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Gender differences in children's social skills growth trajectories

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ABSTRACT

At school entry, girls are rated by teachers as more competent on measures of social skills than boys. It is less clear if this higher rating is stable or grows over time. To address this question, multiple group curve of factors models investigated gender-specific growth trajectories across seven waves of measurement in a large, longitudinal sample ($N = 1024$, NICHD SECCYD). Results showed that girls' social skills were consistently rated higher from kindergarten to sixth grade, and the effect size was moderate (latent Cohen's $d = .37$ to .62). Boys demonstrated greater heterogeneity in social skills at nearly every grade with the gender difference in variability stable after second grade. An examination of gender differences in growth trajectories showed that boys demonstrated a linear decrease over time, whereas girls' social skills did not significantly change over time after accounting for initial level of social skills in kindergarten.

Social skills represent a scaffolded set of learned behaviors critical for both promoting positive interactions and minimizing negative interactions within social situations (Gresham & Elliott, 2008). Social skills include the knowledge of competent behaviors and the skills to effortlessly select and enact those behaviors in a manner that is sensitive and responsive to situational and social environmental cues (Bierman & Welsh, 1997; Cummings et al., 2008). School-based social skills are often conceptualized as consisting of two distinct constructs, interpersonal skills and learning-related social skills (McClelland & Morrison, 2003; Missal & Hojnoski). Interpersonal skills include the verbal and nonverbal actions used to initiate and maintain conversations as well as joining peer groups and navigating difficult situations to obtain desired outcomes. Learning-related social skills represent the compliant behaviors highly valued by teachers rather than peers (Foulks & Morrow, 1989; Missal & Hojnoski, 2008), such as staying on-task, following directions, and organizing work materials neatly (McClelland & Morrison, 2003). Although social skills development begins with infant-parent interactions, other interpersonal relationships with teachers, peers, and adults continue to impact social skills development as the social dyadic network expands in both number and complexity of interactions (Birch & Ladd, 1996).

Another variable that is related to social skills is gender. There is evidence to suggest girls are rated higher on social skills measures. DiPrete and Jennings (2012) examined a teacher-rated social and behavioral skills latent factor (as measured by approaches to learning, self-control, and interpersonal skills) at kindergarten, first, third, and fifth grade using data from the Early Child Longitudinal Study–Kindergarten Cohort (ECLS–K:1999). They found girls are rated as having moderately higher social and behavioral skills ratings in kindergarten (approximately 0.4 *SD* difference). Further evidence of higher social skills ratings for girls was demonstrated among different samples and measures of social skills (Caemmerer & Keith, 2015; Welsh et al., 2001; Wentzel, 1991).

However, girls' early edge in social competencies may be accompanied by additional growth over time. In a study that investigated growth trajectories in social skills using a large secondary dataset, Berry and O'Connor (2010) used growth curve modeling to examine maternal ratings of children from kindergarten through sixth grade using measured variables (social skills total raw scores). They found that children showed curvilinear social skills growth trajectories from kindergarten to sixth grade, with periods of

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acceleration between kindergarten and first grade as well as third and fifth grade and a period of deceleration from fifth to sixth grade. In addition, they found that boys entered kindergarten with significantly fewer social skills and showed less-positive rates of change in social skills compared to that of girls. However, Berry and O'Connor (2010) noted the use of maternal ratings as a limitation and, given the contextual specificity offered by teachers, that there might be qualitatively different growth trajectories in social skills between raters.

With that said, Chan et al. (2000) found that while teacher ratings of social skills show a general pattern of linear decline, the rate of decline for girls was slower compared to that of boys in a sample of children in kindergarten through third grade. It would not be unexpected to find differences in teacher and maternal ratings of children's social skills given teachers have a greater number of normative comparisons available to them within an academically and socially demanding environment. In support, evidence suggests that teachers' ratings of children's social skills generally account for more variability in math and reading achievement growth regardless of the child's gender. For example, Konold et al. (2010) found that teacher-rated social skills explained 19.3% of the variance in growth in standardized math achievement scores, whereas maternal ratings accounted for only 2.6% of the variance in growth. Furthermore, teacher and maternal ratings of social skills have been shown to differ in both agreement and stability over time. DiPrete and Jennings (2012) examined the ECLS-K:1999 longitudinal sample and found weak correlations ($r = 0.2$–0.3) between teacher and parent ratings with parent ratings demonstrating weaker stability than teacher ratings over time. The present study builds on earlier work (e.g., DiPrete & Jennings, 2012) in that analyses are conducted annually, across seven waves from kindergarten to sixth grade.

Potential reasons for gender differences

Differences in the way genders are socialized by adults and caregivers as well as differences in self-regulatory behaviors have been proposed to explain individual differences in social skills at the aggregate level. Either mechanism may serve to explain gender differences in the interaction- and convention-driven aspects of interpersonal skills and the control- and organization-driven aspects of learning-related social skills. From a social perspective, the gender difference in social skills may be explained by the gender socialization process described within social learning theory (Bandura, 1977). Once children are known to exist within a gender group, reinforcement from adults and peers is differentially applied when child behaviors conform to gender-based expectations. At the adult level, teachers may hold gender-typed expectations wherein girls and boys receive different feedback about appropriate classroom behavior (Koch, 2003). At the student level, Carter and McCloskey (1984) surveyed elementary students at four grade levels ranging from kindergarten to sixth grade and found that older students more harshly rated cross-gender toy choice as well as cross-gender friend selection.

Limiting cross-gender friend selection may have long-term social impacts for boys. A rich body of work supports differences in gender-normative communication styles between males and females. Examinations of cross- and within-gender conversations suggest significant divergence in interactional style (Maltz & Borker, 1982). Female conversation has been noted to include fewer interruptions, fewer statements of disagreement, more positive nonverbal and verbal content (e.g., nodding, short statements of agreement), and more question asking than that of males. Furthermore, females' question asking often serves to signal attentiveness to the conversational partner rather than males' simple request for information (Fishman, 1997). These interactional differences are likely bolstered during the early childhood and elementary years within the higher frequency of child-selected, same-gender play groups (Fabes et al., 2003; Thorne, 1993). As an example, female play activities during these years tend to be characterized as more organized and dyadic, with engagement in more adult role-play scenarios that may serve as a practice field for meeting socially desired teacher expectations (Martin & Fabes, 2001). Conversely, male play is more likely to include fantastic rather than realistic themes, as well as high-energy, unstructured large-group activities with gross motor play that provide few opportunities to resolve problems sensitively without hindering the flow of the game (Maccoby, 1998).

Differences in self-regulatory behaviors, which are also socially situated and contextually shaped, may also serve to explain gender differences in social skills. The ability to monitor, inhibit, and direct one's own attention and behavior (Gathercole & Pickering, 2000) shares substantial overlap with the self-regulatory skills conceptualized as executive function and may serve as a potential explanation for girls' higher ratings of social skills. Matthews et al. (2009) examined self-regulatory behaviors using both indirect (teacher

rating scale; Child Behavior Rating Scale) and direct observational measures (Head-Toes-Knees-Shoulders (HTKS) task) in a sample of 268 kindergartners. Girls outperformed boys on both self-regulation measures, with larger differences found with the more objective HTKS measure. Moreover, greater variability was found for boys on the HTKS measure, primarily due to a higher frequency of scores in the low range. The young age of participants coupled with the consistency of results across indirect and direct measures provide additional support for gender differences in the self-regulatory components of social skills.

Additionally, gender expectations may result in teachers shaping child behavior by differentially punishing or rewarding expected classroom behaviors. Evidence of a similar bias functioning for child race and ethnicity has been found when teachers rate behaviors of students in controlled experiments. That work suggests that teachers rate student behavior more harshly when positive stereotypes are violated than those same behaviors displayed by the group without the positive expectancy (Mason et al., 2014). For girls that engage in the high motor activity and rambunctious behavior often expected of boys, correction may come both more swiftly and with greater consistency.

The current study

This study provides a novel examination of social skills behaviors across child development that has not been addressed in prior research. The current study examines teacher-rated social skills growth trajectories for boys and girls from kindergarten to sixth grade using a large, longitudinal sample. We employ multiple group latent variable growth curve models referred to as curve of factors models, which characterize growth patterns using latent repeated measures (Little, 2013). This analytic technique obviates measurement error concerns present in manifest (measured)-variable approaches to growth curve modeling (Isiordia & Ferrer, 2018).

The evidence base supporting larger numbers of boys in studies of children with poorer social skills (Cooper & Farran, 1988; Cooper & Speece, 1988; Speece & Cooper, 1990) merits a consideration of changes in social skills across child development. We first tested the parameters of the growth model for equivalence between genders and across time before fitting the second-order latent curves; evidence of factorial invariance allows for stronger conclusions about behavioral change over time (Widaman et al., 2010). These tests of equivalence ensure different teachers' impressions of the same child at different grade levels are consistent for boys and girls; thus, concerns of measurement bias are reduced, especially when the focus is on latent changes over time. Next, we examine characteristics of social skills (latent means, factor variances) between genders and across time. As boys have demonstrated greater heterogeneity (larger variance) in other educational variables such as academic achievement (e.g., Brunner et al., 2013; Reynolds et al., 2015), we expect boys to show greater heterogeneity in social skills relative to girls across development. Last, we hypothesized that boys would be rated as having lower initial levels of social skills at school entry and expected girls to demonstrate faster rates of social skills growth. If social skills development differs between genders, then an intervention modification may be merited. For example, a modified intervention may include a more targeted, sensitive approach whereby intervention intensity is matched to social skills developmental patterns to maximize efficacy for boys and girls at different grades. The study was conducted to address the following research questions:

1. Are teacher ratings of children's social skills measured the same between genders and grade levels from kindergarten to sixth grade?
2. Are there latent mean or latent variance differences in social skills between boys and girls and from kindergarten to sixth grade?
3. What are the latent growth trajectories of social skills for boys and girls?

Method

The National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD) was an extensive four-phase longitudinal study that followed the development of children from one month (1991) to 15 years of age (2007). The NICHD Study was conducted in ten different locations: Little Rock, AR; Irvine, CA; Lawrence, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton, NC; Seattle, WA; and Madison, WI. Participant selection was based on a conditional random sampling plan to ensure diversity in maternal employment, demographics (economic, educational, and ethnic), and family status (single-parent and two-parent families). Inclusion criteria requirements were that the mother of the study participant was at least 18 years of age, understood and spoke English, anticipated

remaining in the catchment area for at least three years, and had overall good health. The data that support the findings of this study are available from the NICHD SECCYD. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from https://www.icpsr.umich.edu/web/ICPSR/series/00233 with permission from the NICHD.

Participants

Participants included 1,024 children from phases two and three of the NICHD SECCYD, which included yearly assessments from kindergarten (1997) through sixth grade (2004). Children's demographic information is as follows: 50.4% male ($n = 516$), 49.6% female ($n = 508$); 82.6% European American, 11.0% African American, 6.0% Hispanic, 1.4% Asian or Pacific Islander, 0.4% American Indian/Eskimo/Aleutian, and 4.6% Other (percentages exceeded 100% due to participants selecting multiple categories). Maternal education, collected one month after the child's birth, is as follows: had not graduated high school or obtained a GED (8.2%), graduated high school or obtained a GED (19.9%), some college (32.9%), earned a bachelor's degree (23.2%), some graduate work or a master's degree (13.1%), and higher than a master's degree (2.7%).

Teachers' ratings of the children were analyzed in this study. Teachers in the NICHD SECCYD identified as female (84%–97%; data unavailable at second grade), European American (87%–95%), African American (2%–4%), Hispanic (<1%–8%), Asian (<2%), or Other (<1%). Teachers reported having an average of 11.29–15.45 years of teaching experience, and the average teacher age was 41.58–45.01 years (data unavailable at kindergarten and first grade).

Measures

Social skills rating system

Children's social skills were measured using the teacher-report form of the Social Skills Rating System (SSRS; Gresham & Elliott, 1990), a validated, norm-referenced measure of student social behaviors. The SSRS is one of the most widely used measures of children's social behaviors in schools and its use is supported by a large body of research (Gresham et al., 2011). Teachers responded annually to SSRS items during the fall of kindergarten and during late winter to early spring at first through sixth grade.

The teacher form includes 57 items designed to measure three domains: Academic Competencies, Problem Behaviors, and Social Skills. Our study focused on the Social Skills domain only, which included three subscales of 10 items each: Assertion (e.g., asking others for information, introducing oneself, and responding to the actions of others), Cooperation (e.g., following rules, helping others, and sharing), and Self-Control (e.g., responding appropriately to others' actions and taking turns and compromising) (Gresham & Elliott, 1990). Teachers rate the frequency of children's behaviors on a three-point Likert-type scale (0 = *Never* to 2 = *Very Often*). Total raw scores, analyzed in the current study, range from 0 to 20 for each subscale (Konold et al., 2010). In the norming sample, the average teacher-rated raw scores were slightly higher for kindergarten through sixth grade girls than boys on the Assertion, Cooperation, and Self-Control subscales (Gresham & Elliott, 1990).

Within the NICHD SECCYD the three teacher-rated subscales evidenced high internal consistency from kindergarten through sixth grade. Cronbach's alpha ranged from .91 to .92 for Cooperation, .84 to .87 for Assertion, and .87 to .90 for the Self-Control subscales (Research Triangle Institute, 2000a, 2000b, 2001, 2003, 2005). The SSRS teacher form has strong positive correlations with other teacher-rated social skills measures including the Social Behavior Assessment, the Harter Teacher Rating Scale, and the Walker-McConnell Scale of Social Competence and School Adjustment (Gresham & Elliott, 1990; Walker & McConnell, 1988; Walthall et al., 2005).

Analytic plan

Measurement model

Longitudinal data were analyzed for boys and girls across seven waves from kindergarten to sixth grade. The measurement model included seven correlated latent social skills variables estimated by the Assertion, Cooperation, and Self-Control subscales (see Figure 1). The residuals for the three SSRS subscales were correlated with the same measure at each subsequent timepoint; each subscale is likely correlated with its subsequent measurements beyond its relation with the social skills latent variables (Kenny, 2011; Little et al., 2007). For example, the kindergarten Cooperation subscale residual was correlated with 1st, 2nd, 3rd, 4th, 5th, and 6th grade Cooperation residuals and the 1st grade Cooperation residual was correlated with 2nd, 3rd, 4th, 5th, and 6th grade Cooperation residuals and

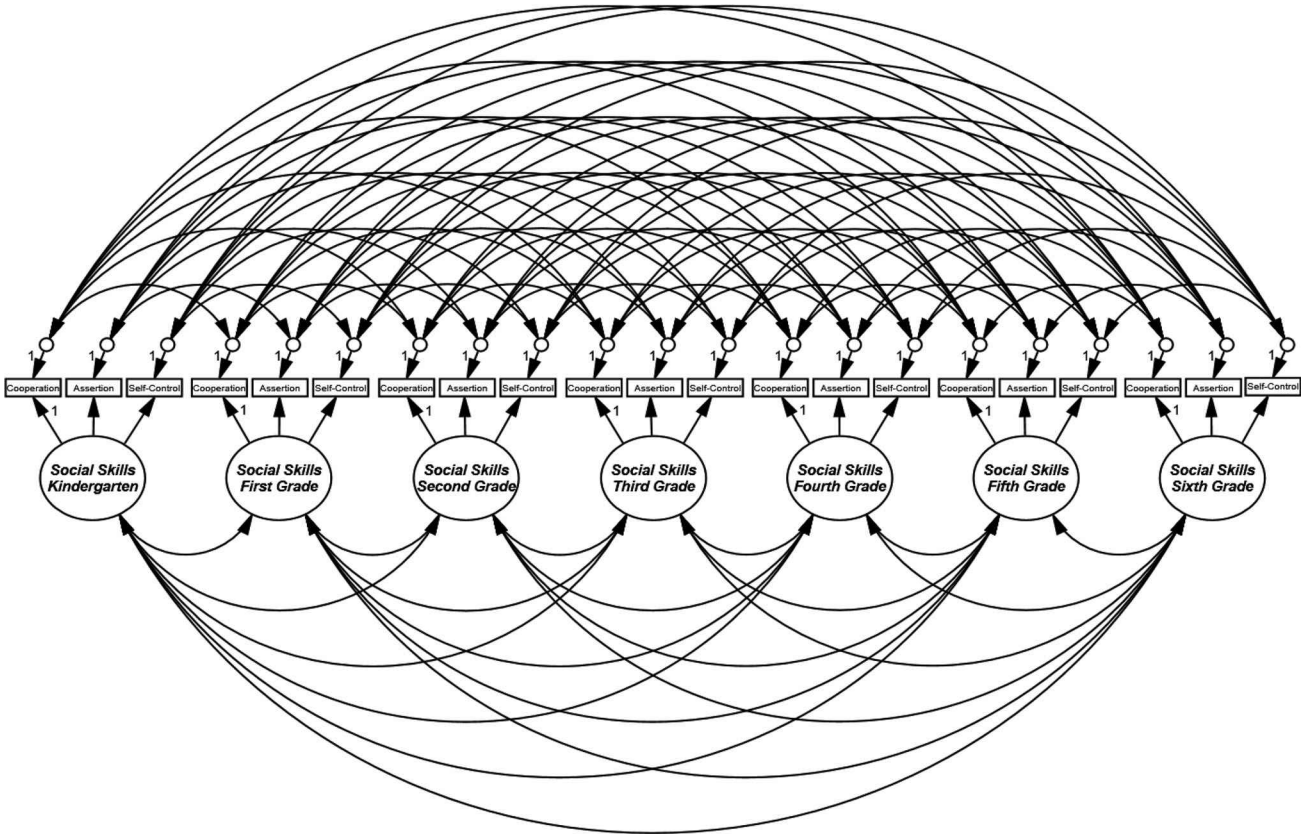

Figure 1. Multiple Group (Females and Males) Longitudinal Confirmatory Factor Analysis Model of Social Skills from Kindergarten to Sixth Grade.

Note. Marker variable method used to set the scale. This model was used to test factorial invariance (configural, weak, and strong) across time and between genders and equivalence of latent parameters (means, variances) between genders.

so on. The analyses were completed in a series of steps.

Factorial invariance

First the measurement model was tested for longitudinal factorial invariance, then factorial invariance between gender groups was tested. Factorial invariance ensures the social skills constructs were measured the same across each grade and each gender. Factorial invariance is a necessary precursor for comparisons between latent variances and means and appropriate specification of the latent curve factors (i.e., intercept and slope; Little, 2013). If invariance were supported, constraints were retained in latent growth models.

Equivalence of latent parameters (structural invariance)

Next, we tested whether the latent social skills factor variances were equally heterogeneous between boys and girls across development. Next, we tested whether the latent means were equal between boys and girls across development, which examines whether average levels of social skills were similar for boys and girls at different grades.

Curve of factors or second-order latent variable growth models

Next, curve of factors models were tested, which combine measurement and latent growth models. At the first-order level, curve of factors models include multiple indicators of the latent variable at each measurement occasion, which allows for the estimation of each indicators' intercept, factor loading, and residual variance. At the second-order level, the latent growth trajectory is estimated, including intercept and slope means, variances, and a covariance (Whittaker et al., 2014). Curve of factors models are infrequently used in the social sciences (Isiordia & Ferrer, 2018), but are useful for examining intraindividual change over time and interindividual variability in intraindividual change using latent repeated measures (Little, 2013; Preacher et al., 2008).

The means of the first-order latent social skills factors were fixed to zero to allow mean-level information to be interpreted at the second-order growth

Table 1. Correlations, means, and standard deviations of NICHD SECCYD variables arranged chronologically.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	COPRSTKF		0.48	0.67	0.41	0.23	0.30	0.48	0.30	0.37	0.45	0.23	0.34	0.37	0.20	0.29	0.37	0.22	0.28	0.29	0.10	0.16
2	ASTRSTKF	0.39		0.52	0.19	0.35	0.10	0.24	0.33	0.15	0.26	0.37	0.23	0.21	0.29	0.17	0.18	0.26	0.14	0.13	0.15	0.05
3	SLFRSTKF	0.62	0.48		0.29	0.22	0.36	0.32	0.24	0.38	0.30	0.17	0.36	0.24	0.18	0.36	0.24	0.20	0.29	0.17	0.07	0.15
4	COPRST1S	0.51	0.18	0.29		0.47	0.58	0.59	0.35	0.34	0.56	0.23	0.30	0.48	0.31	0.35	0.47	0.20	0.30	0.46	0.32	0.30
5	ASTRST1S	0.28	0.34	0.21	0.49		0.46	0.29	0.37	0.16	0.24	0.25	0.10	0.18	0.27	0.11	0.20	0.25	0.11	0.22	0.31	0.21
6	SLFRST1S	0.36	0.14	0.40	0.63	0.54		0.35	0.26	0.46	0.33	0.17	0.36	0.27	0.16	0.39	0.27	0.13	0.34	0.33	0.16	0.33
7	COPRST2S	0.48	0.12	0.32	0.56	0.24	0.38		0.54	0.60	0.56	0.32	0.37	0.51	0.36	0.38	0.45	0.23	0.32	0.39	0.28	0.26
8	ASTRST2S	0.24	0.31	0.18	0.31	0.42	0.24	0.43		0.58	0.30	0.39	0.24	0.28	0.43	0.29	0.30	0.34	0.24	0.20	0.31	0.14
9	SLFRST2S	0.30	0.07	0.35	0.36	0.19	0.41	0.59	0.55		0.34	0.29	0.45	0.36	0.31	0.47	0.31	0.22	0.46	0.31	0.27	0.33
10	COPRSTG3	0.42	0.13	0.23	0.54	0.23	0.34	0.58	0.24	0.31		0.49	0.59	0.61	0.33	0.40	0.48	0.22	0.30	0.47	0.26	0.27
11	ASTRSTG3	0.26	0.29	0.19	0.30	0.36	0.24	0.27	0.33	0.23	0.48		0.57	0.27	0.39	0.24	0.23	0.31	0.19	0.28	0.32	0.16
12	SLFRSTG3	0.25	0.09	0.21	0.36	0.15	0.39	0.38	0.19	0.38	0.58	0.53		0.44	0.29	0.49	0.32	0.17	0.39	0.32	0.19	0.30
13	COPRSTG4	0.40	0.12	0.29	0.51	0.20	0.38	0.53	0.25	0.29	0.50	0.24	0.34		0.52	0.63	0.53	0.25	0.37	0.54	0.26	0.32
14	ASTRSTG4	0.22	0.29	0.16	0.28	0.32	0.21	0.25	0.40	0.23	0.27	0.34	0.24	0.43		0.53	0.28	0.39	0.24	0.32	0.34	0.19
15	SLFRSTG4	0.25	0.10	0.30	0.30	0.15	0.36	0.35	0.29	0.44	0.34	0.21	0.41	0.52	0.50		0.39	0.27	0.50	0.37	0.15	0.34
16	COPRSTG5	0.36	0.13	0.23	0.48	0.18	0.32	0.52	0.28	0.30	0.52	0.28	0.36	0.54	0.28	0.30		0.49	0.65	0.56	0.28	0.43
17	ASTRSTG5	0.24	0.31	0.17	0.28	0.28	0.21	0.29	0.33	0.21	0.31	0.31	0.20	0.33	0.46	0.28	0.49		0.56	0.32	0.39	0.27
18	SLFRSTG5	0.30	0.07	0.31	0.35	0.14	0.40	0.34	0.20	0.42	0.35	0.20	0.39	0.38	0.26	0.44	0.59	0.52		0.43	0.23	0.50
19	COPRSTG6	0.38	0.17	0.22	0.51	0.21	0.29	0.42	0.21	0.26	0.50	0.26	0.36	0.47	0.22	0.35	0.50	0.32	0.40		0.42	0.62
20	ASTRSTG6	0.22	0.24	0.13	0.26	0.23	0.15	0.16	0.28	0.12	0.19	0.25	0.15	0.16	0.31	0.20	0.21	0.36	0.17	0.42		0.50
21	SLFRSTG6	0.32	0.12	0.26	0.41	0.18	0.30	0.28	0.19	0.27	0.33	0.17	0.31	0.34	0.24	0.37	0.34	0.32	0.41	0.66	0.54	
F	Means	16.82	13.41	15.61	16.37	13.6	15.73	16.77	14.25	16.08	16.22	13.69	15.58	16.56	13.4	15.78	16.92	13.3	15.81	17.31	13.24	16.19
	SDs	3.57	3.96	3.50	3.73	3.96	3.54	3.59	3.91	3.64	4.06	3.68	3.52	3.66	3.66	3.51	3.60	3.96	3.52	3.38	4.08	3.26
M	Means	15.05	12.48	14.79	14.62	12.89	14.61	14.91	13.17	14.92	14.44	12.27	14.40	14.73	12.15	14.46	14.57	12.36	14.60	14.39	11.85	14.53
	SDs	4.29	4.33	3.87	4.21	3.76	3.78	4.20	4.05	4.09	4.68	4.18	4.17	4.46	4.02	3.94	4.31	4.11	4.05	4.63	4.30	3.91

Note. The matrix for girls is shown below the diagonal; the boys' matrix is shown above the diagonal. Abbreviations: COPRST = cooperation, ASTRST = assertion, and SLFRST = self-control subscales; KF = kindergarten fall, 1S = 1st grade spring, 2S = 2nd grade spring, G3 = 3rd grade spring, G4 = 4th grade spring, G5 = 5th grade spring, G6 = 6th grade spring measurements;. F = females and M = males.

factors (Little, 2013). The second-order intercept factor represents the initial level of social skills when the time variable is zero (kindergarten in our model), whereas the slope factor represents the rate at which social skills change over time. The intercept and slope factor covariance tests whether the initial status of kindergarten social skills is related to the rate of growth in social skills. Paths from the intercept factor to each latent social skills variable were constrained to one to represent the influence of a constant (Little, 2013). Different path coefficients from the slope factor to each latent social skills variable were tested (i.e., latent basis, linear, and quadratic) to examine alternative growth trajectories in social skills.

After the appropriate growth pattern was established, alternative model specifications were tested. Equality constraints were tested between genders for intercept and slope means, variances, and the covariance. The first-order latent social skills residual variances were constrained equal across grades to determine whether time-varying contextual factors influenced latent social skills—the assumption of homoscedasticity or the stationarity of the residuals (Little, 2013).

Model evaluation

All latent variable structural equation models were estimated in M*plus*. Global model fit was examined with several indexes of standalone fit: the root mean square error of approximation (RMSEA)[1], comparative fit index (CFI), and standardized root mean square residual (SRMR). Acceptable criteria for model fit were: RMSEA $\leq$ .06, CFI $\geq$ .95, and SRMR $<$ .08 (Hu & Bentler, 1999; Schermelleh-Engel et al., 2003). Factorial invariance was evaluated using ΔCFI, with a $\Delta \leq .01$ evidence of invariance (Cheung & Rensvold, 2002; Little, 2013). Substantive nested model comparisons of equivalent latent means, covariances, and residual variances were evaluated using the likelihood ratio test ($\Delta\chi^2$, $p < .05$) and adjusted Bayes Information Criterion (aBIC). Smaller aBIC values indicate better fitting models (Keith, 2019).

Results

Descriptive statistics

Correlation matrices for girls and boys, including means and standard deviations, for the three SSRS subscales are reported in Table 1. On average girls were rated higher than boys on the Assertion, Cooperation, and Self-Control subscales. All of the univariate distributional assumptions were within

[1]A recommended correction to the RMSEA was applied in the multiple group latent variable models to account for the number of groups (RMSEA multiplied by the square root of the number of groups; Steiger, 1998).

Table 2. Correlations between social skills latent variables for boys and girls.

	SS-K	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
SS-K		.41	.47	.43	.38	.36	.21
SS-1	.44		.53	.42	.41	.38	.48
SS-2	.40	.51		.53	.57	.46	.41
SS-3	.34	.47	.50		.58	.42	.42
SS-4	.37	.48	.54	.53		.53	.48
SS-5	.34	.44	.47	.49	.58		.61
SS-6	.34	.44	.36	.41	.50	.52	

Note. SS = Social Skills. The corresponding letter/number indicates grade level. All correlations between social skills latent variables are statistically significant at $p \leq .001$. The correlation matrix for girls is shown below diagonal; the boys' matrix is shown above the diagonal.

acceptable limits; absolute values of skewness ranged from 0.26 to 1.44 and kurtosis ranged from 0.02 to 1.43 (Curran et al., 1996). The correlations between the social skills latent variables for each gender group are reported in Table 2. All correlations were statistically significant, and correlations between adjacent waves ranged from 0.41 to 0.61. There was some variability in teachers' ratings of children's social skills across time, as a different teacher rated each child at each grade.

The percentage of missing data on the three SSRS subscales was as follows: 7% in kindergarten, 2% in first grade, 14% in second grade, 12% in third grade, 18% in fourth grade, 17% in fifth grade, and 23% in sixth grade. The assumption that data were missing completely at random (MCAR) was supported by Little's Missing Completely at Random Test (χ^2 (919) = 988.23, p = .06). M*plus* handles missing data using the strongly recommended Full Information Maximum Likelihood (FIML) procedure (Enders, 2010; Enders & Bandalos, 2001; Schafer & Graham, 2002). FIML maximizes the data available and does not discard important information provided by variables with missing data, which thereby increases the accuracy of the estimation process (Enders, 2010). FIML yields unbiased estimates when data are MCAR or missing at random (MAR; Enders, 2010; Graham, 2009).

Latent variable longitudinal models

Factorial invariance

The unconstrained measurement model (Model 1 in Table 3, the longitudinal configural invariance model) fit the data well and the SSRS subscales loaded strongly on all latent social skills variables (standardized factor loadings ranged from 0.60 to 0.89). Given the support for the measurement model longitudinal invariance was first tested across time for a combined sample of girls and boys. Longitudinal weak factorial (metric) and strong factorial (intercept) invariance were supported as the change in CFI values were well below the .01 cutoff (see Table 3); this supports fitting a second-order growth model to the first-order latent social skills factors (Little, 2013). Next, configural, weak factorial, and strong factorial invariance were supported between gender groups (see Table 3), which allows tests of equal latent means and variances between gender groups. Thus, the SSRS is measuring the same constructs for kindergarteners through sixth graders and for girls and boys. All longitudinal and gender invariance constraints were included in the latent growth models.

Equivalence of latent parameters (structural invariance)

First all corresponding latent variances were constrained to be equal between gender groups in an omnibus test. The χ^2 difference test comparing this model to the strong gender invariance model was statistically significant (Table 3, Model 7); latent variances differed statistically significantly between genders at all grade levels except first and second grade (Table 3, Models 8-14). Descriptively, boys showed a general increase in individual differences in social skills through sixth grade with greater heterogeneity at nearly every grade level compared to that of girls. Girls showed a slight decrease in heterogeneity from kindergarten to fourth grade followed by a slight increase (see Figure 2). The gender difference in variability was generally stable from third grade and beyond.

Next, all corresponding latent means were constrained to be equal between gender groups. The χ^2 difference test was statistically significant (Table 3, Model 15). Latent means differed statistically significantly between genders at every grade level (Table 3, Models 16-22). Girls had higher ratings on social skills from kindergarten to sixth grade (latent Cohen's d = .37 to .62), which generally increased over time (see Figure 3).

Curve of factors latent growth models

The latent basis model (also referred to as the unstructured model) was estimated first (Table 4, Model 1); the slopes for kindergarten and sixth grade social skills were constrained to zero and one respectively, and all others were freely estimated. The latent basis model is exploratory, the shape of change is estimated from the data rather than specified to a particular functional form (Grimm et al., 2013). An estimation error occurred, a not positive definite latent covariance matrix. Two estimates were

Table 3. Model fit statistics for longitudinal and multiple group invariance tests.

Model Tested	χ^2 (*df*)	$\Delta\chi^2$ (Δdf)	Δp	CFI	ΔCFI	Adj. RMSEA	SRMR
	Factorial invariance across time and gender						
Longitudinal Invariance							
1. Configural Invariance	279.202 (105)	–	–	.982	–	.040*	.066
2. Weak Invariance	297.829 (117)	–	–	.981	.001	.039*	.066
3. Strong Invariance	383.357 (129)	–	–	.974	.007	.044*	.068
Gender Invariance							
4. Configural Invariance	369.632 (210)	–	–	.983	–	.055	.066
5. Weak Invariance	387.689 (224)	–	–	.982	.001	.054	.066
6. Strong Invariance	473.193 (238)	–	–	.974	.008	.062	.065
	Equivalence tests of latent parameters between genders						
Latent Variances							
7. All Latent Variances	499.017 (245)	25.824 (7)[a]	.001	.972	–	.064	.089
8. Kindergarten	482.040 (239)	8.847 (1)[a]	.003	.974	–	.062	.071
9. First Grade	473.199 (239)	.006 (1)[a]	.938	.975	–	.062	.065
10. Second Grade	476.618 (239)	3.425 (1)[a]	.064	.974	–	.062	.068
11. Third Grade	480.506 (239)	7.313 (1)[a]	.007	.974	–	.062	.070
12. Fourth Grade	482.239 (239)	9.046 (1)[a]	.003	.974	–	.064	.072
13. Fifth Grade	478.783 (239)	5.59 (1)[a]	.018	.974	–	.062	.069
14. Sixth Grade	478.955 (239)	5.762 (1)[a]	.016	.974	–	.062	.069
Latent Means							
15. All Latent Means	557.747 (245)	84.554 (7)[a]	<.001	.966	–	.071	.083
16. Kindergarten	498.119 (239)	24.926 (1)[a]	<.001	.972	–	.065	.069
17. First Grade	505.631 (239)	32.438 (1)[a]	<.001	.971	–	.066	.070
18. Second Grade	505.686 (239)	32.493 (1)[a]	<.001	.971	–	.066	.071
19. Third Grade	506.968 (239)	33.775 (1)[a]	<.001	.971	–	.066	.070
20. Fourth Grade	514.279 (239)	41.086 (1)[a]	<.001	.970	–	.066	.072
21. Fifth Grade	511.365 (239)	38.172 (1)[a]	<.001	.970	–	.066	.071
22. Sixth Grade	532.157 (239)	58.964 (1)[a]	<.001	.968	–	.069	.073

Note. CFI = Comparative Fit Index. Adj. RMSEA = Root Mean Square Error of Approximation adjusted for number of groups in comparison. SRMR = Standardized Root Mean Residual.
*Unadjusted RMSEA.
aCompared to gender strong invariance model.

implausible, a correlation greater than one between the latent boys' sixth grade social skills variable and the latent slope variable and the latent boys' sixth grade social skills residual was negative. This non-significant residual was constrained to zero and the model ran successfully. Model fit was generally acceptable (see Table 4).

Next, a linear growth model was specified (Table 4, Model 2). Kindergarten through sixth grade slope factor loadings were constrained to 0, 1.5, 2.5, 3.5, 4.5, 5.5, and 6.5 respectively to account for years since the kindergarten fall measurement; kindergarteners were assessed in the fall and first through sixth graders were assessed in the spring. The more parsimonious linear model had acceptable fit and a lower aBIC. Next, the quadratic slope model was specified which included two sets of slope factors, quadratic (squared values of the linear slope loadings) and linear slope factors (Table 4, Model 3). The quadratic model resulted in a statistically significant improvement in model fit, but a higher aBIC. Boys' and girls' quadratic slope means and the boys' quadratic slope variance were not statistically significantly different from zero ($p > .05$). And girls' latent social skills means at each grade in the gender strong invariance model (Table 3, Model 6) also do not suggest quadratic growth (girls' latent means = 1.05, 1.07, 1.07, 1.16, 1.29, 1.28, 1.73 in kindergarten through sixth grade respectively; boys were coded zero). Thus, we removed the quadratic slope factors and accepted the linear model (Muthen, 2012; Preacher et al., 2008)[2].

Next, equality constraints between genders were individually tested and each model was compared to the unconstrained linear model, model 2. Model 4 constrained the second-order intercept and model 5 constrained the slope factors equal for boys and girls. Both models were rejected (see Table 4 for likelihood ratio tests and aBIC). Model 6 was supported which tested equal intercept and slope variances and covariances across gender. Model 7 was also supported which tested equal latent social skills residual factor variances across time (Model 7; see Table 4). Model 8 tested the supported constraints simultaneously—the growth factor variance and covariance and first-order residual variance constraints—and resulted in significantly better model fit. Thus, model 8 is the final model and was interpreted further (see Table 4 for fit indices and Figure 4 for a visual representation).

[2]The mean of the quadratic components is not statistically significant, and the quadratic factors may have overfit the data by absorbing random variability (Preacher et al., 2008). While methodologists have differing opinions about which model to accept in this situation, we erred on the side of caution and accepted the linear model (Muthen, 2012; Preacher et al., 2008).

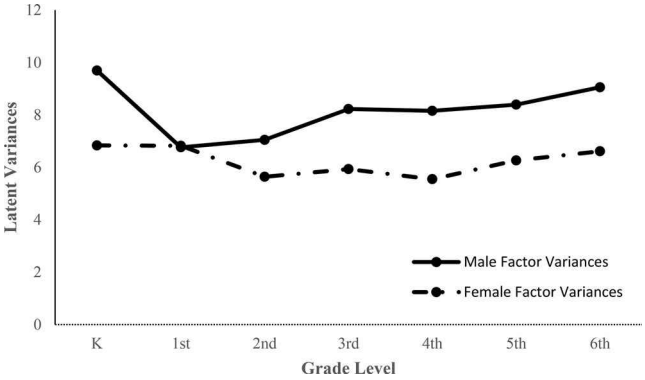

Figure 2. Gender Differences in Heterogeneity in Social Skills from Kindergarten to Sixth Grade.

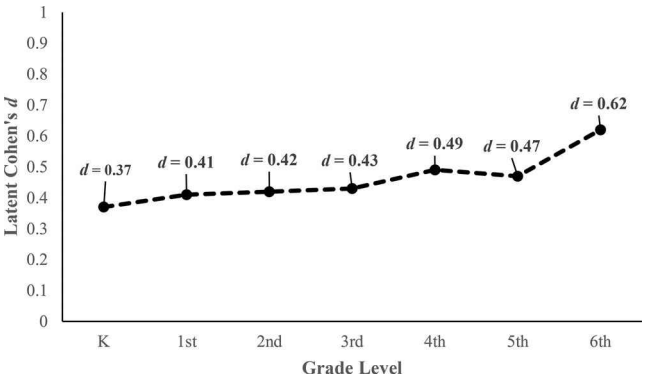

Figure 3. Female Advantage in Social Skills from Kindergarten to Sixth Grade.

As reported in Table 5, the second-order mean intercept for girls was 0.88 units higher than the mean intercept for boys. Boys' mean slope factor was statistically significant and negative, whereas girls' slope factor did not differ from zero ($p = .14$). On average, boys' social skills decreased 0.06 units per year; there was an absence of statistically significant change from kindergarten to sixth grade for girls. The constrained negative intercept and slope covariance suggests children rated with higher social skills in kindergarten tended to decrease at a faster rate (steeper slopes) than those rated lower; this relation was similar for boys and girls (Table 5). Or stated differently, children beginning kindergarten with lower-rated social skills increase their social skills more quickly than their higher-rated peers (Keith, 2019). Boys' and girls' slope and intercept factor variances were statistically significant, suggesting there were interindividual differences in growth for both groups.

At the first-order level, the assumption of homoscedasticity or stationarity of the latent social skills residuals was supported, which suggests the variance not explained in social skills by the growth factors is equivalent at each grade (Little, 2013). All of the SSRS factor loadings on the latent social skills variables were statistically significant and of a large magnitude, suggesting the SSRS subscales are strong measures of the underlying social skills construct (see Figure 4). Standardized regression coefficients ranged from 0.62 (Cooperation 3rd grade) to 0.87 (Self-Control kindergarten) for boys, and 0.62 (Assertion kindergarten) to 0.92 (Self-Control sixth grade) for girls; equality constraints apply to unstandardized coefficients only (Keith, 2019). The majority of the correlated residuals between each of the three SSRS subscales and their later measurements were statistically significant with a few exceptions among the Self-Control measured variables[3]. These non-significant correlations were not pruned and remained in the model.

Discussion

The current study examined gender-specific growth trajectories in social skills from kindergarten to sixth grade within a large, longitudinal sample. Multiple group curve of factors models were employed to investigate whether there is a differential growth pattern in latent social skills between boys and girls across a dynamic developmental period. A moderate average difference in social skills was found between genders with girls rated higher across all measurement periods (latent Cohen's $d = .37$ to .62). In addition, a test of heterogeneity in social skills showed that boys were generally more variable than were girls with the gender difference in variability stable after second grade. Last, a comparison of growth trajectories in social skills between genders showed boys, on average, demonstrated a linear decrease over time, whereas girls, on average, did not significantly grow over time after accounting for initial level of social skills in kindergarten.

Gender differences in social skills development

The finding that females were rated higher in social skills as compared to males has been found in other research (Caemmerer & Keith, 2015; DiPrete & Jennings, 2012; Welsh et al., 2001). Given that girls, on average, demonstrate fewer academic and

[3]Among girls and boys the sixth grade Self-Control subscale was not statistically significantly correlated with any measurements from kindergarten through fourth grade (at a $p < .05$ level). For girls specifically kindergarten and third, kindergarten and fourth, second and third, and fifth and sixth Self-Control measurements were also not statistically significantly correlated. For boys specifically kindergarten and fifth grade Self-Control measurements were also not statistically significantly correlated.

Table 4. Fit statistics for multiple group latent growth models.

Model Tested	χ^2 (*df*)	$\Delta\chi^2$ (Δdf)	Δp	CFI	Adj. RMSEA	SRMR	aBIC
1. Latent Basis (unstructured model)*	664.065 (304)	–	–	.961	.068	.077	95352.476
2. Linear Unconstrained (linear slope)	669.434 (308)	–	–	.961	.068	.076	95342.823
3. Quadratic Unconstrained (nonlinear slope)	646.923 (300)	22.511 (8)[b]	.004	.962	.068	.071	95350.355
4. Linear Slope: Second-Order Intercepts Equal Gender	696.164 (309)	26.730 (1)[b]	<.001	.958	.069	.081	95365.798
5. Linear Slope: Second-Order Slopes Equal Gender	677.165 (309)	7.731 (1)[b]	.005	.960	.068	.077	95346.799
6. Linear Slope: Second-Order Covariances & Variances Equal Gender	675.453 (311)	6.019 (3)[b]	.111	.960	.068	.082	95337.576
7. Linear Slope: First-Order Residual Variances Equal Time	682.964 (320)	13.530(12) [b]	.332	.961	.066	.078	95311.289
8. Final Linear Model: Constraints from Models 6 & 7	689.461 (323)	20.027(15) [b]	.171	.960	.066	.084	95306.520

Note.
*The latent males sixth grade social skills residual was constrained to zero in this model.
[a]Compared to the latent basis model.
[b]Compared to the linear unconstrained (baseline) model.

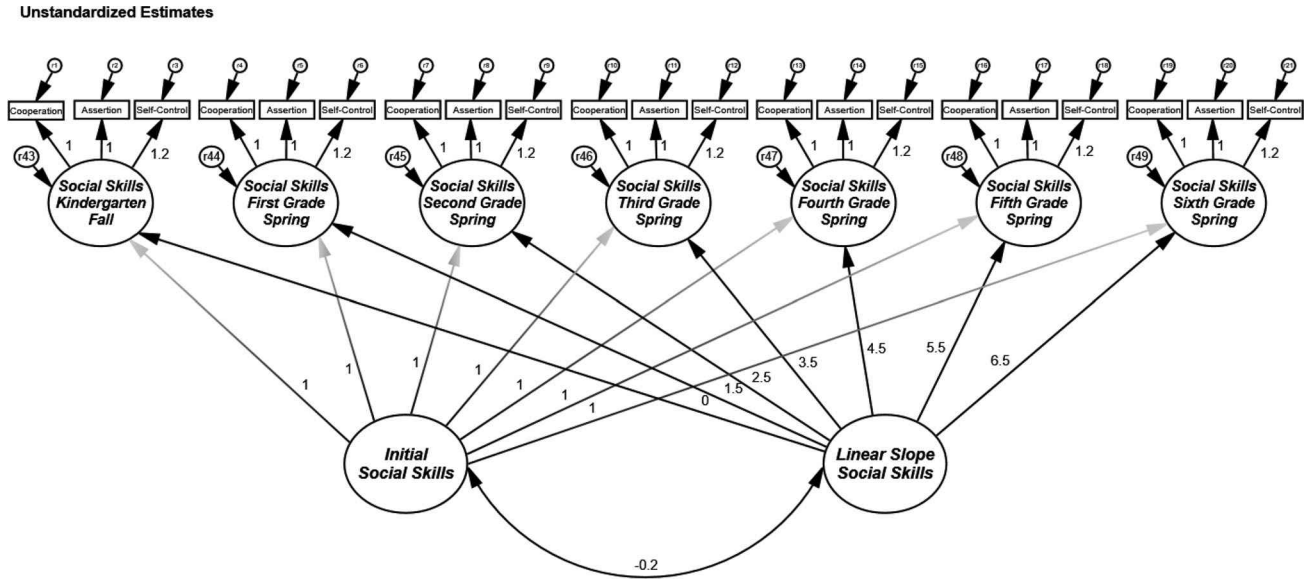

Figure 4. Final Multiple Group Curve of Factors Model for Females and Males.
Note. All presented estimates were fixed across groups; unstandardized estimates are presented because constraints are made on unstandardized but not standardized estimates. Social Skills Rating System subscales factor loadings and intercepts were constrained equal across gender and time. The first-order social skills residual factor variances were constrained equal across time but not gender. Marker variable method was used to set the scale and was based on Cooperation. Corresponding SSRS subscale residual variances were correlated across time within each group (63 covariances not shown here, but included in Figure 1; allowed to vary across groups and time).

behavioral problems than boys, especially during the early years of schooling (Hamre & Pianta, 2001), it is possible that the higher ratings for girls reflect a teacher bias in social skills ratings. For example, given that teachers have been shown to interact more positively with academically capable students (Brophy & Good, 1970), it is possible that teachers rate those students perceived to be more behaviorally compliant and academically competent to be higher in social skills. Further, positive interactions between teachers and students may naturally improve student engagement and thus elicit more prosocial student behaviors. However, it is plausible that more competent social skills enhance classroom performance. In support, DiPrete and Jennings (2012) showed in the ECLS-K:1999 sample that the higher social skills ratings observed for girls was an explanation, not a result, of better teacher-rated academic skills for girls as they demonstrated more academic engagement and work-completion behaviors.

The finding that boys demonstrated greater heterogeneity in social skills at nearly every grade level (except in first and second grade) is consistent with past research. This finding is not altogether different from findings supporting greater male variability in other psychological and educational variables such as

Table 5. Parameter estimates for final linear growth model (Model 8).

Parameter	Unstandardized (standard error)	Standardized (standard error)
Boys		
Mean intercept	0.00 (0.00)	0.00 (0.00)
Mean slope	−0.06 (0.02)*	−0.23 (0.02)*
Intercept variance	3.69 (0.00)*	1.00 (0.00)
Slope variance	0.07 (0.00)*	1.00 (0.00)
Intercept/slope covariance	−0.19 (0.00)*	−0.37 (0.00)*
Girls		
Mean intercept	0.88 (0.00)*	0.46 (0.00)*
Mean slope	0.03 (0.14)	0.12 (0.15)
Intercept variance	3.69 (0.00)*	1.00 (0.00)
Slope variance	0.07 (0.00)*	1.00 (0.00)
Intercept/slope covariance	−0.19 (0.00)*	−0.37 (0.00)*

Note. Model 8 includes the two constraints supported by the likelihood ratio test ($\Delta\chi^2$) and aBIC; the covariance between the intercept and slope was set equal for boys and girls and the latent social skills residuals were constrained equal across time. Parameter constraints apply to unstandardized estimates only.
*parameters are statistically significant at $p < .05$.

intelligence, achievement, or personality (cf. Borkenau et al., 2013; Deary et al., 2007; Reynolds et al., 2015). Thus, this study adds to the literature on the development of social skills by showing that boys demonstrate more individual differences in social skills than girls. While the mechanism behind boys' greater variability over time was not the focus of the study, we propose a potential explanation for this finding. Measures of teacher-rated social skills include both the polite conventions found within interpersonal skills as well as the behavioral self-regulation required of classroom settings. Although behavioral self-regulation appears to serve as a predictor of academic outcomes over time, interpersonal skills are learned and socialized. It is here that we would expect girls to outpace boys, as the socialized interactions between female students are likely closer to the adult expectations teachers hold. As an example, both the use of positive nonverbal gestures (e.g., nodding) and the tendency to ask questions prior to stating disagreement are more common to female interactions, with precocity in matching adult social skills serving to enhance popularity among females but not males (Adler et al., 1992). These more adult conventions may be particularly salient to teachers as students mature, resulting in the negative growth rates over time displayed by boys. We contend that boys are not losing social skills as they mature, but rather are not meeting the social standard set by girls in the same classes and are losing in a race of comparisons.

Because this study used teacher-rated social skills, the growth trajectory findings differed from some past studies. For example, Berry and O'Connor (2010) examined maternal-rated social skills in the same sample as our study and found that normative social skill development followed a nonlinear trajectory with two periods of acceleration followed by a period of deceleration (i.e., a quartic model). Similarly, Chan et al. (2000) found a nonlinear growth trajectory for home-based social skills ratings in a sample of 378 children in kindergarten through third grade. The current results partially overlap with teacher-based findings from Chan et al. (2000) in that teacher ratings of social skills followed a negative linear pattern over time, but only for boys in the current study. Girls did not differ in their rate of growth after accounting for initial level of social skills in kindergarten in the current study. However, Chan et al. (2000) did find that the slope growth factor for girls showed a slower rate of linear decrease from kindergarten to third grade compared to that of boys. Although there is good reason to think that teacher ratings offer a different lens on the social skills question than is possible with maternal ratings, findings from the current study provide additional support that girls' higher social skills ratings is evident from both teacher and maternal perspectives.

Methodological differences and sample characteristics between the current study and past research may also explain some of the different findings despite some overlap. For example, the current longitudinal sample was predominantly a low risk one, whereas the Chan et al. (2000) study used a sample of children enrolled in Head Start programs. While the current study sample may provide insight into social skills development within a lower-risk sample, the risk profile may have affected some of the gender-specific findings. Further, the current study used latent repeated measures over a longer period of time, whereas Chan et al. (2000) and Berry and O'Connor (2010) used observed repeated measures. The use of latent repeated measures within a growth modeling design allows for an examination of growth trajectories without contamination from measurement error or specificity. The use of latent variables offered an additional benefit to test factorial invariance (to

ensure equal measurement of social skills variables across developmental periods and gender groups) and assess latent means over a seven-year period of social skills development.

Limitations and future directions

There are several limitations that should be considered when interpreting the findings. The current study sample was drawn from multiple waves of the NICHD data that ended in 2004 and population demographics, school contexts, or educational policies may have shifted since data collection. Further, students' social skills were rated by teachers, and while teachers provide important contextual specificity, maternal ratings also provide unique information (Konold et al., 2010). For example, maternal ratings may be especially important for those social skills behaviors that may only be enacted in an environment outside of the school setting (i.e., some items may capture little to no variance within the school setting). Additionally, there is evidence of qualitatively different growth trajectories in social skills development based on rater (Berry & O'Connor, 2010; Chan et al., 2000); future theoretical models of social skills should consider how environmental setting moderates growth trajectories. Thus, conclusions regarding social skills development will be strengthened when information is gathered from multiple sources simultaneously. Given the majority of teachers were female, future research should also consider whether social skills ratings differ by gender-specific teachers and parents, as dyads may experience and observe different social interaction patterns.

Second, the number of latent repeated measures made it advantageous for assessing different growth patterns, however, some of the dynamic changes may have been better captured with more frequent measurements (e.g., biannual). Third, we used longitudinal data collected on an older measure of social skills (SSRS) of which is now the revised version referred to as the Social Skills Improvement System-Rating Scales (SSIS-RS; Gresham & Elliott, 2008). Research has shown high internal consistency estimates and moderately high validity indices for social skills between the SSRS and SSIS-RS (Gresham et al., 2011). Nonetheless, it would benefit the literature to conduct longitudinal studies using the SSIS-RS, which provides a more comprehensive conceptualization of social skills behaviors that is based on an updated normative sample.

Finally, the use of indirect ratings absent direct observation of social skills warrants conservative interpretation of results. The SSRS, like most rating scales, includes items that represent a continuum of highly specific and very broad behaviors that must be rated on a three-point scale (never, sometimes, and often). The more specific items describe situations that the teacher may not actually witness with any regularity, if at all (e.g., student responds appropriately to teasing) while the broad items encompass teacher impressions of a wide array of student behaviors (e.g., student cooperates with peers). However, "not observed" is not provided as a possible response option. It is likely that in the absence of specific information informing an item response, the teacher must guess, ostensibly by ceding to the teacher's more general impressions of the student's behavior. This is not a result of teacher bias per se, but rather an unavoidable result of rating scale use when teachers must report on behaviors tied to events they did not actually witness. Relatedly, An et al. (2019) assessed sources of variance in teachers' ratings of students' strengths for 344 kindergarten students in fall and spring for two consecutive years. In their analysis, rating occasion served to account for roughly half of explained variance (43%-50%) with the remaining variance explained by student (36%-46%) and teacher characteristics (11%-16%). We posit that specific situations witnessed by teachers between rating sessions served to influence both the specific and more general items. If so, evidence that girls tend to engage in structured play in closer proximity to teachers during the early years of schooling (Fabes et al., 2003; Martin & Fabes, 2001) may provide an explanatory mechanism for the greater male variability as additional opportunities to observe girls' play would reduce occasion-driven variability.

Theoretical and practical implications

According to our findings, girls were rated higher on social skills across development, which was inconsistent with the GSH (Hyde, 2014). In fact, the size of the difference in social skills is similar to the higher performance observed for girls on other variables such as processing speed or written expression (cf. Camarata & Woodcock, 2006; Hajovsky et al., 2018; Reilly et al., 2019). As we found differential social skills growth trajectories for boys and girls using latent repeated measures, this study provides additional support suggesting girls are rated higher in social skills within the educational setting across an extended period of early

schooling. Thus, a theory of social skills development may need to consider how subpopulations differ in their rates of social skills growth (Widaman et al., 2013). Further, although it was beyond the scope of the current study, developmental scholars should possibly consider which factors may influence those developmental differences. The identification of these factors will likely require an integration of multiple theoretical perspectives, including biological, social, and cognitive perspectives (Maccoby, 2002). For example, hormonal differences that begin prenatally shape behavior and may contribute to gender differences early (Berenbaum & Beltz, 2011; Hines, 2010) but differing expectations and play experiences may serve to widen the gap via opportunities to acquire and practice skills over time.

Practically speaking, social skills differences between boys and girls represent a complex proposition for schools seeking to remedy skill deficits as the groups diverged and the gap widened over time. If a school were to screen students for social skills deficits, a disproportionate number of boys would likely meet criteria for intervention. Conversely, the use of gender specific norms for screening would resolve the disproportionality while also excluding a number of boys that are not meeting teachers' expectations of social competence. That said, the divergence between groups represents a real risk for boys tasked with mastering academic content while learning to approximate socially appropriate behavior in a group setting. If verbal and nonverbal skills are not naturally mastered by boys (and some girls) to the expectations of teachers, the most reasonable course is to select and teach these skills explicitly. Schools and students would likely benefit by engaging in the process of defining and reinforcing those skills students need most. Moreover, these lessons may provide the teachers the opportunity to examine their own biases and expectations about the manner in which boys and girls communicate. It is possible that upon reflection, they may find unintentional reinforcement of their own assumptions in the classroom.

Conclusion

Growth models of social skills in school-age children support evidence of gender differences in social competence across development. Girls were rated moderately higher in social skills from kindergarten to sixth grade and boys generally demonstrated more variability in social skills over time. Boys and girls showed differential growth trajectories with boys decreasing, on average, at a constant rate from kindergarten to sixth grade and girls showing no average differences in their rate of growth after accounting for initial levels at kindergarten. Children who began kindergarten with lower-rated social skills tended to benefit from improved social skills ratings at a faster rate than their higher-scoring peers. This study adds to the literature by examining gender differences in characteristics of latent social skills and gender differences in growth trends over an extended period of school-age development. However, findings should be replicated with other social skills variables derived from other longitudinal samples to support conclusions.

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