nice teenager was female, and the gender of the mean teenager was male. For the other half of participants, the gender of the nice kid was female, the gender of the mean kid was male, the gender of the nice teenager was male, and the gender of the mean teenager was female.

Example Script and Test Questions for “mean kid”: This kid is mean. Not very mean or a little mean, he’s medium mean. [In random order for each participant]: When this kid was a newborn baby, do you think he was a mean or nice person? A little, medium, or very [mean/nice]? When this kid was a littler kid, do you think he was a nice or mean person? A little, medium, or very [mean/nice]? When this kid is all grown up, do you think he will be a mean or nice person? Very, medium, or a little [mean/nice]?

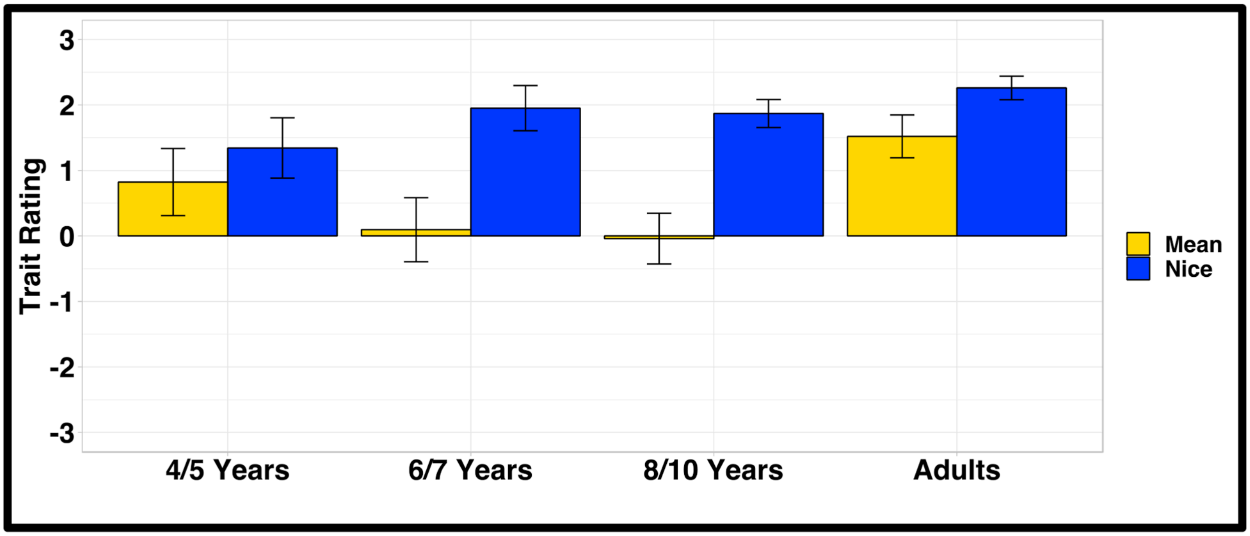

Figure 2.

Traits as babies by age group (4- to 5-year-olds, 6- to 7-year-olds, 8- to 10-year-olds, adults) and trait (mean, nice).

Note. Error bars are 95% confidence intervals. Trait ratings ranged from −3 (very mean) to 3 (very nice).

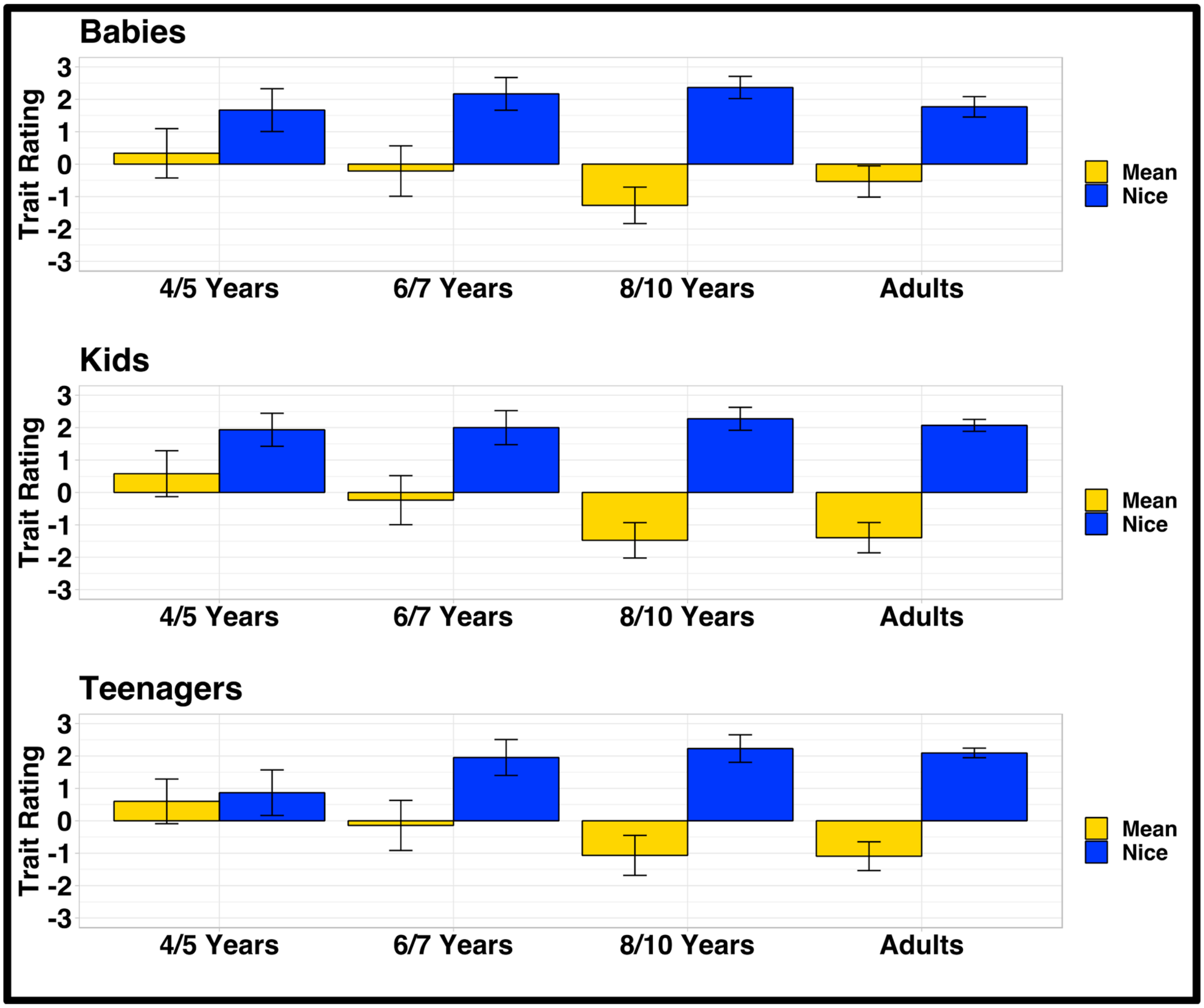

Figure 3.
Traits as grownups by age group (4- to 5-year-olds, 6- to 7-year-olds, 8- to 10-year-olds, adults), trait (mean, nice), and character (babies, kids, teenagers).
Note. Error bars are 95% confidence intervals. Trait ratings ranged from −3 (very mean) to 3 (very nice).

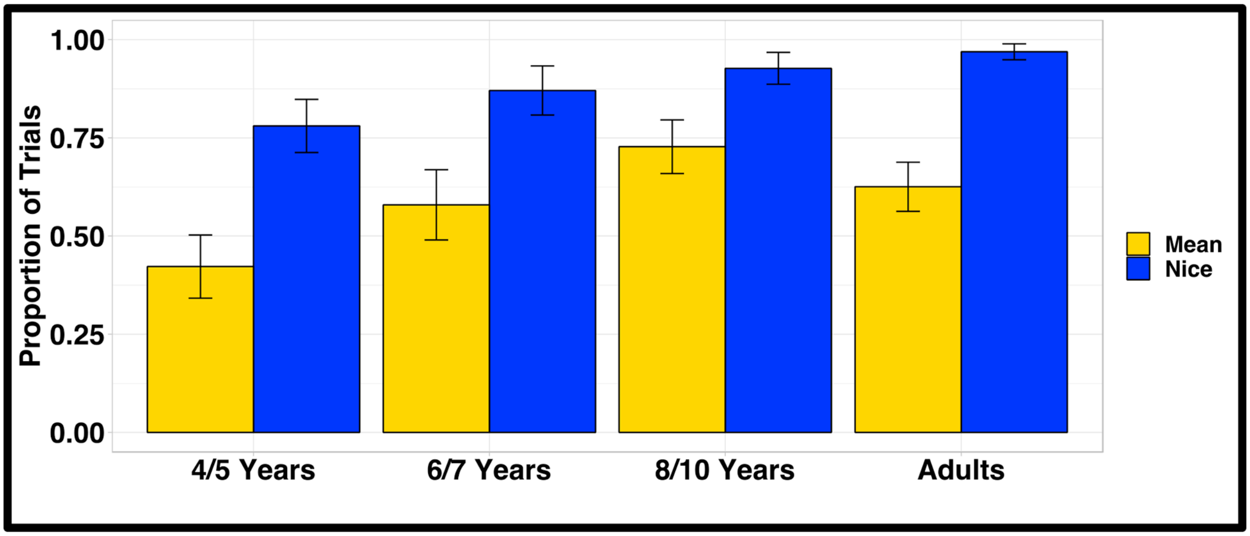

Figure 4.
Proportion of trials participants provided valence-stable trait judgments (valence-stability scores) by age group (4- to 5-year-olds, 6- to 7-year-olds, 8- to 10-year-olds, adults) and trait (mean, nice).
Note. Errors bars are 95% confidence intervals.

Table 1.

Mean (SDs) of Trait Ratings by Age Group, Character, and Time Point

	4/5 Years (*n* = 48)	**6/7 Years (*n* = 52)**	**8/10 Years (*n* = 50)**	**Adults (*n* = 48)**	**All Age Groups (*N* = 198)**
	Medium-Nice Baby				
as a Kid	2.16 (1.92)	1.98 (1.67)	2.18 (1.17)	2.07 (0.74)	2.10 (1.44)
as a Teenager	1.73 (2.20)	2.21 (1.51)	1.80 (1.39)	1.56 (0.93)	1.82 (1.59)
as a Grownup	1.67 (2.20)	2.17 (1.62)	2.36 (1.12)	1.77 (1.02)	1.99 (1.58)
	Medium-Mean Baby				
as a Kid	−0.31 (2.66)	−0.62 (2.46)	−1.66 (1.67)	−1.47 (1.32)	−1.01 (2.16)
as a Teenager	−0.44 (2.61)	−0.62 (2.40)	−1.48 (1.68)	−1.16 (1.60)	−0.93 (2.14)
as a Grownup	0.33 (2.53)	−0.21 (2.49)	−1.27 (1.85)	−0.53 (1.56)	−0.42 (2.21)
	Medium-Nice Kid				
as a Baby	1.52 (2.22)	2.02 (1.80)	1.94 (1.10)	2.25 (0.89)	1.93 (1.60)
as a Younger Kid	1.83 (1.98)	1.53 (2.09)	1.86 (1.36)	2.10 (0.59)	1.83 (1.63)
as a Grownup	1.94 (1.66)	2.04 (1.61)	2.30 (1.11)	2.06 (0.56)	2.09 (1.31)
	Medium-Mean Kid				
as a Baby	0.63 (2.57)	−0.10 (2.51)	−0.16 (1.97)	1.48 (1.65)	0.44 (2.29)
as a Younger Kid	0.38 (2.48)	−0.37 (2.38)	−1.12 (1.69)	−0.38 (1.79)	−0.38 (2.16)
as a Grownup	0.48 (2.35)	−0.35 (2.38)	−1.32 (1.83)	−1.38 (1.50)	−0.64 (2.17)
	Medium-Nice Teenager				
as a Baby	1.17 (2.33)	1.88 (1.77)	1.80 (1.07)	2.27 (0.89)	1.78 (1.65)
as a Younger Kid	1.17 (2.50)	1.58 (1.97)	1.62 (1.24)	1.96 (0.87)	1.58 (1.77)
as a Grownup	0.96 (2.30)	1.85 (1.79)	2.30 (1.33)	2.08 (0.50)	1.80 (1.68)
	Medium-Mean Teenager				
as a Baby	1.02 (2.50)	0.29 (2.52)	0.08 (1.94)	1.56 (1.60)	0.72 (2.24)
as a Younger Kid	0.65 (2.48)	−0.35 (2.33)	−0.92 (1.61)	−0.54 (1.80)	−0.30 (2.15)
as a Grownup	0.54 (2.28)	−0.25 (2.43)	−1.00 (2.02)	−1.00 (1.53)	−0.43 (2.18)

Note. Sample sizes for statistics for "medium-nice" and "medium-mean" babies include the reduced sample ($N = 174$). Trait ratings ranged from −3 (very mean) to 3 (very nice).

Table 2.

Percentage of Participants Who Provided a Valence-Stable Trait Judgment by Participant Age, Time Point, and Character.

	4/5 Years (*n* = 48)	**6/7 Years (*n* = 52)**	**8/10 Years (*n* = 50)**	**Adults (*n* = 48)**	**All Age Groups (*N* = 198)**
	Medium-Nice Baby				
as a Kid	89%	88%	95%	98%	93%
as a Teenager	82%	90%	89%	91%	88%
as a Grownup	80%	90%	95%	93%	90%
	Medium-Mean Baby				
as a Kid	56%	64%	86%	88%	74%
as a Teenager	64%	60%	82%	77%	71%
as a Grownup	40%	57%	75%	67%	60%
	Medium-Nice Kid				
as a Baby	75%	90%	96%	98%	90%
as a Younger Kid	83%	81%	92%	100%	89%
as a Grownup	88%	88%	96%	100%	93%
	Medium-Mean Kid				
as a Baby	40%	58%	52%	19%	42%
as a Younger Kid	44%	62%	78%	60%	61%
as a Grownup	40%	54%	74%	79%	62%
	Medium-Nice Teenager				
as a Baby	71%	88%	96%	98%	88%
as a Younger Kid	73%	83%	88%	96%	85%
as a Grownup	71%	83%	92%	100%	86%
	Medium-Mean Teenager				
as a Baby	33%	48%	46%	17%	36%
as a Younger Kid	35%	60%	80%	69%	61%
as a Grownup	42%	56%	70%	75%	61%

Note. Sample sizes for statistics involving “medium-nice” and “medium-mean” babies include the reduced sample ($N = 174$).

Table 3.

Proportion of Valence-Stable Judgments (Valence Stability Scores) by Participant Age and Trait.

	4/5 Years (*n* = 45)	**6/7 Years (*n* = 42)**	**8/10 Years (*n* = 44)**	**Adults (*n* = 43)**	**All Age Groups (*N* = 174)**
Nice	0.78 (0.23)***	0.87 (0.20)***	0.93 (0.13)***	0.97 (0.07)***	0.89 (0.18)***
Mean	0.42 (0.27)	0.58 (0.29)	0.73 (0.22)***	0.63 (0.20)***	0.59 (0.27)***

* $p < .05$,

** $p < .01$,

*** $p < .001$ compared to chance (.50)

Table 4.

Means (SDs) of Individual Difference Measures by Age Group

	4/5 Years (n = 45)	6/7 Years (n = 40)	8/10 Years (n = 43)	Adults (n = 43)	All Age Groups (n = 171)
IC Proportion Errors	.27 (0.20)	.12 (0.12)	.09 (0.08)	.05 (0.05)	.14 (0.15)
IC RT (secs)	2.27 (0.92)	1.95 (0.51)	1.63 (0.24)	1.21 (0.20)	1.77 (0.68)
VWM	16.93 (3.92)	20.48 (4.32)	25.19 (3.90)	28.95 (4.66)	22.86 (6.23)

Note. IC = Inhibitory control; RT = reaction time per trial in seconds; VWM = verbal working memory.

Table 5.

Bivariate Correlations Among Key Variables

	Nice Valence Stability	Mean Valence Stability	Age	WM	IC Errors	IC RT
Nice Valence Stability	1					
Mean Valence Stability	.09	1				
Age	.33***	.16*	1			
VWM	.31***	.26***	.65***	1		
IC Errors	−.24**	−.25***	− 42***	−.57***	1	
IC RT	−.28***	−.26***	−.54***	−.47***	.21**	1

Note.

* < .05,

** < .01,

*** < 001.

IC = Inhibitory control; RT = reaction time in seconds; VWM = verbal working memory