DOI: 10.1111/cdev.14052

EMPIRICAL ARTICLE

CHILD DEVELOPMENT

# Am I a good person? Academic correlates of explicit and implicit self-esteem during early childhood

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**Funding information**
Bezos Family Foundation; Deirdre & Fraser Black; Division of Human Resource Development, Grant/Award Number: HRD-1661285; Hrvatska Zaklada za Znanost, Grant/Award Number: PZS-2019-02-9814; Overdeck Family Foundation; SBE Office of Multidisciplinary Activities, Grant/Award Number: SMA-1640889

**Abstract**
Implicit and explicit self-esteem are not commonly measured in the same children. Using a cross-sectional design, data from 354 Croatian children (184 girls) in Grade 1 ($M_{age}$ = 7.55 years) and Grade 5 ($M_{age}$ = 11.58 years) were collected in Spring 2019. All children completed explicit and implicit self-esteem measures; math and language grades were obtained. For the explicit measure, older children showed lower self-esteem than younger children, and girls showed lower self-esteem than boys. For the implicit measure, there were no age effects, and girls showed higher self-esteem than boys. Although both types of self-esteem were positively associated with academic achievement, implicit self-esteem was associated more strongly with language than with math achievement. Discussion is provided about why self-esteem relates to academic achievement during childhood.

**KEYWORDS**
gender differences, implicit and explicit attitudes, school achievement, self-esteem

Psychological theorists have characterized self-esteem as an essential ingredient of personality in both adults and in children. In social psychology studies with adults, measures of explicit and implicit self-esteem have been found to be only weakly correlated, and they are widely considered differentiable constructs with unique behavioral correlates (e.g., Greenwald & Farnham, 2000). In adults, explicit and implicit self-esteem are both predictive of positive behavioral outcomes, but they do not always predict the same outcomes as each other (Krause et al., 2016; Murray et al., 2000). Whether, and to what extent, explicit and implicit self-esteem may relate to different behaviors during childhood is understudied, especially with respect to educational outcomes. In this cross-sectional study, we assess both explicit and implicit self-esteem in one group of children at the start of formal schooling (Grade 1), and in another group as they transition to middle school (Grade 5). This design allowed us to evaluate age-related differences, differences between girls and boys, and the relations of both measures of self-esteem to behavioral outcomes—measures of school achievement.

## Conceptualizing explicit and implicit self-esteem

In general, explicit self-esteem is defined as a conscious, self-reflective feeling of self-liking, self-worth,

**Abbreviations:** IAT, Implicit Association Test; SPPC, Self-Perception Profile for Children.

and acceptance (Zeigler-Hill, 2006). Nonetheless, there are multiple characterizations of explicit self-esteem in the literature, ranging from relatively simple conceptions such as a positive attitude toward oneself (Rosenberg, 1965) to multifaceted evaluative schemas involving dimensional comparisons (Wylie, 1979; see Cvencek & Greenwald, 2020, for a review). Such conceptual variability may be due at least partly to how explicit self-esteem is measured. In the most widely used explicit self-esteem measures, respondents are explicitly asked to make introspective judgments about their global worth as a person.

In contrast, implicit self-esteem has been defined as "the association of the concept of self with a valence" (Greenwald et al., 2002), a global self-evaluation that may lie outside of awareness and introspective access and can be indexed by a speeded sorting task measuring association strengths between mental categories such as "self" and "good" (Greenwald et al., 2003). It has been suggested that differences between explicit and implicit self-esteem may draw on differences in the nature of people's explicit and implicit belief systems—a distinction that is sometimes referred to as "dual-process" theory (Kahneman, 2011; Strack & Deutsch, 2004). Explicit self-esteem is theorized to tap into slow, reflective, introspective processes; in contrast, implicit self-esteem is thought to tap fast, intuitive processing that draws on individuals' patterns of associative structures and affective experiences (Cvencek, Meltzoff, et al., 2021; Gawronski et al., 2006; Greenwald & Banaji, 2017). Some social psychologists have theorized that implicit and explicit constructs differ in their degree of conscious availability. For some attitudes and beliefs, people lack conscious awareness of the original sources of those learned attitudes or beliefs (e.g., early, preverbal parent–child relationships). Implicit measures are theorized to reflect evaluations arising from cognitions or experiences for which people lack awareness (Gawronski et al., 2006; Rudman et al., 2007). We acknowledge that there is a debate in the literature about whether explicit and implicit self-esteem should be thought of as relatively independent or whether they are more overlapping and interdependent in nature (Stieger et al., 2017), and to what degree implicitly measured constructs may be considered to operate "unconsciously" (e.g., Gawronski et al., 2006; Greenwald & Banaji, 2017).

Recognizing this debate within contemporary social psychology, Greenwald and Lai (2020) urged that research can and should continue using multiple methods, for example, using both explicit self-reports in parallel with measures tapping implicit beliefs and attitudes (e.g., the Implicit Association Test, IAT, Greenwald et al., 1998, or evaluative priming, Fazio et al., 1986). The goal of such research would be to help build up a more comprehensive accounting about how well different measures correlate to each other and the degree to which they predict differential behavior. We designed this study not to resolve the debate about (potential) differences or similarities in underlying mental processes, but to add to the database using *both* widely accepted explicit and implicit self-esteem measures in the same children, in addition to behavioral measures of academic outcomes.

## Age and gender differences in self-esteem

The potential conceptual distinction between explicit and implicit self-esteem is particularly relevant to the questions in developmental psychology because there are some mixed data as to how they relate to each other with regard to age differences and gender differences. Measuring explicit and implicit self-esteem *in the same children* may help toward shedding light on some of these issues.

Cross-sectional studies have traditionally reported that children's *explicit* self-esteem is generally high during early childhood (Harter, 2006) and lower in adolescence (Bleidorn et al., 2016). A more recent meta-analysis of 331 independent longitudinal samples showed that children's generally high self-esteem remains constant into adolescence and then increases in young adulthood (Orth et al., 2018). Detailed examinations of *implicit* self-esteem across childhood are scarce, but the few available studies report no age-related differences in implicit self-esteem between early childhood and adolescence using either cross-sectional (Cvencek et al., 2016; Dunham et al., 2007) or longitudinal designs (Cvencek et al., 2020; Leeuwis et al., 2015; van Tuijl et al., 2014).

There has been interest in exploring possible patterns of gender differences between explicit and implicit self-esteem. Regarding explicit self-esteem, it has been reported in some studies using cross-sectional methods that both boys and girls display positive explicit self-esteem during elementary school, but that girls in early adolescence begin to report lower explicit self-esteem than boys (Robins & Trzesniewski, 2005). A comprehensive review of studies using longitudinal methods reported that mean levels of explicit self-esteem do not significantly differ by gender (Orth et al., 2018). Regarding implicit self-esteem, there are, to date, no reported gender differences in *implicit* self-esteem between boys and girls during early childhood or adolescence in either cross-sectional (Cvencek et al., 2018; Dunham et al., 2007) or longitudinal research (Cvencek et al., 2020; Leeuwis et al., 2015; van Tuijl et al., 2014).

## Self-esteem as a predictor of positive functioning

Both explicit and implicit self-esteem are predictive of positive behavioral outcomes in adults. In adults, *explicit* self-esteem is predictive of success in several important domains, including work (Kuster et al., 2013), interpersonal relationships (Murray et al., 2000), and

mental health (Sowislo & Orth, 2013). In adults, *implicit* self-esteem is associated with positive nonverbal behavior during a conflict interaction with a romantic partner (Peterson & DeHart, 2013), self-confident and outgoing behaviors (Krause et al., 2016), as well as increased neural signals in reward-related regions of the brain (Izuma et al., 2018). Moreover, in adults, explicit and implicit self-esteem are also reported to predict *different aspects* of the same outcome, especially in the domain of "holistic evaluation of one's life." For example, in one study, explicit self-esteem was significantly associated with "subjective well-being," whereas the interaction between explicit and implicit self-esteem was related to "life satisfaction" (Zhang et al., 2020). Taken together, this pattern of findings suggests that in some instances explicit and implicit self-esteem predict different aspects of adult positive functioning. Little is known about the relation between explicit and implicit self-esteem in young children, especially for important outcomes in their lives, such as measures of academic achievement.

## Children's self-esteem and academic achievement

Academic success is often considered one of the central predictors and indicators of positive functioning during childhood (Suldo et al., 2006). Children's achievement in math and reading significantly predicts: (a) future achievement and learning (Duncan et al., 2007), (b) reliably holding down a future job (Masten et al., 2010), and (c) occupational prestige (Magnusson & Nermo, 2018).

### Children's explicit self-esteem and academic achievement

Researchers have argued that the relation between explicit self-esteem and academic achievement is bidirectional; explicit self-views may be shaped by achievement as much as achievement is shaped by explicit self-views (e.g., Marsh & Craven, 2006). During elementary school-years, research shows that explicit self-esteem relates to both math and language achievement, with some studies showing that relations to math and language achievement are similar in magnitude (Davies & Brember, 1999), and other studies show stronger relations to math than to language achievement (Metsäpelto et al., 2020). Research with middle and high school students also documents linkages between explicit self-esteem and academic achievement. For example, a meta-analysis of 60 longitudinal studies ($N > 50{,}000$; $k = 282$) found that the relation between explicit self-esteem and multiple indices of academic achievement (standardized scores and school grades) was significantly positive (Valentine et al., 2004). Longitudinal research additionally suggests that these positive relations between self-esteem and educational attainment are likely bidirectional (Marsh & O'Mara, 2008). Positive self-views tapped by explicit measures have also been found to be beneficial for students dealing with anxiety following failure or negative feedback (e.g., Dodgson & Wood, 1998).

### Children's implicit self-esteem and academic achievement

Implicit measures of self-esteem have been developed for use with children as young as preschool, making it possible to examine students' self-esteem at the start of elementary school (Cvencek et al., 2016). These implicit self-esteem measures have been shown to be linked to academic achievement (as measured by school grades) in Grades K–2 over and above what could be explained from explicit academic self-concept measures (Cvencek et al., 2018). It has been theorized that, at the start of formal education, students' self-esteem—how positively they feel about themselves—may be a substrate or mechanism that helps students deal with educational failures, take educational risks in learning new things, and overcome challenges in school (Cvencek et al., 2018; Cvencek & Meltzoff, 2015; see also Kamins & Dweck, 1999).

## Current study

The current study was designed to increase our understanding of children's developing explicit and implicit self-esteem by measuring both in the same children. We also chose to conduct this study outside of a North American context, specifically in Croatia, in line with calls to broaden sampling in child research (Nielsen et al., 2017). We selected Croatia for two chief reasons. First, in the Croatian educational system, children's grades from their teachers carry high-stakes implications for students, such as assignment to different classroom tracks. Second, Croatia has recently developed a standard grading system for evaluating student achievement in all its schools (Bušljeta & Kardum, 2019). This nation-wide uniformity allows for more consistent interpretation of students' performance (compared to, for example, the U.S.A., in which different regions and districts can have different grading frameworks).

In this study, we examined explicit and implicit self-esteem in relation to a measurable index of early student achievement, namely school grades in math and language. We focused on school grades in math and language because: (a) math and language education are mandated from Grade 1 onward across most countries, including Croatia, and (b) early math and language

achievement are the most significant predictors of future academic achievement (Duncan et al., 2007).

School grades were used as indicators of academic achievement because they offer several advantages at the ages tested. First, grades from official school records have been shown to be predictive of future school achievement (Arens et al., 2017). Second, grades are salient indicators to children of their own academic performance, which can be easily compared with that of other children in their class (Arens et al., 2017). Third, school grades take into account children's behavior, effort, and other factors involved with learning (McMillan et al., 2002). Fourth, even though we are not assessing gender stereotypes directly, the use of grades as a measure of school achievement has theoretical implications for our understanding of stereotypes as described in the Discussion.

The current study is best classified as exploratory in nature because the extant data do not allow firm predictions, and we did not preregister the study. Nonetheless, we examined three main hypotheses derived from prior literature, which itself contained mixed evidence. First, we hypothesized that mean levels of explicit self-esteem would be lower in Grade 5 than in Grade 1, while mean levels of implicit self-esteem would be stable or vary across ages to a small degree. Second, we hypothesized that gender differences showing higher self-esteem in boys than girls would be evident on explicit measures. Third, because explicit and implicit self-esteem are theorized to be conceptually differentiable from one another, and both have been shown to relate to academic achievement in elementary school, we hypothesized that each measure of self-esteem would relate positively to academic achievement. Finally, we also examined, in exploratory fashion, whether the magnitude of such expected positive relations would vary by the achievement domain (math and language).

This study makes four novel contributions to the literature. First, it advances our understanding of explicit and implicit self-esteem in childhood by measuring them both in the same children and in two different age groups (Grade 1: approximately 7.5 years of age; and Grade 5: approximately 11.5 years of age). Second, we systematically examine whether implicit self-esteem reveals the same gender differences (favoring boys) as explicit self-esteem measures do. Third, by relating both explicit and implicit self-esteem to measures of academic achievement, we examine whether implicit and explicit self-esteem exhibit differentiated relations to academic achievement. Fourth, because reading and math achievement have been gender-stereotyped (i.e., "reading is for girls" and "math is for boys"), examining both types of achievement in relation to children's self-esteem will increase our understanding of how self-esteem may relate children's academic achievement in gender-stereotypical ways during the time when such stereotypes are just forming.

# METHOD

## Participants

With the help of the Croatian Ministry of Education, we contacted eight elementary schools. Participating schools were located in the Zagreb Greater Metropolitan Area, primarily in the city of Zagreb, Croatia, as well as in nearby municipalities. All children were in either Grade 1 or Grade 5 and came primarily from Croatian working- and middle-class families (89%). This socioeconomic status characterization was derived by using the official guidelines that the Croatian National Population Statistics Directorate uses to define "working class" and "middle class." These national classifications were determined for each of the schools by combining: (a) parental employment (percentage of families who are above the classification of "very low employment rate") and (b) family income data (percentage of families who are above the classification of "material and social deprivation").

According to school records, 94% of the students in the sample were ethnically Croatian (with the remaining 6% including Serbian, Bosnian, and Roma ethnic minorities), and all spoke Croatian as their first language. In line with other recent research in Croatian schools (e.g., Kim & Burić, 2020), families were not required to provide race information about their children inasmuch as Croatians are mainly homogeneous (i.e., European White), and this information is not collected by the Croatian national census. Across the eight schools, 540 parents received permission forms, and parents of 376 students (190 girls) agreed to have their child participate in the study. Specifically, 186 child participants were in Grade 1 (96 girls) with mean age 7.53 years (SD = 0.35), and 190 were in Grade 5 (94 girls) with mean age 11.54 years (SD = 0.59). All research procedures were approved by the Croatian Institute of Medical Research Ethics Committee.

## Materials and procedure

Researchers were provided with a quiet room on school premises where students were tested individually using a 25-cm tablet, consistent with other tablet-administered implicit and explicit measures with children (Cvencek, Brečić, et al., 2021). Students were given verbal instructions before and during the test. This included introducing students to the sorting tasks (implicit measure) and the questionnaire (explicit measure) about their feelings toward themselves. The testing took place in the 2018–2019 academic school year, between March 5 and May 7, 2019 (i.e., prior to the COVID-19 pandemic). All school grades were final grades from the 2018–2019 academic school year.

## Explicit self-esteem measure

We used the global self-worth scale from Harter's (1982, 2012) Self-Perception Profile for Children (SPPC) to measure explicit self-esteem. The SPPC is the most widely used and well-validated explicit self-esteem measure for children in the age range tested (Donnellan et al., 2015). The six items of the SPPC are designed to assess children's general feelings of self-worth. In each item, children are presented with a statement with two opposing views (e.g., "Some kids are very happy being the way they are BUT other kids wish they were different"). Children are then prompted to select which statement they feel is "more true" for themselves. In the original scoring system, ratings are done on a 4-point scale ranging from 1 to 4. The scale score of 4 represents the most positive self-judgment and 1 represents the most negative self-judgment. The SPPC has shown acceptable reliability levels (.78–.84) with children in Grades 3–6 (e.g., Harter, 2012); in our (younger) sample, Cronbach's α was estimated at .54 for Grade 1, and .75 for Grade 5. Closer inspection of these data showed significant left skew and leptokurtosis, particularly for Grade 1 (i.e., most children scored an average of 4), and measurement invariance testing using confirmatory factor analyses in the lavaan package for *R* (Rosseel, 2012) indicated that the item-factor relations significantly differed for Grade 1 compared with Grade 5, $\chi^2(5) = 12.90$, $p = .024$. Given that each of the individual item scores were left-skewed, we dichotomized the items such that the original code of 4 = 1 (i.e., when the child responded to each positively worded statement with "really true for me"), and any other response was coded 0. The total scores of the recoded set of six items now ranged from 0 to 6 points, and this simplified scoring yielded a substantially less skewed distribution (with no excess kurtosis) and improved reliability for both grade levels (Cronbach's alpha estimated at .69 for Grade 1 and .82 for Grade 5). Moreover, the item-factor loadings no longer significantly differed based on grade level in confirmatory factor analyses, $\chi^2(5) = 6.40$, $p = .270$. Our statistical models (see Results) are therefore based on the recoded (simplified) explicit self-esteem total score; this said, model estimates using the original SPPC coding were substantively the same.

## Implicit self-esteem measure

Implicit self-esteem was assessed using the child-friendly version of the IAT validated by Cvencek et al. (2016) (This is similar to a child adaptation of the IAT reported by Dunham et al., 2007, but with some methodological refinements; see Cvencek et al., 2016; Cvencek, Greenwald, et al., 2011). The Child IAT involves children sorting exemplars from four categories, which are displayed in the middle of the screen, by pressing two response keys. The Child IAT is based on the assumption that children will be faster to respond when the categories sharing response keys are more strongly associated in the children's mind. To illustrate: If the categories *ice cream* and *good* were paired with each other on one response key, and the categories *insects* and *bad* were paired with each other on the other response key, children would be predicted to respond quickly because those pairings are already linked in the child's mind ("congruent pairing"). If the pairings were reversed, so that *insects* and *good* were paired with each other, and *ice cream* and *bad* were paired ("incongruent pairing"), children would be predicted to respond more slowly because those pairings are not already linked in their mind.

The implicit measure of self-esteem provided by the Child IAT assesses the linkages between "self" and emotional valence (i.e., *self* = *good* or *self* = *bad*). The four categories used in this IAT were *self*, *other*, *good*, and *bad*. The exemplars for *self* and *other* were: *self* = I, me, my, myself; *other* = other, theirs, them, they. The exemplars for *good* and *bad* were: *good* = friendly, good, happy, nice, smart; *bad* = awful, bad, mad, mean, naughty. In the congruent pairing, children were instructed to respond as quickly as possible to *self* and *good* using one of the response keys, and to respond to *other* and *bad* using the other response key. In the incongruent pairing, children were instructed to respond as quickly as possible to *self* and *bad* using one of the responses keys, and to respond to *other* and *good* using the other response key. Following the procedures described in Cvencek et al. (2016), all exemplars used in the Child IATs were presented simultaneously as text and audio recordings.

The IAT *D*-score algorithm (Greenwald et al., 2003) was used such that positive scores indicated *self* = *good* (maximum: +2) and negative scores indicated *self* = *bad* (minimum: −2). Equal response times to *self* = *good* and *self* = *bad* tasks were indicated by the score of zero. The Child IAT showed satisfactory internal consistency, Cronbach's $\alpha = .71$ (Grade 1 Cronbach's $\alpha = .72$; Grade 5 Cronbach's $\alpha = .68$). Details of preliminary analyses can be found in the Supporting Information (Section S1.1).

## Math and language achievement

Achievement in math and language were obtained in the form of end-of-year grades from official school records for all participating children. In the Croatian grading system—which is used in all schools across the country—children's achievement in each subject is rated on a 5-point scale, with 1 = *insufficient*, 2 = *sufficient*, 3 = *good*, 4 = *very good*, and 5 = *excellent*. In addition to examining math achievement separately from language achievement, we also created an index of *average academic achievement* by taking the average of students' math and language grades ([math + language]/2) to capture individual differences in overall academic achievement.

## Data exclusion criteria

Following the procedure described in Cvencek, Meltzoff, et al. (2011) and Cvencek et al. (2016), three standard exclusion criteria were used. Meeting any one of the criteria resulted in the exclusion of all the child's data, because it suggested that children either may not have understood the instructions or may not have concentrated enough on the Child IAT task. The three exclusion criteria were: (a) responding in under 300 ms on more than 10% of the trials, (b) having a mean response time greater than 3 SDs above the sample mean response time, and (c) making errors on more than 35% of the trials. Application of these criteria excluded 22 children from the sample, leaving $N = 354$ (184 girls) with valid data for analyses (the "analytic sample").

## Data analysis plan

### Multilevel approach

To test our hypotheses, we used multilevel regression analyses using the *R* lme4 and lmerTest packages (Bates et al., 2015; Kuznetsova et al., 2017). The multilevel approach offers two advantages over other modeling choices. First, it decomposes lower-level effects into separate variance components between and within classrooms, which is useful because observed relations between variables can differ at different levels. Second, it enables the predictor effects to be tested with (a) correct degrees of freedom and (b) at their appropriate levels. As is standard practice (Luo et al., 2021), intercept-only models were specified before formal analyses began in order to confirm the appropriate multilevel structure by assessing the degree of non-independence in children's scores due to their classrooms and schools. With respect to measures of *self-esteem*, we used 3-level models (types of self-esteem cannot be combined into one model together, because they were measured on different scales): intercept-only models revealed that classrooms ($N = 31$) explained 6% of the variance in children's implicit self-esteem scores and 17% of the variance in children's explicit self-esteem scores, whereas schools ($N = 8$) did not explain variance in self-esteem. With respect to measures of *achievement*, we used a 4-level model with both achievement scores at Level 1 (math and language were measured on the same scale). The intercept-only achievement model showed that children ($N = 354$) explained 43% of the variability in achievement scores, classrooms ($N = 31$) and schools ($N = 8$) explained 18% and 1% of variance in achievement, respectively.

Significance was determined using an alpha of .05, two-tailed, for all analyses (observed *p*-values are reported in tables). Given our use of predictor mean-centering, the model intercepts were estimates of the conditional dependent variable means. Specifically, we effect-coded type of achievement (1 = math, measure level), child gender (girls = 1, student level), and grade level (Grade 5 = 1, classroom level), and we *z*-scored continuous predictors (cluster-mean centering used for lower-level predictors). To follow-up significant interactions, we decomposed the data to test for simple effects. Further useful information and details about the multilevel analyses can be found in the Supporting Information (Section S2).

# RESULTS

## Self-esteem

The raw, unadjusted means are presented descriptively in Table 1; Table 2 provides model-based

**TABLE 1** Descriptive statistics and zero-order correlations among all measures separately for boys and girls.

| | Boys ($n = 170$) | | Girls ($n = 184$) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variable** | ***M*** | **SD** | ***M*** | **SD** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
| 1. Explicit self-esteem | 4.64 | 1.70 | 4.22 | 1.99 | — | **.16** | **.29** | **.18** | **−.38** | **.50** | **.89** | .04 | **.16** |
| 2. Implicit self-esteem | 0.24 | 0.36 | 0.33 | 0.33 | −.03 | — | .07 | **.20** | .01 | .06 | **.16** | **.39** | **.93** |
| 3. Math achievement | 4.48 | 0.78 | 4.43 | 0.83 | **.35** | −.01 | — | **.66** | **−.36** | **.27** | **.19** | .01 | .07 |
| 4. Language achievement | 4.54 | 0.66 | 4.58 | 0.67 | **.21** | .09 | **.62** | — | **−.22** | .16 | .12 | .10 | **.18** |
| 5. Grade (1 = Grade 5) | 0.55 | 0.50 | 0.51 | 0.50 | **−.27** | .15 | **−.40** | **−.32** | — | **−.72** | −.05 | .08 | −.03 |
| 6. Exp S-E classroom aggregate | 4.46 | 0.90 | 4.39 | 0.92 | **.47** | −.07 | **.34** | **.28** | **−.60** | — | .04 | .05 | .04 |
| 7. Exp S-E within-classroom (student) | 0.18 | 1.50 | −0.17 | 1.73 | **.85** | .02 | .19 | .07 | .05 | −.06 | — | .02 | **.16** |
| 8. Imp S-E classroom aggregate | 0.29 | 0.14 | 0.29 | 0.12 | −.08 | **.36** | **−.17** | .02 | **.31** | −.12 | −.02 | — | .01 |
| 9. Imp S-E within-classroom (student) | −0.04 | 0.34 | 0.04 | 0.30 | .00 | **.93** | .06 | .09 | .04 | −.03 | .02 | −.02 | — |

*Note*: $N = 354$ students (167 Grade 1), 31 classrooms (14 Grade 1), and 8 schools (all except one with Grades 1 and 5). Pearson's *r* reported. Possible scores for the explicit self-esteem measures range from 0 to 6; possible scores for the implicit self-esteem measures range from −2 to +2; and possible achievement scores range on a scale from 1 to 5. Correlations for girls are presented above the diagonal. Correlations for boys are presented below the diagonal. Bold font indicates significant value at $p < .05$, two-tailed level.

Abbreviations: Exp S-E, explicit self-esteem; Imp S-E, implicit self-esteem.

**TABLE 2** Multilevel model results predicting self-esteem.

| | Explicit self-esteem | | | | | | Implicit self-esteem | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fixed effects** | **Coeff** | **SE** | ***t*** | **(df)** | ***p*** | ***d**** | **Coeff** | **SE** | ***t*** | **(df)** | ***p*** | ***d**** |
| Intercept (mean self-esteem) | **4.48** | **.18** | **25.57** | **(6)** | **<.001** | **9.04** | **0.28** | **.02** | **12.39** | **(28)** | **<.001** | **4.39** |
| Grade (+1 = Grade 5, −1 = Grade 1) | **−0.67** | **.11** | **−6.25** | **(22)** | **<.001** | **−1.12** | 0.03 | .02 | 1.20 | (28) | .239 | 0.22 |
| Gender (+1 = girls, −1 = boys) | **−0.20** | **.09** | **−2.16** | **(349)** | **.032** | **−0.11** | **0.04** | **.02** | **2.45** | **(352)** | **.015** | **0.13** |
| Grade × gender | −0.11 | .09 | −1.15 | (350) | .252 | −0.06 | −0.02 | .02 | −1.15 | (352) | .252 | −0.06 |

*Note*: $N = 354$ students (167 Grade 1), 31 classrooms (14 Grade 1), and 8 schools (all except one with Grades 1 and 5); three-level models conducted using *R* lme4/lmerTest packages; estimates based on full information maximum likelihood; *t*-tests based on Satterthwaite degrees of freedom (rounded to nearest whole number). *d** = approximate Cohen's *d* equaling the coefficient divided by the approximate pooled SD. Bold font indicates statistical significance at $p < .05$.

estimates. Figures 1 and 2 summarize the key results of the 3-level models for the explicit and implicit self-esteem measures separately by grade level (Figure 1) and by gender (Figure 2). In these figures, as well as in Figure 3, model-implied (predicted) values were plotted to account for dependencies in scores due to classrooms and schools.

As can be seen in Table 2, both explicit and implicit self-esteem means (intercepts) were significantly different from zero in the positive direction. As shown in Row 1, explicit self-esteem was predicted to average 4.48 points (SE = .18), $p < .001$, and implicit self-esteem was predicted to average 0.28 points (SE = .02), $p < .001$, controlling for grade level, gender, classroom, and school (see Supporting Information, Section S2.2 for further details about interpreting the multilevel regression results). In line with the first hypothesis, and as shown in Table 2 (Row 2), Grade 5 students were estimated to be −0.67 points lower than average on explicit self-esteem (which translates to −1.34 points lower than Grade 1 students), $p < .001$, $d = -1.12$, and they did not significantly differ on implicit self-esteem, $p = .239$. Supporting the second hypothesis, and as shown in Table 2, Row 3, girls were estimated to be −0.20 points lower than the average on explicit self-esteem (which translates to −0.40 points lower than boys), $p = .032$, $d = -0.11$, but 0.04 points higher than the average on implicit self-esteem (0.08 points higher than boys), $p = .015$, $d = 0.13$. No interactions between grade and gender were detected, $ps = .252$, for either explicit and implicit self-esteem, and the approximate $R^2$s were 15% and 5% for explicit and implicit self-esteem models, respectively.

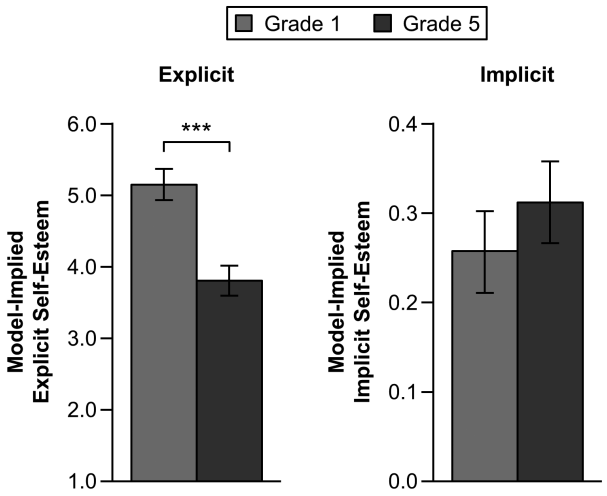


**FIGURE 1** Explicit and implicit self-esteem by grade level. Means for model-implied explicit and implicit self-esteem, split by grade level. Higher scores on explicit and implicit self-esteem indicate higher self-esteem. Brackets indicate significant grade level differences. Error bars indicate ±1 SE. ***$p < .001$.

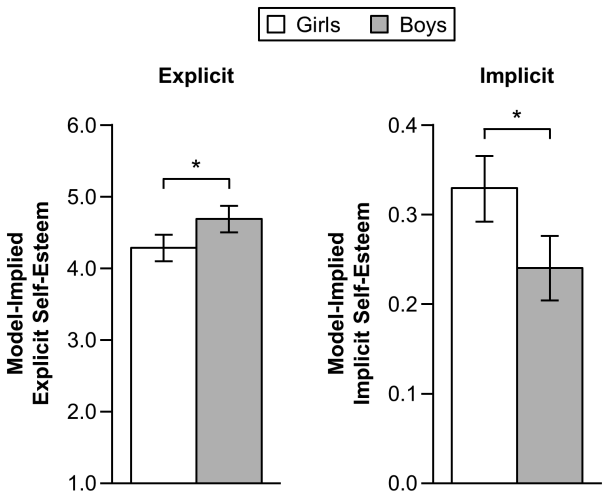


**FIGURE 2** Explicit and implicit self-esteem by gender. Means for model-implied explicit and implicit self-esteem, split by gender. Higher scores on explicit and implicit self-esteem indicate higher self-esteem. Brackets indicate significant gender differences. Error bars indicate ±1 SE. *$p < .05$.

## Math and language achievement

Results bearing on the third hypothesis are given in Table 3, which reports results from the 4-level model predicting achievement (Level 1) within children (Level 2), classrooms (Level 3), and schools (Level 4), using type of achievement (math vs. language), implicit self-esteem, explicit self-esteem, grade level (Grade 5 vs. 1), child gender (girl vs. boy), and their interactions as fixed effects. As

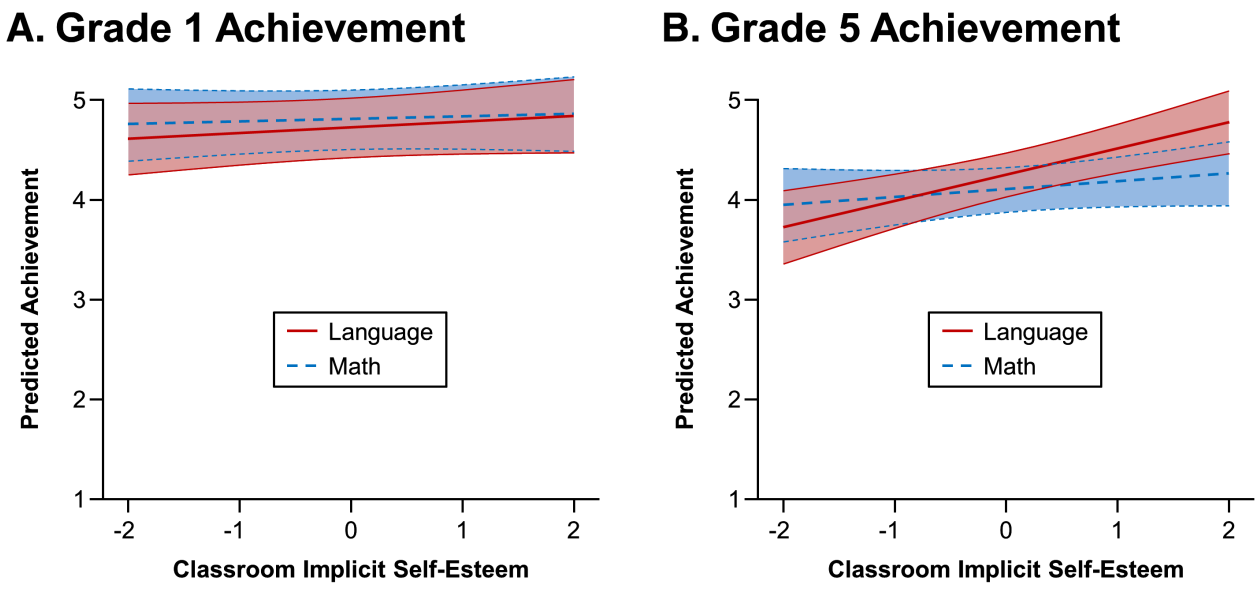


**FIGURE 3** Model-predicted relations between type of achievement and classroom-level implicit self-esteem by grade level. Model-predicted relations between classroom-level implicit self-esteem and language (red) and math (blue) achievement for Grade 1 and Grade 5 shown. Shaded regions indicate 95% confidence intervals. The implicit self-esteem–language achievement relation was significant for Grade 5 ($p = .050$); no other slopes were significant ($ps > .05$).

can be seen, there were significant positive main effects of child-level explicit self-esteem (0.09-point increase in mean achievement predicted for each standard deviation increase in explicit self-esteem, $p = .026$) and implicit self-esteem (0.07-point increase in mean achievement predicted per standard deviation increase in implicit self-esteem, $p = .031$), both with $ds = 0.12$. There was also a significant negative main effect of grade level on mean achievement (Grade 5 classrooms had children who were −0.60 [2 × −0.30] points lower on average than Grade 1 classrooms, $p < .001$, $d = -0.82$).

The explicit child self-esteem and grade-level main effects, however, were qualified by a significant interaction: The positive effect of children's explicit self-esteem on their achievement was greater for older children (Grade 5) compared with younger children (Grade 1) by 0.09 × 2 = 0.18 points ($p = .028$, $d = 0.12$). Another way to interpret this finding is that the grade level difference in achievement (i.e., lower achievement in Grade 5 relative to Grade 1) was lower for children with higher explicit self-esteem.

Interestingly, there was also a significant main effect of *classroom* aggregate implicit self-esteem on achievement showing that, for each standard deviation increase in classroom implicit self-esteem, children's average achievement was predicted to increase by 0.11 points, $p = .006$, $d = 0.50$. Furthermore, there was a significant two-way interaction between type of achievement and classroom-aggregate implicit self-esteem ($p = .004$, $d = -0.11$) and a significant three-way interaction between type of achievement and classroom-aggregate implicit self-esteem and grade level ($p = .036$, $d = -0.08$). To understand the nature of these interactions, we plotted model-predicted values. As illustrated in Figure 3b, children in Grade 5 classrooms with higher implicit self-esteem appeared to have relatively higher language achievement, but this relation was flat for math achievement. In contrast, for children in Grade 1 (Figure 3a), there appeared to be no relation between classroom-level implicit self-esteem and either type of achievement measure. To confirm these observations, we separated the data by achievement type and grade level and re-specified the models (dropping achievement type and grade level effects) and found that the positive relation between classroom aggregate implicit self-esteem and achievement for Grade 5 was only significant for language, Coeff = 0.14 (SE = .07), $p = .050$, $d = 0.36$, but not for math ($p = .288$); there were no significant effects of classroom-level implicit self-esteem for Grade 1 language or math achievement, $ps = .370$ and .970, respectively.

Finally, we note that although we found significant differences between girls and boys on their *mean* levels of both implicit and explicit self-esteem (see Figure 2), we found no significant evidence (i.e., no interactions) that the relations between the two types of self-esteem and achievement differed by gender (all $ps > .05$; see Table 3). Both implicit and explicit self-esteem measures had significant positive effects on achievement, but the effects were qualified by grade level, not gender.

## DISCUSSION

The present study investigated how explicit and implicit self-esteem may differ for girls and boys at two different

**TABLE 3** Multilevel model results predicting achievement.

| Fixed effects | Coeff | SE | *t* | (*df*) | *p* | *d** |
|---|---|---|---|---|---|---|
| Intercept (mean achievement) | **4.47** | **.11** | **40.24** | **(12)** | **<.001** | **14.23** |
| Ach type (1 = math, −1 = language) | −0.01 | .03 | −0.47 | (354) | .642 | −0.02 |
| Grade (+1 = Grade 5, −1 = Grade 1) | **−0.30** | **.06** | **−4.54** | **(349)** | **<.001** | **−0.82** |
| Gender (+1 = girls, −1 = boys) | 0.02 | .06 | 0.34 | (346) | .736 | 0.02 |
| Ach type × grade | −0.06 | .03 | −1.82 | (354) | .070 | −0.07 |
| Ach type × gender | 0.01 | .03 | 0.23 | (354) | .821 | 0.01 |
| Grade × gender | 0.02 | .06 | 0.32 | (347) | .747 | 0.02 |
| Ach type × grade × gender | −0.03 | .03 | −1.00 | (354) | .319 | −0.04 |
| Explicit self-esteem | | | | | | |
| Classroom S-E (*z*) | −0.04 | .08 | −0.47 | (351) | .638 | −0.08 |
| Ach type × classroom S-E | 0.00 | .04 | 0.05 | (354) | .961 | 0.00 |
| Grade × classroom S-E | 0.01 | .08 | 0.10 | (344) | .921 | 0.02 |
| Gender × classroom S-E | −0.04 | .07 | −0.56 | (346) | .573 | −0.03 |
| Ach type × grade × classroom S-E | 0.04 | .04 | 0.98 | (354) | .328 | 0.04 |
| Ach type × gender × classroom S-E | −0.02 | .04 | −0.62 | (354) | .537 | −0.02 |
| Grade × gender × classroom S-E | 0.01 | .07 | 0.13 | (346) | .895 | 0.01 |
| Ach type × grade × gender × classroom S-E | 0.04 | .04 | 0.94 | (354) | .347 | 0.04 |
| Student S-E (*z*) | **0.09** | **.04** | **2.23** | **(345)** | **.026** | **0.12** |
| Ach type × student S-E | 0.04 | .02 | 1.94 | (354) | .053 | 0.07 |
| Grade × student S-E | **0.09** | **.04** | **2.20** | **(345)** | **.028** | **0.12** |
| Gender × student S-E | 0.02 | .04 | 0.49 | (348) | .627 | 0.03 |
| Ach type × grade × student S-E | 0.04 | .02 | 1.80 | (354) | .072 | 0.07 |
| Ach type × gender × student S-E | −0.01 | .02 | −0.41 | (354) | .685 | −0.02 |
| Grade × gender × student S-E | −0.05 | .04 | −1.37 | (348) | .171 | −0.07 |
| Ach type × grade × gender × student S-E | 0.01 | .02 | 0.48 | (354) | .629 | 0.02 |
| Implicit self-esteem | | | | | | |
| Classroom S-E (*z*) | **0.11** | **.04** | **2.77** | **(350)** | **.006** | **0.50** |
| Ach type × classroom S-E | **−0.05** | **.02** | **−2.91** | **(354)** | **.004** | **−0.11** |
| Grade × classroom S-E | 0.06 | .04 | 1.71 | (354) | .088 | 0.31 |
| Gender × classroom S-E | 0.02 | .03 | 0.54 | (347) | .592 | 0.03 |
| Ach type × grade × classroom S-E | **−0.04** | **.02** | **−2.10** | **(354)** | **.036** | **−0.08** |
| Ach type × gender × classroom S-E | 0.01 | .02 | 0.74 | (354) | .459 | 0.03 |
| Grade × gender × classroom S-E | 0.00 | .04 | 0.03 | (347) | .978 | 0.00 |
| Ach type × grade × gender × classroom S-E | 0.01 | .02 | 0.59 | (354) | .557 | 0.02 |
| Student S-E (*z*) | **0.07** | **.03** | **2.17** | **(345)** | **.031** | **0.12** |
| Ach type × student S-E | −0.02 | .02 | −1.21 | (354) | .227 | −0.05 |
| Grade × student S-E | 0.01 | .03 | 0.26 | (345) | .794 | 0.01 |
| Gender × student S-E | 0.01 | .03 | 0.30 | (345) | .764 | 0.02 |
| Ach type × grade × student S-E | 0.00 | .02 | 0.11 | (354) | .914 | 0.00 |
| Ach type × gender × student S-E | −0.02 | .02 | −0.96 | (354) | .338 | −0.04 |
| Grade × gender × student S-E | −0.01 | .03 | −0.32 | (347) | .753 | −0.02 |
| Ach type × grade × gender × student S-E | 0.02 | .02 | 1.27 | (354) | .205 | 0.05 |

*Note*: $N = 354$ students (167 Grade 1), 31 classrooms (14 Grade 1), and 8 schools (all except one with Grades 1 and 5); 4-level models conducted using *R* lme4/lmerTest packages; estimates based on full information maximum likelihood; *t*-tests based on Satterthwaite degrees of freedom (rounded to nearest whole number). *d** = approximate Cohen's *d* equaling the coefficient divided by the approximate pooled SD. Bold font indicates statistical significance at $p < .05$.
Abbreviations: Ach, achievement; S-E, self-esteem.

grade levels, and the degree to which these measures of self-esteem relate to math and language achievement. Three interesting findings emerged. First, explicit self-esteem was lower in older than younger children, as expected. Second, girls demonstrated lower explicit self-esteem, but higher implicit self-esteem than boys. Third, both measures of self-esteem were related to both math and language achievement. However, whereas explicit self-esteem was equally strongly associated with both language and math achievement, implicit

self-esteem was more strongly associated with language achievement than with math achievement. We discuss each of these findings in turn.

## Grade level differences in explicit and implicit self-esteem

Strongly positive explicit (Cimpian et al., 2017; Harris et al., 2018) and implicit self-esteem (Cvencek et al., 2016, 2018) are evident in children as young as age 5. The study reported here suggests that the two types of self-esteem may exhibit somewhat different patterns of age differences.

### Decrease across grade levels in explicit self-esteem

As expected, explicit self-esteem was more positive in Grade 1 than in Grade 5. Prior developmental research has highlighted that explicit self-esteem is generally inflated during early childhood (e.g., Brummelman et al., 2015; Harris et al., 2018). Early childhood is characterized by unrealistically positive evaluations of the self and predominantly positive feedback from adults and peers (Robins & Trzesniewski, 2005), although young children are also capable of adjusting such positive self-evaluations in flexible ways in response to failure or other contextual factors (Cimpian et al., 2017). During adolescence, explicit self-esteem has been reported to decline (Robins & Trzesniewski, 2005; but see also Orth et al., 2018). During this time, children's self-esteem is shaped by increasingly more realistic (and sometimes negative) feedback from peers and authority figures (Fenzel, 2000). Here, our findings are compatible with the findings of lower explicit self-esteem in adolescence, inasmuch as we find lower explicit self-esteem in Grade 5 (11.5 years of age) than Grade 1 (7.5 years of age).

### No significant differences in implicit self-esteem across grades

In contrast to explicit self-esteem, *implicit* self-esteem was not significantly different between Grades 1 and 5, as expected. The divergent patterns (differences as a function age) between the implicit and explicit self-esteem may be understandable within the context of the theorized conceptual differences between the constructs and their different origins. It has been theorized that implicit processing of stimuli is predominantly shaped by a person's early learning experiences, prior to robust introspective language skills and formal educational experiences (the latter are hypothesized to play stronger roles in the explicit processing; Cvencek et al., 2016; DeHart et al., 2006; Rudman et al., 2007). Some converging work comes from reports that children's implicit attitudes about social groups (such as race) form early and may be somewhat stable across different ages (for a discussion, see Dunham et al., 2013; Olson & Dunham, 2010; Rhodes & Baron, 2019). We extend this work by showing that, at a group mean level, there are no significant differences in implicit self-esteem across two elementary school grades (Grades 1 and 5). Thus, theorizing about early attitudinal stability may not be restricted only to the attitudinal objects previously studied, but would also generalize to attitudes about the self (*me = good*), at least across the age ranges sampled here (see Cvencek et al., 2016, 2020, for further discussion about developmental factors and implicit self-esteem).

## Gender differences in explicit and implicit self-esteem

A significant body of cross-sectional literature also showed that, starting by about 13 years of age, girls demonstrate lower explicit self-esteem than boys (Robins & Trzesniewski, 2005; but see Orth et al., 2018, for longitudinal work). The current study confirmed gender differences in children's explicit self-esteem and extended previous findings by showing that this pattern is evident at least as early as Grade 5 (approximately 11.5 years old). We offer four possible accounts for lower explicit self-esteem in girls by this age. First, criticism in school can influence self-esteem: Negative evaluation of girls' (under)performance in school contexts is often attributed to lack of intellectual ability (e.g., not being good at math), whereas negative evaluations of boys' underperformance in school is more often attributed to non-intellectual aspects (e.g., lack of motivation; Dweck et al., 1978), which may contribute to girls having lower explicit self-esteem than boys. Second, starting from a young age, societal stereotypes and differential treatment of boys and girls tend to result in more support and value being placed on masculine pursuits (Cheryan & Markus, 2020), which may negatively affect girls (Rosenfield, 1999). Third, as they enter puberty, children become more aware of gender differences in body image ideals (Stojković, 2013). If girls compare unfavorably to the culturally specific ideals of beauty, they are more likely than boys to be judged negatively, which may affect explicit self-esteem (McMullin & Cairney, 2004). Fourth, gender differences in explicit self-esteem may also reflect a social desirability bias. Females are generally subject to stronger modesty norms than males are (Dalton & Ortegren, 2011); consequently, girls' self-esteem, as assessed by explicit measures, could reflect, at least to some degree, an artifactual difference caused by heightened impression management concerns (Chung & Monroe, 2003). At the same time, we note that girls' explicit self-esteem was still positively and significantly correlated with their implicit self-esteem (Table 1),

suggesting that the explicit measure is not completely reducible to social desirability concerns.

In contrast to the self-reported (explicit) self-esteem findings, girls had *higher implicit* self-esteem than boys. We can offer two ideas about this. First, young children may observe through repeated encounters that boys are disruptive in school and disciplined more often, leading to more negative evaluations of boys as a group (Beaman et al., 2006). This may be reflected in implicit measures, which can be thought of as being based on pattern detection or statistical learning from the environment (Cvencek et al., 2016; Cvencek, Greenwald, et al., 2011). Second, in addition, higher implicit self-esteem in girls is theoretically expected based on Balanced Identity Theory (Cvencek et al., 2014; Cvencek, Meltzoff, et al., 2021; Greenwald et al., 2002). The constructs of self-esteem, gender identity, and gender in-group attitudes are thought to self-organize to become mutually consistent or balanced. A girl who associates *self* with *good*, and also associates *self* with *girl*, should develop the additional association between *girl* and *good*. Previous research with 5-year-olds demonstrated that young girls have significantly stronger own-gender identity and stronger in-group gender attitudes than boys do (Cvencek et al., 2016). Thus, it fits with balanced identity predictions that girls should have higher implicit self-esteem than boys, as was found in the current study. Future research will profit from testing these ideas about gender differences in implicit self-esteem—especially by combining self-esteem measures with gender in-group and gender identity measures (as was done in Cvencek et al., 2016)—as well as by sampling diverse racial–ethnic groups (for more extensive discussion of young children's motivation to balance thoughts and feelings about self and others, see Cvencek et al., 2016; Meltzoff, 2013).

## Linking children's self-esteem and academic achievement

Our results showed that both explicit and implicit self-esteem were positively associated with school achievement (as measured by the average of math and language grades; see Table 3, Intercept). However, there were some differences between implicit and explicit self-esteem at the classroom level (see Table 3). In particular, although explicit self-esteem was similarly associated with math as it was with language achievement (see Table 3, first line under "Explicit self-esteem," showing no interaction between achievement type and classroom explicit self-esteem), implicit self-esteem was significantly more strongly associated with language achievement, relative to math achievement (see Table 3, first bold line under "Implicit self-esteem," showing an interaction between achievement type and classroom implicit self-esteem). This finding emerged from exploratory analyses, and we acknowledge that it requires replication in future preregistered studies. However, we think the patterns are of interest and potentially fit with three lines of available knowledge about parenting, children, literacy, and praise received by children.

First, it is widely believed by parents that their role in supporting their children's formal education in reading is more important than supporting their children's formal math training (Szczygieł, 2020; Wirth et al., 2023). Specifically, parents consider teaching reading to be at least partly their responsibility to do at home (often in bedtime rituals) and training in formal mathematics to be primarily the responsibility of teachers in schools (Cannon & Ginsburg, 2008). It has also been reported that most parents deem reading to be more important in their children's early schooling than math (Musun-Miller & Blevins-Knabe, 1998; Simpkins et al., 2012). One explanation offered for the importance parents placed on early reading is that children use their reading skills to learn other subjects such as history, science, and math.

Second, one way for parents to communicate to their children how important it is to learn how to read is for parents to praise children when they are reading (Segal & Martin-Chang, 2019). *Process praise* focuses on children's efforts and strategies, such as the effort through which they accomplished a certain task (e.g., "You found a good way to do it"). By contrast, *person praise* focuses on children's traits or overall worth as a person (e.g., "You're really smart at this"). Different types of praise have been associated with increases in self-esteem in children (Brummelman et al., 2014; Gunderson et al., 2013; Kamins & Dweck, 1999), but only praise directed at children's effort through which they accomplished a certain task ("process praise") in early childhood has been shown to longitudinally predict academic achievement in elementary school (Gunderson, Sorhagen, et al., 2018). This is theorized to occur via children's beliefs that intelligence can be improved through effort (Gunderson, Donnellan, et al., 2018), in part based on teacher's instructional practices (Park et al., 2016).

Third, implicit self-esteem does not involve deliberative comparisons to *other* children (explicit self-views are said to involve such comparisons; Arens et al., 2017; Metsäpelto et al., 2020). Because implicit self-esteem is more focused on feeling good about oneself (*self=good*) and parents' communications about reading are often that being good at reading is of value (*reading=good*), these two could become linked in the child's mind (Cvencek et al., 2016). We acknowledge that further research, preferably using longitudinal methods, is needed to investigate these ideas about developmental processes that may serve to link children's implicit self-esteem more to language and reading achievement.

## Broader theoretical inferences

The current pattern of findings raises two general theoretical points. The first one concerns the potential of

children's self-esteem to promote their academic achievement, and the second involves a theorized role of self-esteem in the development of gender stereotypes.

## Self-esteem and early academic achievement

The first theoretical point concerns the function of self-esteem in promoting children's academic outcomes. Some models have suggested that children's beliefs that are specific to one academic subject (e.g., math self-concepts) should be better predictors of academic achievement in that domain (math achievement) than more global feelings of self-esteem (Marsh & Craven, 2006). Data generally support these models with *middle-school and older students* (Valentine et al., 2004), but the evidence is sparse for students as young as those tested here (Lohbeck & Möller, 2017). Our results bear on this gap in the literature by suggesting a link between self-esteem and children's academic outcomes at ages younger than this previous theory had predicted (Marsh & Craven, 2006).

Why would self-esteem be linked to academic achievement at the ages tested here? We suggest that persistence is a potential psychological mechanism. We hypothesize that children's self-esteem can support their early achievement (even prior to clearly defined academic self-concepts pertaining to school subjects), because how young children feel about themselves may allow them to tolerate and profit from feedback and criticism about their academic progress. Two lines of research are relevant. First, children's self-evaluations are related to persistence as early as preschool years (Master et al., 2017). One study with 5- and 6-year-old children using role-playing involving a setback showed that children who experienced process criticism persisted more and evaluated themselves more positively than children who received person criticism (Kamins & Dweck, 1999). These results suggest that self-esteem and persistence are linked at or before Grade 1 (Heyman et al., 1992). Second, longitudinal studies of persistence on challenging tasks and academic achievement show that children who demonstrate more persistence on challenging tasks at age 3 scored higher in math and language skills at age 5 (Mokrova et al., 2013). Taken together, these studies suggest that self-esteem may support/enable persistence on challenging tasks, which in turn, can facilitate better math and reading skills over time (Mokrova et al., 2013). These relations may be especially salient during early elementary school, when young children experience many "corrections" in formal educational contexts, because few children consistently score 100% on all homework assignments or tests. It is possible that children with higher self-esteem in early elementary school are better equipped to deal with such negative feedback (Cimpian et al., 2017; Cvencek et al., 2018). Thus, at the start of formal education, students may primarily rely on how they feel about themselves (self-esteem) to make other judgments about themselves and their academic ability rather than by intentionally comparing their grades to other peers as occurs later (this comparison becomes increasingly salient in late elementary school; Metsäpelto et al., 2020).

We therefore propose that the relation between self-esteem and achievement is weighted toward self-esteem promoting achievement in elementary school (by tolerance for criticism). Over the course of development, this leads to academic success, which sparks a "virtuous cycle" in which academic achievement itself becomes a salient source of self-esteem, especially at ages at which active academic comparisons with others become prominent (Arens et al., 2017; Metsäpelto et al., 2020). By middle school, the bidirectionality of self-esteem and achievement comes into full bloom. Middle school is also the age at which others (e.g., Marsh & Craven, 2006) have traditionally discussed the mutual dependence of self-views and school achievement, and we are proposing that this begins at earlier ages.

## Role of self-esteem in the development of gender stereotypes in children

A second broader theoretical issue concerns how self-esteem may feed into the developmental pathway for the acquisition of gender stereotypes. The current study does not include a direct measure of gender stereotypes about math or reading (e.g., *math = boys*, *reading = girls*); however, it is known that these specific gender stereotypes are already detectable in early elementary school especially using implicit measures (e.g., Cvencek, Meltzoff, et al., 2011; del Río et al., 2019). Because we lack data about the gender stereotypes of our specific participants, the following proposals should be regarded as speculative theorizing, pending future empirical work. One finding from the present study is particularly relevant: Girls demonstrated higher implicit self-esteem and their implicit self-esteem was related to their language achievement (which is stereotypically a female domain). It is possible that, for girls who already have positive self-esteem, once they develop a positive attitude toward, or liking of, reading (e.g., by being praised for or doing well at reading), this can influence the formation of their gender stereotypes through the mechanism of affective–cognitive consistency or balance: If *girl = good* and *reading = good*, then *girl = reading*. This could contribute to children (especially girls) acquiring the gender stereotype that "reading is for girls." That is, we believe that self-esteem and gender stereotypes become linked because they share the "common denominator" of children's sense of identity or "belonging" to gender groups, which also links them to specific academic subjects (Cimpian et al., 2012; Master et al., 2017). The linkages to specific

academic subjects—such as *me=math* (which correspond to a "math self-concept")—are shaped by achievement as much as achievement is shaped by self-concepts (Marsh & Craven, 2006). We acknowledge that, based on the currently available data, it is not possible to clearly distinguish whether self-esteem influences the acquisition of gender stereotypes through achievement (our preferred view) or the reverse (gender stereotypes influence self-esteem through achievement). To investigate this empirically, further research needs to be designed to measure multiple constructs (gender identity, self-esteem, gender in-group attitudes, gender stereotypes, and academic achievement) in the same children, using longitudinal methods.

### Limitations and suggestions for future research

Despite several strengths—combined use of explicit and implicit measures, assessment of math and language achievement—this study also had several limitations that warrant comment. First, the age comparisons were cross-sectional. Even in instances in which we found no mean-level differences on self-esteem measures across grades (e.g., implicit self-esteem did not differ from Grade 1 to 5), there might still have been pronounced variability between children in their developmental trajectories. A longitudinal design will be more informative for testing developmental changes, as well as for assessing bidirectional relations. Second, in some contexts, school grades can be biased by teachers' perceptions of children, which could itself vary according to children's self-esteem (the standardized national system for evaluating student achievement in all Croatian schools is probably less susceptible to such influences than other national contexts, such as in the United States). Third, future investigations of children's self-esteem and academic achievement should include more variability in students' actual math and language achievement, as well as a broader range of external validity criteria (e.g., standardized tests), including long-term outcomes (e.g., career aspirations). Fourth, the outcome measures in this study were domain-specific, whereas self-esteem was measured at a more global level. Building on the present results, a more comprehensive study could now be designed to include explicit and implicit measures of domain-specific identities (math and language self-concepts) along with self-esteem, as well as domain-specific grades (and standardized tests) in math and language, allowing for a more comprehensive investigation.

## CONCLUSION

In adults, both explicit and implicit self-esteem are related to behavioral and social-cognitive outcomes. The current study suggests that these two measures of self-esteem are already positively related to academic outcomes during childhood. The research tools, empirical findings, and hypotheses offered in this paper suggest the value of studying the origins and consequences of children's self-esteem for school achievement, beginning at younger ages than have traditionally been targeted. How children's feelings of self-esteem interact with setbacks and criticisms involved in early schooling, as well as the willingness to take academic risks and explore topics outside of one's strengths, would be a fruitful topic for future work.

### FUNDING INFORMATION

This research was supported by the National Science Foundation (SMA-1640889, HRD-1661285), the Croatian Science Foundation (PZS-2019-02-9814), the Bezos Family Foundation, the Overdeck Family Foundation, and Deirdre & Fraser Black.

### CONFLICT OF INTEREST STATEMENT

We have no known conflict of interest to disclose.

### DATA AVAILABILITY STATEMENT

The data and code necessary to reproduce the analyses presented here are publicly accessible, as are the materials necessary to attempt to replicate the findings. The analyses presented here were not preregistered. Data, code, and materials for this research are available at the following URL: https://osf.io/zxyja/.

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**How to cite this article:** Cvencek, D., Brečić, R., Sanders, E. A., Gaćeša, D., Skala, D., & Meltzoff, A. N. (2024). Am I a good person? Academic correlates of explicit and implicit self-esteem during early childhood. *Child Development*, *95*, 1047–1062. https://doi.org/10.1111/cdev.14052