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## Journal of Clinical Child & Adolescent Psychology

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t775648094>

### Social-Emotional Learning Skill, Self-Regulation, and Social Competence in Typically Developing and Clinic-Referred Children

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Online publication date: 11 November 2009

**To cite this Article** McKown, Clark , Gumbiner, Laura M. , Russo, Nicole M. and Lipton, Meryl (2009) 'Social-Emotional Learning Skill, Self-Regulation, and Social Competence in Typically Developing and Clinic-Referred Children', Journal of Clinical Child & Adolescent Psychology, 38: 6, 858 – 871

**To link to this Article:** DOI: 10.1080/15374410903258934

**URL:** <http://dx.doi.org/10.1080/15374410903258934>

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# Social-Emotional Learning Skill, Self-Regulation, and Social Competence in Typically Developing and Clinic-Referred Children

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Social-emotional learning (SEL) skill includes the ability to encode, interpret, and reason about social and emotional information. In two related studies, we examined the relationship between children's SEL skill, their ability to regulate their own behavior, and the competence of their social interactions. Study 1 included 158 typically developing children ages 4 to 14 years. Study 2 included 126 clinic-referred children ages 5 to 17 years. Findings from both studies supported the conclusion that SEL skill includes three broad factors: awareness of nonverbal cues; the ability to interpret social meaning through theory of mind, empathy, and pragmatic language; and the ability to reason about social problems. Furthermore, the better children perform on measures of SEL skill and the more their parents and teachers report that children can regulate their behavior, the more competent their social interactions.

Children's ability to develop positive peer relationships is critical to their well-being. Compared to children who are accepted by their peers, socially rejected

children are at substantially elevated risk for later adjustment troubles, including academic underachievement, school dropout, criminal activity, and psychiatric

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This study was made possible through the generous support of the Dean and Rosemarie Buntrock Foundation and the William T. Grant Foundation. Portions of this work were presented at the annual meeting of the American Educational Research Association in New York in March 2008 and the International Meeting for Autism Research in London in May 2008.

We thank Louis Fogg, Randi Hagerman, Steve Nowicki, Roger Weissberg, and Jenny Wojcik for their encouragement and helpful advice along the way. We thank Daniel Alderson, Bradley Bergey, Jason Johnson, Melissa Lee, Jonathan Levine, Mara Stankiewicz, Michael Strambler, Gregory Stasi, and Adelaide Walker for their assistance with all phases of this project. Finally, we are grateful to the educators, families, and children who agreed to participate in these studies.

For simplicity of presentation, not all covariances and associated inferential statistics are presented in this article. The authors would be happy to provide this information to interested colleagues.

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problems (Lopez & Dubois, 2005; Malecki & Elliott, 2002; Parker & Asher, 1987). In this context, the prevalence of social problems among school-aged children is alarming. Approximately 12% of elementary school students are actively rejected by their peers (Bierman, 2004; Coie, Dodge, & Cappotelli, 1982). With more than 39 million elementary-aged children in the United States (Snyder, Dillow, & Hoffman, 2007), this means that approximately 4 million struggle socially. Those children are at elevated risk of failing and dropping out of school, and of developing conduct and mental health problems.

## ANTECEDENTS OF PEER ACCEPTANCE

### Socially Competent Behavior

Children's own behavior strongly influences their social acceptance. For example, the more children engage in socially competent behavior, defined as cooperative, assertive, socially appropriate behavior, and skillful participation in group activities, the more accepted they are by peers (Newcomb, Bukowski, & Pattee, 1993). The link between socially competent behavior and peer acceptance is also suggested by intervention trials: School-based social competence promotion programs consistently increase a child's level of social competence as reported by parents and teachers; they also enhance children's peer acceptance (Conduct Problems Prevention Research Group, 1999; Domitrovich, Cortes, & Greenberg, 2007; Payton et al., 2008).

### Social-Emotional Learning (SEL) Skill

For children to engage in socially competent behavior, a large number of cognitive, behavioral, and emotional processes must operate in concert (Bierman, 2004; Crick & Dodge, 1994; Lipton & Nowicki, in press). In particular, children's SEL skill, defined as the ability to encode, interpret, and reason about social and emotional information, are associated with children's social behavior (Bierman, 2004; Crick & Dodge, 1994; Nowicki & Mitchell, 1998). In this article, when referring to specific SEL tests and the competencies they measure, we use the plural, "SEL skills"; when referring to the broad skill set reflected in performance on these tests, we use the singular, "SEL skill." In addition to SEL skill, self-regulation, particularly the ability to focus attention and inhibit impulses, associated with social competence (Barkley, 2001; Coie & Kupersmidt, 1983; Melnick & Hinshaw, 2000; Mischel, Shoda, & Peake, 1988; Raver, Blackburn, Bancroft, & Torp, 1999). Although it seems likely that social behavior and SEL skill influence one another bidirectionally, in this article we hypothesize that SEL skill and self-regulation are antecedents and socially competent behavior is the consequence.

## EVIDENCE FOR ASSOCIATIONS BETWEEN SEL SKILL AND SOCIAL SUCCESS

### Nonverbal Awareness: Reading Nonverbal Cues

The ability to read nonverbal cues that signal others' emotions is related to social success. Nowicki and Duke (1994) reviewed 14 construct validation studies and found that typically developing (TD) children's ability to infer others' emotions from facial expression, tone of voice, and posture was related to children's locus of control, self-esteem, peer regard, and achievement test scores. Similarly, in a review of SEL assessment in preschoolers, Denham (2006) reported that greater emotion recognition skill was associated with social competence. Furthermore, children with neuro-behavioral disorders, including learning disorders and autism-spectrum disorders (ASDs), have difficulty reading nonverbal cues (Capps, Yirmiya, & Sigman, 1992). Children with these and other disorders also have greater rates of peer relationship problems (Capps et al., 1992; Kavale & Forness, 1996). Impaired ability to read nonverbal cues is likely to contribute to difficulties with peers for these clinical populations. Overall, the evidence from typical and atypical populations suggests that the ability to read nonverbal cues contributes to social success.

### Social Meaning: Cognitive, Linguistic, and Emotional Interpretation of Social Cues

Social success is also associated with the ability to interpret others' intentions (theory of mind), the social meaning of language (pragmatic language), and one's own emotional response to others (empathy). Among TD children, the ability to make mental state inferences is positively associated with teacher report of more frequent competent and less frequent aggressive and withdrawn behavior (Hughes & Ensor, 2007; Slaughter, Dennis, & Pritchard, 2002), better teacher-reported interpersonal negotiating skill (Yeates, Schultz, & Selman, 1991), and greater peer regard (Banerjee & Watling, 2005; Slaughter et al., 2002). Similarly, greater verbal ability is associated with more frequent teacher-reported competence and less frequent aggression, which are in turn associated with peer regard (Slaughter et al., 2002). Pragmatic language skill in particular strongly predicts social behavior and social functioning (Capps, Kehres, & Sigman, 1998; Landa, 2000; McKown, 2007). Finally, the more empathic children's response to others' distress, the better their parent- and teacher-reported social functioning (Eisenberg et al., 1996).

Research with atypical populations also suggests the importance of these competencies. Children with ASDs

often demonstrate pragmatic language deficits (Hubbard & Trauner, 2007; Rapin & Dunn, 2003). Children with learning disorders and attention deficit hyperactivity disorder (ADHD) also often demonstrate pragmatic language deficits (Lapadat, 1991; Marton, Wiener, Rogers, Moore, & Tannock, 2009). Lower empathic ability is also noted in children with ASDs, ADHD, and learning problems (Braaten & Rosén, 2000; Marton et al., 2009).

### Social Reasoning

Research on social problem-solving has shown that the better children can identify social problems; develop appropriate social goals; and generate, evaluate, and select competent solutions to those problems, the more socially competent their behavior (Bauminger, Edelsztein, & Morash, 2005; Crick & Dodge, 1994; Denham, 2006; McKown, 2007). Conversely, impaired social problem-solving interferes with social functioning. Children with reading disorders, conduct disorders, and ASDs all exhibit social problem-solving impairment, which likely contributes to poor peer relationships (Bauminger et al., 2005; Channon, Charman, Heap, Crawford, & Rios, 2001; Crick & Dodge, 1996). Intervention trials also provide evidence of a link between social problem-solving skill and children's relationships. School- and clinic-based social problem-solving interventions reduce parent- and teacher-reported aggression and improve social relationships (Payton et al., 2008; Kazdin, Siegel, & Bass, 1992).

### Self-Regulation

We define self-regulation as the ability to modulate (inhibit, activate, or change) attention and behavior in response to a situation (Eisenberg, Smith, Sadovsky, & Spinrad, 2004; Smith-Donald, Raver, Hayes, & Richardson, 2007). Self-regulation encompasses several components and has been operationalized a variety of ways, including the ability to sustain attention, control impulses, and delay gratification. For our purposes, we focus on inhibition and attention because research suggests that behavioral inhibition and attentional capacity are associated with social outcomes. For example, in a study of 95 TD children, Mischel and colleagues (1988) found that the longer preschoolers were able to delay gratification, the more their parents reported that they were socially and academically competent 10 years later. In a study of 181 children, Hinshaw and Melnick (1995) found that children with ADHD who were low in inhibitory control were more poorly regarded by peers than children higher in inhibitory control. Although there are many dimensions to self-regulation, we focus on attention and inhibitory control because of its association with social outcomes.

## A MODEL OF FACTORS THAT AFFECT CHILDREN'S SOCIAL BEHAVIOR

Three models of SEL processes guide the present work. One model, proposed by Crick and Dodge (1994), holds that children encode, interpret, and reason about social information in a sequenced and recursive fashion that is influenced by memory and emotion and that shapes responses to social situations. Lemerise and Arsenio (2000) extended this model to emphasize the influence of emotion on social judgment. Denham (2006) described a second model of preschool children's social-emotional competence that emphasizes the importance of emotional expressiveness, emotion understanding, social problem-solving, and social and relationship skills. Adolphs (2003) described a third model of interrelated neural systems that work in concert to mediate the perception, interpretation, appraisal, and reasoning about social information and influence emotional and behavioral responses. Each model also acknowledges the importance of self-regulation in the production of social behavior.

Although these models come from different intellectual traditions, they share important features, including: (a) a "holistic" model of SEL processes that includes multiple interrelated components, (b) an emphasis on cognitive and affective processes, (c) propositions about what processing features are most salient in social situations, and (d) a flexible presumed sequence in which social information is processed. Perhaps most strikingly, all three models emphasize three critical features of SEL: (a) how social-emotional information is perceptually *encoded*, (b) how that information is cognitively and emotionally *interpreted*, and (c) how *reasoning processes are enlisted* to make sense of and formulate a response to the information. Finally, all three models suggest that self-regulatory capacity influences social behavior.

We propose a hybrid model that integrates components of the models of Crick and Dodge (1994), Denham (2006), and Adolphs (2003). Specifically, we propose that SEL includes three skill domains: (a) *nonverbal accuracy*, defined as the ability to label others' emotions from nonverbal cues; (b) *social meaning*, defined as the ability to interpret others' intentions, to understand the social meaning of language, and to experience others' feelings; and (c) *social problem-solving*, defined as the ability to identify and solve complex social problems. Furthermore, we propose that *self-regulation*, defined as the ability to inhibit behavior and focus attention, influences social success. We also propose that existing assessments designed for research are well-suited to measure children's abilities in these domains (Lipton & Nowicki, in press).

## Synthesis, Goals, and Hypotheses

In sum, children's SEL skill and self-regulation are associated with parent- and teacher-reported social competence and peer relationships. Less clear is what the key elements of SEL skill are, and how SEL skill and self-regulation together shape children's social competence. Furthermore, few reliable and valid strategies to assess SEL skill are suitable for clinical practice, leaving clinicians without a cohesive conceptual framework and measurement tools to assess children's SEL skill.

The purpose of the present study was to evaluate a model of SEL skill and to evaluate the criterion-related validity of individually administered tests of SEL skill. In terms of model testing, we hypothesized that (a) each of the three domains of SEL skill constituted an important element of SEL skill; (b) greater SEL skill, reflected in these three SEL domains, was associated with greater parent- and teacher-reported social competence; and (c) self-regulation made an independent contribution to parent- and teacher-reported social competence.

We addressed these hypotheses using different measures of the underlying constructs in two samples: a sample of TD children ages 4 to 14 years and a sample of clinic-referred children ages 5 to 17 years. Because both the samples and measures differ, examining the study hypotheses in these two samples allows us to evaluate the robustness of our model of SEL ability. One possibility is that these hypothesized relationships are similar in TD and clinic-referred samples, using different measures of SEL skills. Alternatively, it may be that these relationships are different in TD and clinic-referred samples, using different measures of SEL skills. If we find similar results in the two samples with different measures, this will lend confidence in the robustness of the model. This cross-sample replication of our hypothesized model will contribute to our understanding of the nature and impact of SEL skill. The applied goal of this study is to broaden the range of options for assessing and identifying SEL deficits that may underlie social failure.

## STUDY 1

### Methods

#### *Participants*

The study participants were students at two elementary schools that included children in preschool through Grade 8. Data were collected over the course of three school years. During Year 1, the 2006–2007 school year, 20 children participated in the study. During the 2007–2008 school year, 76 additional children participated. Finally, during the 2008–2009 school year, 62 more children joined the study for a total of 158

children. The Rush University Medical Center Institutional Review Board granted permission to invite children and their parents to participate in a study focused on the assessment of SEL skill. Consent forms and a letter of invitation were mailed to all parents in both schools, along with letters from the principal investigator and school administrators. Informational meetings were held with parents and teachers.

Both schools were in the Chicago area. School A was a north-suburban public school where 28.5% of the student body was ethnic minority (6.4% Black, 7.1% Hispanic, 7.9% Asian, and 7.1% biracial). School B was an urban Catholic school where 95.2% of the students were ethnic minority (58.0% Black, 28.2% Hispanic, and 9.0% Asian). Any student who attended one of these two schools was invited to participate in the study. There were no other inclusion or exclusion criteria. One hundred fifty-eight children in grades K through 8 and their parents consented to participate. Based on school records, mean age at time of testing was 8.8 years (range = 4–14 years,  $SD = 2.6$ ), with 55% of the sample being girls. Together, the sample consisted of the following ethnicities: 51% White, 23% Black, 18% Hispanic, 15% biracial, and 8% Asian.

#### *Measures*

*Facial affect recognition.* The Comprehensive Affect Testing System, or CATS (Weiner, Gregory, Froming, Levy, & Ekman, 2006) is a computer-administered test of nonverbal accuracy. Children were presented with stimuli and were asked to indicate what emotion was being expressed. For children below third grade, the examiner read response options and recorded the child's verbal response. Children completed Name Affect, a 16-item test in which children viewed pictures of faces and indicated from a menu of options what emotion each face was displaying. Internal consistency reliability was  $\alpha = .61$ .

*Prosody recognition.* Children also completed Match Emotional Prosody to Emotional Face (MEPEF) from the CATS; this is a 22-item test in which children listen to recordings of a person saying sentences. Children selected one of five faces that expressed the same emotion as the speaker's voice. Internal consistency reliability was  $\alpha = .66$ .

*Posture recognition.* To measure children's ability to infer others' emotions from posture, children viewed 24 photographs (Heberlein, Gläescher, & Adolphs, 2007), in random order, of adults in different postures, with faces obscured. Children indicated the emotion being expressed by each person. Internal consistency reliability was  $\alpha = .80$ .

**Gait recognition.** To measure children's ability to infer others' emotions from their gait, children viewed 20 short video clips in random order of "point-light walkers" or abstracted walking humans (Heberlein, Adolphs, Tranel, & Damasio, 2004). Children indicated whether the stimulus figure was happy, sad, angry, or scared. Internal consistency reliability was  $\alpha = .60$ .

**Theory of mind 1—Strange Stories.** The Strange Stories (Happé, 1994) is a series of brief vignettes in which a character says one thing but means another. The examiner read each vignette to children in Grades 5 and below. After each vignette, children were asked whether what the person said was true and why the person said what he said. For the "why" question, children's responses were coded correct if they used mental state language appropriately (e.g., "She said this because she *did not want* to hurt their feelings"). In this case, the child inferred the protagonist's desire, specifically, not to hurt someone's feelings. A team of four raters who were blind to children's identities independently coded the Strange Stories and achieved average pairwise kappas of .78. Discrepancies were resolved by consensus, with the child's final score being coded as correct when three or more raters coded the child as correct.

**Theory of mind 2—NEPSY-II ToM.** The second edition of the NEPSY (Korkman, Kirk, & Kemp, 2007) includes a theory of mind subtest. That test includes a "verbal" section. Most test items assess false belief understanding. Published internal consistency and test-retest reliabilities range from .76 to .84, depending on the age of the child (Korkman et al., 2007).

**Empathy.** Children completed a six-item self-report scale, adapted by Spinrad et al. (1999) that measures empathic concern about others in distress (e.g., "I feel sorry for other children who are sad or in trouble"). Children rated how true each item was for them, choosing between *not at all true*, *a little true*, *pretty much true*, or *a lot true*. Internal consistency reliability for this scale was Cronbach's  $\alpha = .80$ .

**Pragmatic language.** The Pragmatic Judgment subtest of the Comprehensive Assessment of Spoken Language, or the CASL (Carrow-Woolfolk, 1999), was administered to assess pragmatic language skill. For this test, children answered questions about what they would say in a variety of common social situations. Published internal consistency reliabilities for children ages 3 to 16 years range from .79 to .92, depending on actual age (Carrow-Woolfolk, 1999).

**Social problem-solving.** To assess social problem-solving skill, the examiner read five brief

vignettes about social situations. Children were asked to identify the problem, determine goals for the situation, identify potential solutions, and then chose one of their solutions (Bauminger, Edelsztein, & Morash, 2005). Vignettes reflected situations including peer entry, coping with peer pressure, responding to negative peer treatment and resolving differences of opinion (Crick & Dodge, 1996). Two sets of five vignettes were developed for children in grades K to 2 and two sets of five vignettes were developed for children in grades 3 and older. Prior to their testing, children were randomly assigned to one or the other problem-solving sets.

Four independent raters coded children's responses to the social problem-solving vignettes. Per Bauminger and colleagues (2005), for each vignette, raters assigned children a score for (a) how well they identified the problem (0 = incorrect or "I don't know," 1 = correct identification without reference to the social consequences of the problem, and 2 = correct identification with reference to the social consequences), (b) the quality of the goals they identified (competent/socially appropriate or noncompetent/socially inappropriate), (c) the kind of solutions they generated (competent or noncompetent), and (d) the congruence between their social goals and solutions they indicated they would choose (0 = contradiction between goal and chosen solution, 1 = no congruence, and 2 = congruence). Average pairwise  $\kappa$  across four raters was .63 (range = .34–.86). Average interrater covariance (Cronbach's alpha) was .91 (range = .83–.95). Thus, although raters did not always agree on an individual item, rater directionality was consistent. To reflect this consistency across raters, the final raw score for each child on each code was the average score across raters summed across the vignettes. There was no effect of condition on children's social problem-solving scores.

**Self-regulation.** The social skills rating system (SSRS) is a behavior rating scale assessing the frequency of socially competent and socially interfering behavior and has been used in many empirical studies examining children's social competence (Gresham & Elliott, 1990). The SSRS hyperactivity scale measures the frequency of impulsive and hyperactive behaviors. Parent and teacher reports of hyperactivity on the SSRS were used as a measure of poor self-regulation. In structural models, one factor loading was assigned a regression weight of  $-1$  so that this latent variable could be more naturally interpreted as reflecting self-regulation.

**Social competence.** The SSRS includes three scales assessing social competence (specifically, cooperation, assertiveness, and self-control). Across the forms and

scales used for this study, internal consistency reliabilities range from .72 to .94 (Gresham & Elliott, 1990).

### Procedures

**Experimental apparatus.** With the exception of the CATS, which was already computer delivered, photographs and movie clips for all nonverbal awareness measures were imported to a laptop computer platform using DirectRT and MediaLab from Empirisoft. That platform permitted the measurement of response accuracy and latency. Children were shown stimuli on a laptop computer and answers were recorded with an Empirisoft DirectIN button box. For children in grades K through 2, the experimenter used the button box to record the child's verbal response; children in Grades 3 through 8 indicated their responses with the button box on their own. Practice trials were administered before each test to ensure correct use of the button box.

**Data collection procedures.** Children were interviewed individually at their school by one of 10 trained research assistants. During data collection, up to three interviewers were conducted at each school for up to 6 weeks. With the exception of Year 2 when student data collection took place at School B during the month of February, student data collection took place between October and January in both schools. Individual testing lasted approximately 3 hours over the course of two or three sessions at the school. Teacher- and parent-report questionnaires were completed between 1 and 5 months after individual child testing. Of 63 children for whom only one parent completed a questionnaire, 54 (85.7%) were mothers. For data analyses that follow, mother report on the SSRS was used, except in the nine cases when only father report was available.

### Data Reduction

SEL measures were administered to between 92.7 and 100.0% of participants. Two exceptions were Strange Stories and NEPSY-II ToM. Only children Grades 5 and below completed these measures. A total of 58.2% of the study sample completed the NEPSY-II ToM test, and 69.6% completed Strange Stories. Teacher SSRS forms were completed for 98.1% of children; parent SSRS forms were completed for 81.0% of children. Missing data were estimated through Full Information Maximum Likelihood estimation, which is functionally equivalent to stochastic imputation (McArdle, 1994).

On many skill-based assessments, children's performance normatively improves with age. In these cases, the same raw score has a different meaning for children at different ages. Preliminary analyses evaluated the

relationship between age and raw scores on each measure. For the nonverbal accuracy measures, percentage of items correct was used as the raw score. For the NEPSY-II ToM and Strange Stories, the total number of correct items was used as the raw score. For the empathy self-report, average score across all items was used as the raw score. Age was significantly and positively associated with CATS Name Affect ( $r = .39, p < .05$ ), CATS MEPEF ( $r = .54, p < .05$ ), posture recognition ( $r = .45, p < .05$ ), gait recognition ( $r = .49, p < .05$ ), NEPSY-II ToM Verbal ( $r = .55, p < .05$ ), Strange Stories ( $r = .45, p < .05$ ), empathy self-report ( $r = .22, p < .05$ ), problem identification ( $r = .30, p < .05$ ), competence of solutions ( $r = .41, p < .05$ ), and competence of chosen solution ( $r = .41, p < .05$ ).

Each of these scores was converted to an age-corrected standard score. To do so, each SEL score was regressed separately on age and the standardized residual score was computed. That score reflected the difference, in standard deviations, between each child's score on a measure and their expected score, given their age. Age was not significantly associated with the goal-solution congruence raw score. For measures that were normed (CASL and SSRS), standard scores were derived from manuals. Age-corrected scores were used in subsequent analyses.

Children were nested in classrooms and teacher ratings were nested within teachers. Nested data often violate the assumption of independence of observations that underlies linear models. To assess departures from the assumption of independence, for each outcome measure (SSRS parent and teacher report of social competence), an unconditional random effects model was estimated using HLM 6.04 (Raudenbush, Bryk, Cheong, & Congdon, 2004), and the intraclass correlation (ICC) was computed. The ICC provides an estimate of the proportion of variability in the measure that is associated with classroom membership. The ICC associated with teacher report of social competence was .14, and the random effect associated with classroom membership was statistically significant. The ICC associated with parent report of social competence was .0008, and the random effect associated with classroom was not significant. To reduce dependencies associated with teacher ratings, the measure was standardized within classroom, which reduced the ICC to .000. The correlation between transformed and untransformed measures was  $r = .85$  ( $p < .05$ ). The transformed teacher social competence score was used in subsequent analyses.

### Hypothesis Testing

Hypothesis testing was conducted through confirmatory factor analysis (CFA) and structural equation

modeling using Amos version 17.0 (Arbuckle, 2008). For all models, maximum likelihood estimation was employed. The fit of all models was evaluated with overall chi-square goodness-of-fit,  $\chi^2/df$  adjusted goodness-of-fit, the comparative fit index (CFI), the incremental fit index (IFI), and root mean square error of approximation (RMSEA). Models were interpreted as a good fit with the data if the  $\chi^2/df$  adjusted goodness-of-fit statistic was less than 2, CFI and IFI were both .90 or greater, RMSEA was .08 or less (Browne & Cudeck, 1993), and hypothesized coefficients were significant ( $p < .05$ ) and in the predicted direction.

**Results**

**Confirmatory factor analysis (CFA).** CFA was used to evaluate the three-factor model of SEL skill. Four measures of nonverbal awareness—CATS Name Affect (facial affect), CATS MEPEF (prosody), posture photos (posture), and point-light walkers (gait)—were entered as indicators of a latent variable labeled “nonverbal awareness.” Four measures of social meaning, Strange Stories, NEPSY-II ToM, self-reported empathy, and CASL Pragmatic Judgment were entered as indicators of a latent variable labeled “social meaning.” Four measures of social problem-solving ability, quality of problem identification, competence of solutions generated, competence of solutions selected, and congruence between stated social goals and chosen solutions, were entered as indicators of a latent variable labeled “social reasoning.” Two indicators of social reasoning,

competence of solutions generated and competence of the solution picked, were conceptually related, so the error terms associated with these variables were modeled as correlated. The data fit this model well,  $\chi^2(50) = 71.2, p < .05$  ( $\chi^2/df = 1.4, CFI = .94, IFI = .95, RMSEA = .052$ ). All correlations between latent factors and all factor loadings were statistically significant. The three-factor model fit the data significantly better than a single factor model,  $\chi^2(53) = 90.0, p < .05$  ( $\chi^2/df = 1.7, CFI = .90, IFI = .91, RMSEA = .077$ ),  $\Delta\chi^2(3) = 18.8, p < .05$ .

**Structural model fitting.** We constructed a structural equation model to evaluate the relationship between SEL skill, self-regulation, and social competence. The Self-Regulation factor comprised parent and teacher report of hyperactivity on the SSRS. The Social Competence factor comprised parent and teacher report of social competence on the SSRS. Our preliminary CFA suggested that measures of nonverbal awareness, social meaning, and social reasoning can be modeled as indicators of a single underlying latent construct. We thus built the model so that latent factors labeled awareness, meaning, and reasoning were indicators of a second-order latent construct we called SEL skill. We modeled SEL skill and self-regulation as independent contributors to social competence. The fit of the data to this model was excellent,  $\chi^2(97) = 136.7, ns$  ( $\chi^2/df = 1.4, CFI = .93, IFI = .93, RMSEA = .051$ ). All regression coefficients and factor loadings were

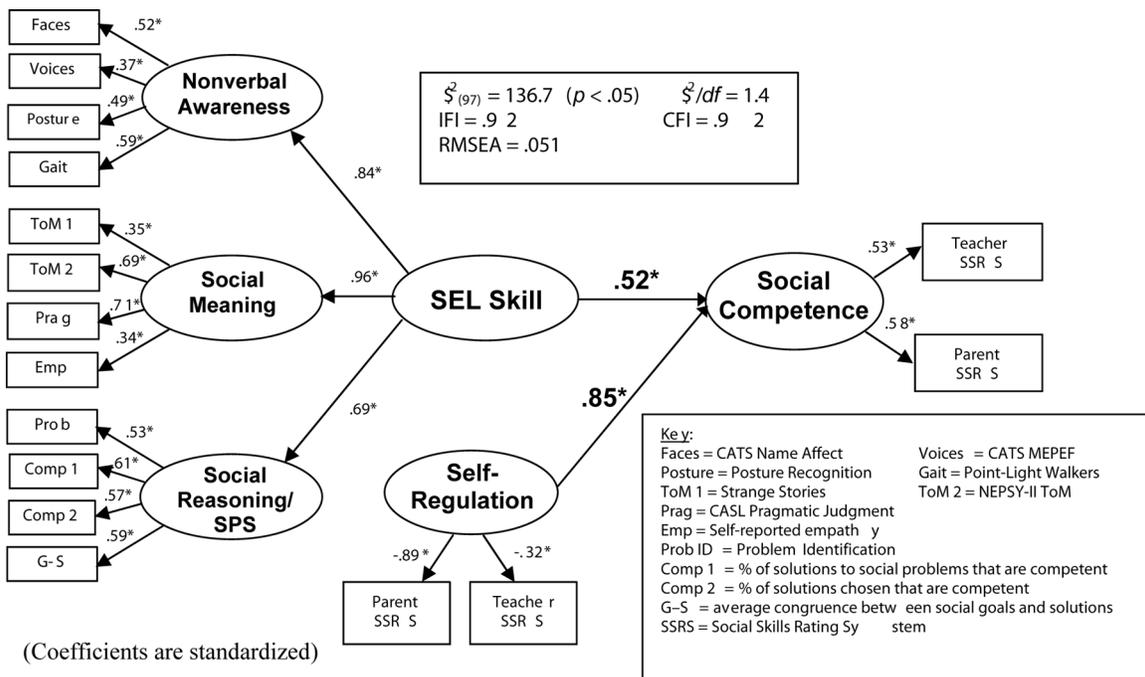


FIGURE 1 Structural relationship between social-emotional learning (SEL) skill, self-regulation, and social competence, Study 1.

statistically significant and in the predicted direction (see Figure 1).

## Discussion

Findings from Study 1 suggest that (a) SEL measures reflect three latent variables, including nonverbal awareness, social meaning, and social reasoning; (b) those factors in turn load onto a broad latent factor reflecting overall SEL skill; (c) the better children perform on tests of SEL skill, the more social competence their parents and teachers report; (d) parent and teacher report of self-regulation is associated with social competence; and (e) SEL skill and self-regulation independently predict social competence.

## STUDY 2

### Methods

#### *Participants*

This study used clinical chart data from a north-suburban Chicago pediatrics clinic as part of a multimethod, multirater study of the relationship between social-emotional learning skill and social functioning. The purpose of Study 2 was to replicate the models from Study 1 using different measures and with a clinic-referred sample. The Rush University Medical Center Institutional Review Board granted permission to include patient data in a clinical data repository including deidentified clinical chart data from children whose parents consented to their inclusion in the repository. Deidentified clinical data were extracted from the data repository.

Participants included 126 children ages 5 to 17 years ( $M = 11.2$ ,  $SD = 3.1$ ) who were administered an IQ test, parent and teacher behavior rating scales, and at least one of the following measures: (a) the Diagnostic Analysis of Nonverbal Accuracy (DANVA; Nowicki & Duke, 1994), (b) the Comprehension subtest of a Wechsler scale, (c) the CASL Pragmatic Judgment subtest (Carrow & Woolfolk, 1999), and (d) the Test of Problem-Solving (TOPS; Zachman, Huisinigh, Barrett, Orman, & LoGiudice, 1994). All children were evaluated to address parental concern about their academic, social, behavioral, or emotional functioning. Seventy-one percent of the sample was boys; 94% of the sample was White. Ninety-three percent of families had at least one parent with at least a college degree. Children in the sample received a variety of diagnoses, including ADHD, ASDs, learning disorders, and mood and anxiety disorders. A minority of children did not meet formal diagnostic criteria for any *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.;

American Psychiatric Association, 1994) disorders. Doctoral-level clinical psychologists using multimethod, multi-informant assessment practices conducted all the diagnostic evaluations.

#### *Measures*

*Affect recognition.* Children completed the child faces, child voices, adult faces, and adult voices subtests of the DAVNA (Nowicki & Duke, 1994). For the faces subtests, children looked at photographs of faces and indicated whether the person was happy, sad, angry, or fearful. For the voices subtests, children listened to audio recordings and indicated from the person's tone of voice whether he was happy, sad, angry, or fearful. For each subtest, the number of errors was tallied and standard scores were derived from a table of age norms. Nowicki and Duke (1994) reported internal alpha reliabilities between .77 and .88 and 4-week test-retest reliabilities between .74 and .86 for the four subtests of the DANVA.

*Social Language Comprehension.* The Comprehension subtest of the Wechsler Intelligence Scales (Wechsler, 2003) includes questions in which children must interpret and apply knowledge of social conventions. The number of correct responses was tallied and scaled scores were derived from a table of age norms. For Comprehension, reported internal consistency reliability is .81 and test-retest reliability is .82 (Wechsler, 2003). Each child completed the age-appropriate version of the Wechsler scales.

*Pragmatic language.* The CASL Pragmatic Judgment subtest was administered (see Study 1).

*Social problem-solving.* The TOPS is a test of critical thinking in context (Bowers, Barrett, Huisinigh, Orman, & LoGiudice, 1991; Zachman et al., 1994). The elementary version was administered to children younger than age 12 and the adolescent version was administered to children ages 12 and older. In the elementary form of the TOPS, children look at pictures of people doing things and answer questions. In the adolescent form, children listen to vignettes involving people doing things and then answer questions. TOPS questions include defining problems, identifying the causes of social situations, predicting outcomes, understanding social conventions, and generating solutions to social problems. The number of correct responses was tallied and a standard score was derived using a table of age norms. Reported test-retest reliability for the elementary edition is .85 (Zachman et al., 1994) and .86 for the adolescent version (Bowers et al., 1991).

**Self-regulation.** The Behavioral Assessment System for Children (BASC) is a behavior rating scale with scale internal consistencies in the high .8 to .9 range (Reynolds & Kamphaus, 1992). Teacher, mother, and father report of inattention on the BASC served as indicators of self-regulation. In structural models, one factor loading was assigned a regression weight of  $-1$  so that this latent variable could be interpreted as reflecting self-regulation.

**BASC, social competence.** Teacher, mother, and father report of social skill and leadership on the BASC were used as indicators of social competence. The Social Skills scale of the BASC includes social behaviors such as polite manners, eye contact, and other desirable social behaviors. The Leadership scale includes items focused on successful and skillful participation in group activities. Scores on these scales are correlated with scores on the SSRS (Flanagan, Alfonso, Primavera, Povall, & Higgins, 1996; Reynolds & Kamphaus, 1992).

**Results**

*Missing Data*

Children in Study 2 were not given a standard battery of tests. Rather, different combinations of tests were used to address the individualized referral questions for each child. As a result, not all children completed

all of the measures of social-emotional learning, and not all parents and teachers completed the BASC. The percentage of children who had each measure available was DANVA Child Faces, 87%; DANVA Child Voices, 87%; DANVA Adult Faces, 84%; DANVA Adult Voices, 83%; Wechsler Comprehension, 84%; CASL Pragmatic Judgment, 69%; TOPS, 74%; BASC Teacher Form, 79%; BASC Mother Form, 93%; BASC Father Form, 79%. As in Study 1, missing data were imputed with Full Information Maximum Likelihood estimation.

*Hypothesis Testing*

**Confirmatory factor analysis.** Using the same procedures as Study 1, CFA was used to evaluate the fit of the data to a three-factor model of SEL skill. Four DANVA subtests were entered as indicators of a latent variable labeled “awareness.” CASL Pragmatic Judgment and Wechsler comprehension were entered as indicators of a latent variable labeled “meaning.” The TOPS was entered as the sole indicator of social reasoning. The data fit this model well,  $\chi^2(12) = 10.0, ns$  ( $\chi^2/df = .83$ , CFI = 1.00, IFI = 1.01, RMSEA = .000). All factor loadings and correlations between latent factors were statistically significant. An alternative single-factor measurement model in which all indicators loaded on a single latent variable labeled SEL skill was a poor fit to this data,  $\chi^2(14) = 62.7, p < .05$  ( $\chi^2/df = 4.48$ , CFI = .82, IFI = .83, RMSEA = .17),  $\Delta\chi^2(2) = 52.7, p < .05$ .

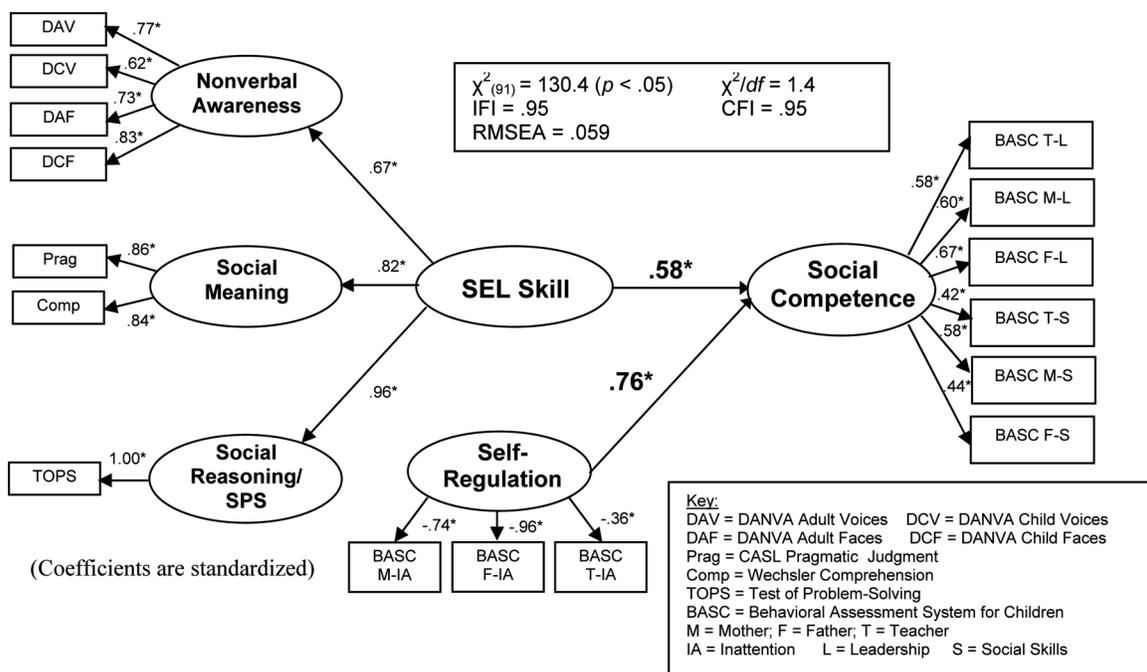


FIGURE 2 Structural relationship between social-emotional learning (SEL) skill, self-regulation, and social competence, Study 2.

**Structural model fitting.** Structural equation modeling was used to evaluate the relationship between SEL skill, self-regulation, and social competence. The Self-Regulation factor included teacher, mother, and father report of inattention on the BASC. The Social Competence factor included teacher, mother, and father report of leadership and social skill on the BASC. To account for common method and common rater variance on the scales that make up this latent factor, error covariances were modeled across raters within each scale (social skills and leadership) and within rater across scales. As in Study 1, we constructed the structural model so that the latent variables associated with awareness, meaning, and reasoning were treated as indicators of a second-order latent construct labeled SEL skill. We modeled SEL skill and self-regulation as independent contributors to social competence. The overall fit of the data to this model was excellent,  $\chi^2(91) = 130.4$ ,  $p < .05$  ( $\chi^2/df = 1.4$ , CFI = .95, IFI = .95, RMSEA = .059). Furthermore, all coefficients were statistically significant and in the predicted direction (see Figure 2).

## Discussion

Findings from Study 2 suggest that (a) SEL measures reflect three latent factors, corresponding to measures of nonverbal awareness, social meaning, and social reasoning; (b) those factors load onto a second-order latent factor reflecting overall SEL skill; (c) the better children perform on tests of SEL skills, the more social competence their parents and teachers report; and (d) parent and teacher report of self-regulation is associated with social competence.

## GENERAL DISCUSSION

Both studies provide evidence of what specific SEL skills are related to social success in typical and clinic-referred children. First, consistent with the literature on nonverbal accuracy (Nowicki & Duke, 1994; Nowicki & Mitchell, 1998), the ability to infer what people are feeling from nonverbal behavior is an important component of social life. Furthermore, study findings are consistent with the literatures on theory of mind (Flavell, 1999), empathy (Eisenberg et al., 1996), and pragmatic language (Lapadat, 1991; McKown, 2007), both of which suggest that the ability to share others' subjective experiences are important contributors to children's ability to interpret the meaning of social information. Finally, these findings support the literature on social problem-solving (Crick & Dodge, 1994), which suggests that the abilities to define problems, develop appropriate social goals, generate alternative solutions, and select an

appropriate solution are important predictors of social outcomes.

Data from multiple and varied measures of SEL skill in both studies fit a three-domain measurement model, which was superior to an alternative one-domain model. In both typical and clinical samples, the three latent factors representing nonverbal awareness, social meaning, and social reasoning all loaded on a second-order latent factor that we labeled SEL skill. Despite differences between the two data sets, both studies provide evidence that the three domains of SEL skill and self-regulation are predictors of competent social behavior.

Findings from both studies are consistent with core propositions of several models of children's social cognition (Adolphs, 2003; Crick & Dodge, 1994; Denham, 2006; Lipton & Nowicki, in press), which suggest that SEL processes include multiple interrelated components that function in a coordinated way in response to social situations to guide individual behavior. Furthermore, these models share common propositions about how SEL works. Specifically, all include propositions about (a) how social-emotional information is encoded, (b) how the information is interpreted, and (c) how higher-order reasoning is enlisted to work through social problems that arise. Both studies presented in this article provide evidence for the importance of these three domains of SEL in guiding children's social behavior.

These studies also suggest that SEL skill is strongly associated with social behavior. Both studies suggest that multiple SEL skills operate in concert and each contributes to a child's social behavior. Bierman (2004) argued that social cognition, though important, is only weakly associated with social behavior and social outcomes. Her conclusion was based on research involving only the assessment of social problem-solving skill. In the present studies, the robust standardized regression coefficients linking SEL skill to children's social competence suggest that sampling SEL skills broadly leads to robust predictive validity. Integrating across theories and methods has provided support for a new model of SEL ability, and it has yielded the practical dividend of providing guidance to clinicians about the range of SEL domains that might be fruitfully assessed to understand the sources of children's social impairment.

At a practical level, these studies strongly suggest that a range of SEL skills matter. In Study 1, greater SEL skill was predictive of more frequent displays of social competence up to 5 months later. Similarly, in Study 2, greater SEL skill was associated with more frequent concurrent displays of social competence. The magnitude of this relationship was moderate to strong (Cohen, 1988), with standardized regression coefficients of .52 in Study 1 and .58 in Study 2. A strength of this finding is the complete nonoverlap in methods between the predictor (SEL skill) and the criterion (social competence).

The lack of common method variance between these factors is likely to result in a noninflated estimate of the relationship between predictor and outcome. Given substantial differences in the characteristics of the samples and the measures, the similarity in effect sizes suggests a robust phenomenon.

In both studies, greater self-regulation (as measured by the SSRS and BASC) was associated with more frequent concurrent social competence. The standardized regression coefficients reflecting the relationship between self-regulation and social competence were .85 in Study 1 and .78 in Study 2. These findings suggest that in addition to being able to skillfully encode, interpret, and reason about social and emotional information, children's ability to regulate (inhibit) their behavior is an important determinant of social outcomes. In both studies, the measures that constituted self-regulation and social competence shared common raters and methods. As a result, the relationship between self-regulation and social competence may be somewhat inflated by common rater and method variance. In addition, the scales used in the two studies were somewhat different, with the SSRS Hyperactivity scale used in Study 1 and the BASC Inattention scale used in Study 2. The noteworthy similarity in findings between the two studies suggests that these two dimensions of self-regulation—hyperactivity and inattention—are each important predictors of social competence.

### Limitations

We sought to identify factors common to several prominent models of SEL, integrate them into one model, and test that model by evaluating the relationship between the key hypothesized factors that affect social behavior and functioning. Although social behavior and social functioning are influenced by a diverse array of individual and situational factors, many of these factors were not examined in these two studies as it was not the goal to identify *all* factors that influence children's social lives. Further research should explore other factors that influence social behavior and functioning.

Measures of SEL skill used in these studies were chosen because of their relevance to our hybrid model. The measures demonstrated good content validity, a factor structure consistent with our model, and a robust association with parent- and teacher-reported social competence. Nevertheless, the measures have some limitations. It is unclear, for example, how much performance on static measures of social information reflects the dynamic skills required to navigate daily life. Future research using measures that more closely approximate lived experience may provide richer information about children's social-emotional strengths and needs.

In both studies, we relied on parent and teacher report on well-established behavior rating scales to indicate the frequency of children's socially competent behavior. One disadvantage of this strategy is that it relies on third-party reporters to rate children's social behavior. This strategy has been extensively employed in many studies, including most of the studies reviewed in the introduction to this article. Furthermore, teachers and parents have an extensive base of knowledge on which to draw in assessing children's social behavior. Nevertheless, it is important to note that what parents and teachers think about a child's social competence is not always the same as directly observed social behavior. Future research should evaluate the relationship between SEL skill and children's social behavior and functioning as assessed through direct observation and peer nomination procedures.

Our SEL model assumes a causal effect of SEL skill on social behavior. However, behavior and SEL skill likely influence each other reciprocally. The correlational design of these two studies does not permit strong inferences about the direction of effects between variables in the model. A strength of Study 1 was that SEL data were collected before behavioral rating scale data. The temporal ordering of the variables permits us to conclude that in the Study 1 data set, social behavior measured at Time 2 did not affect SEL skill measured at Time 1. Future research, using longitudinal and experimental study designs, perhaps in the context of intervention trials, will help disentangle the direction of effects between different components of social interaction.

These studies have relatively small sample sizes ( $n = 158$  and  $n = 126$  in Study 1 and Study 2, respectively) and substantial differences in sample characteristics. Therefore, interpreting findings from either sample alone requires caution. Despite the small sample sizes, in both studies, the fit of the data to the models was excellent and the magnitudes of the coefficients were robust and in the predicted direction. That the data fit the measurement and structural models in both samples (TD and clinic-referred) and that regression coefficients were the same valence and similar magnitude suggests that these findings are robust and generalizable. Further evaluation with different measures and varied populations of typically developing and atypical populations will help determine the robustness and generalizability of this model.

Another potential limitation of these studies is the difference in number and kind of measures used to represent SEL skill, self-regulation, and social competence in the two studies. In Study 1, nonverbal awareness consisted of two subtests of the CATS, a posture recognition task and a gait recognition task; in Study 2, four subtests of the DANVA measured nonverbal

awareness. In Study 1, two ToM tests, an empathy questionnaire, and a pragmatic judgment task measured social meaning; in Study 2, a test of pragmatic language and social convention understanding reflected social meaning. In Study 1, responses to several social problem-solving vignettes measured social reasoning; in Study 2, score on the TOPS reflected social reasoning. Furthermore, different measures assessed self-regulation and social competence. Study 1 used the SSRS hyperactivity scale to reflect self-regulation; for Study 2, the BASC inattention scale was used. In Study 1, the SSRS social competence scale reflected social competence; in Study 2, the BASC social skills and leadership scales reflected social competence. These differences also represent a strength: The striking similarity in pattern of findings across studies suggests that *despite* differences in the number and kind of measures, the underlying constructs were well represented by those measures and that those constructs are robust predictors of social outcomes across settings and samples.

SEL skills change with age. Furthermore, this study included a sample with a wide age range. However, none of the hypotheses, analyses, or findings speaks to developmental changes in children's SEL skill, social behavior, or social relationships. We also did not examine whether our model of SEL skill is invariant or changes across the age span included in the studies. The comparatively small sample size limited our ability to examine age changes. Simple correlations in the Study 1 dataset suggest that on tests of SEL skill children perform better with age. Future research with larger samples will be needed to examine (a) age-related changes in SEL skill, (b) construct heterotypy or homotypy over time, and (c) continuity and change in the underlying structure of SEL and its relation to outcomes.

### Implications for Research, Policy, and Practice

Our hybrid model of SEL skill and social competence is supported in Studies 1 and 2 and thus provides a useful tool for researchers, policymakers, and practitioners. Researchers may use the findings that three domains of SEL and self-regulation are strongly related to social competence to focus their own investigations of SEL skill and children's social functioning. Policymakers may also find these studies useful. Several states have passed legislation requiring schools to assess and address students' social-emotional needs. However, what SEL is and how it is best assessed remain unanswered questions that undoubtedly make it difficult for educators to know how to proceed. Our findings may help policymakers and educators identify components of SEL to address through curriculum-based interventions. In addition, these studies demonstrate several strategies that can be employed to assess children's SEL skills.

Clinicians may benefit from this work as well: Armed with feasible assessment strategies, practitioners may be able to identify more specifically than was previously possible contributors to childhood social impairment and develop intervention strategies tailored to each child's needs. One challenge is that many of the tests that make up the SEL battery in Study 1 are not yet well normed, limiting the interpretability of individual children's scores on these tests. However, a subset of tests in each domain are normed, suggesting that even absent further development, validation, and norming, clinically useful assessment tools are at the clinician's disposal. A second clinical implication of these studies is that SEL skill and self-regulation each shape children's social outcomes. Therefore, assessing both aspects of a child's repertoire is important to understanding those factors that may shape a child's social life.

An important goal of this kind of assessment development is to create theoretically informed, empirically supported strategies that clinicians can use to understand the strengths and limitations that affect each child's social relationships. More important than merely characterizing these strengths and limitations, however, is using that characterization to inform targeted treatment planning to support children's social development. An important next step in this field of research will be to investigate optimal strategies for linking functional assessment of underlying SEL deficits to intervention strategies that help children develop the skills and self-control to become masters of their social destinies.

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