Social-Emotional Factors and Academic Outcomes Among Elementary-Aged Children

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**Social–emotional comprehension involves encoding, interpreting,
and reasoning about social–emotional information, and self-
regulating. This study examined the mediating pathways through
which social–emotional comprehension and social behaviour are
related to academic outcomes in two ethnically and socioeconom-
ically heterogeneous samples totaling 340 elementary-aged chil-
dren. In both samples, social–emotional comprehension, teacher
report of social behaviour, and academic outcomes were measured
in a single school year. In both samples, structural equation
models showed that the relationship between social–emotional
comprehension and reading was mediated by socially skilled be-
haviour. In one sample, but not the other, the relationship between
social–emotional comprehension and math was mediated by so-
cially skilled behaviour. This paper advances our understanding
of the mechanisms through which social–emotional factors are as-
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Key words: social–emotional comprehension; social behaviour;
academic outcomes

An important issue in education and applied developmental science concerns the
pathways through which social–emotional factors affect academic outcomes. Prior
research has examined two kinds of social–emotional factors. First, many studies
suggest that *social behaviour* is associated with academic outcomes (DiPerna
& Elliott, 1999). Other research suggests that *social–emotional comprehension—*
defined as mental processes for encoding, interpreting, and reasoning about

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social–emotional information and self-control—is associated with academic outcomes Izard, Fine, Schultz, Mostow, Ackerman, and Youngstrom, (2001). Less research has examined the mediating pathways through which these factors are related to academic outcomes. The purpose of this study is to examine the relationship between social behaviour, social–emotional comprehension, and academic outcomes in two independent samples.

The critical role of social–emotional factors has been increasingly recognized in educational policy and practice. For example, a growing number of states have adopted elementary and secondary social–emotional learning standards (Dusenbury, Zadrazil, Mart, & Weissberg, 2011). In parallel, social–emotional curricula have proliferated (e.g., Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011). Many have argued that social–emotional factors are related to academic outcomes because schools are inherently social settings and the process of learning is inherently social (Zins, Bloodworth, Weissberg, & Walberg, 2004). Well-developed social–emotional factors increase student availability to learn and engage with their peers, in turn promoting academic outcomes (Elias & Haynes, 2008; Zins et al., 2004). For example, social skills lead to interpersonal support from peers and teachers, which then promotes academic competence (Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo, 2000).

'Social–emotional comprehension' includes mental processes enlisted to encode, interpret, and reason about social–emotional information (Lipton & Nowicki, 2009). The ability to recognize emotion from facial expressions is one example of encoding. The ability to take another person's perspective is an example of interpreting social–emotional information. Engaging in effective problem-solving is an example of reasoning ability. These factors and self-control are critical for social–emotional comprehension (Lipton & Nowicki, 2009).

Research has consistently found a relationship between social–emotional comprehension and academic outcomes. Although studies use varied terminology, the broad constructs they examine significantly overlap what we call social–emotional comprehension. For example, Izard and colleagues (2001) found that 5-year-olds' emotion knowledge predicted teacher-reported academic competence at age 9. Similarly, Nowicki and Duke (1992) found that the better elementary-aged children could identify emotions from facial expressions and other nonverbal cues through direct assessment, the better their standardized test scores. Blair and Razza (2007) reported that preschoolers' theory of mind understanding was significantly associated with kindergarten letter knowledge and math skill. Similarly, Lecce, Caputi, and Hughes (2011) found that preschool theory of mind skill was associated with teacher rating of academic achievement 2 years later. Denham and colleagues (2012) found that preschoolers' responses to hypothetical social problems were associated with school readiness and kindergarten indicators of academic functioning. Ziv (2012) also found that for preschoolers, social reasoning was related to school readiness and this relationship was mediated by social competence. Others have found that among school-aged children, social problem-solving skills were associated with academic outcomes (Dubow, Tisak, Causey, Hryshko, & Reid, 1991; Rotheram, 1987). Finally, in two longitudinal samples, Duckworth and Seligman (2006) found that self-control was a stronger predictor than IQ of eighth graders' academic outcomes.

In addition to the mental processes that make up social–emotional comprehension, children's behaviour is an important part of their social–emotional repertoire. We define 'social–emotional execution' as behaviour expressed during interaction to achieve social goals. Social–emotional execution includes socially skilled

behaviour, or behaviour that increases the likelihood of developing positive connections with peers such as cooperativeness, assertiveness, turn-taking, and conversational skills. Social–emotional execution also includes problem behaviour, which decreases the likelihood of achieving social goals. Problem behaviours include aggression, impulsivity, and social withdrawal. The behaviours that make up social–emotional execution are well characterized by behaviour rating scales such as the Social Skills Improvement System (SSIS) rating scales (Gresham & Elliott, 2008).

Research has demonstrated that social–emotional execution plays a critical role in children's social relationships and academic engagement. For example, DiPerna and Elliott (1999) found that teacher-reported interpersonal skills such as getting along with others, listening to others, accepting suggestions, and interacting well with adults were positively associated with Iowa Test of Basic Skills (ITBS) scores among first through sixth graders. In a sample of 423 sixth and seventh graders, Wentzel (1993) found that controlling for IQ and demographic characteristics, more peer-nominated sharing and cooperativeness was associated with better grades and standardized test scores. Caprara and colleagues (2000) found that self-rated, peer-rated, and teacher-rated cooperativeness, sharing, and kindness in third grade were prospectively related to eighth grade academic achievement.

In contrast, problem behaviour can interfere with academic outcomes. For example, in a longitudinal study, Stipek and Miles (2008) found that teacher-reported aggressive behaviour in kindergarten was negatively associated with standardized literacy and math test scores in subsequent grades, partially mediated by teacher–student conflict. Among elementary-aged children, particularly inattention and hyperactivity are associated with negative academic outcomes, and in adolescence, the negative association between aggression and academic outcomes becomes more prominent (Hinshaw, 1992).

The research reviewed earlier examined either the relationship between social–emotional comprehension and academic outcomes or the relationship between social–emotional execution and academic outcomes. This leaves open the question of how social–emotional comprehension and execution operate together to shape academic outcomes. A few studies have examined mediating pathways through which social–emotional factors affect academic outcomes. For example, Trentacosta and Izard (2007) studied a low-income minority sample and found that the relationship between kindergarten emotion competence and first grade academic competence was largely mediated by teacher-rated focus and attention. Similarly, Rhoades, Warren, Domitrovich, and Greenberg (2011) found that the relationship between preschool emotion knowledge and first grade academic competence was mediated by kindergarten teacher-reported attention. Iyer and colleagues (2010) examined the longitudinal relationship between teacher-reported effortful control—reflected by behaviours such as the ability to calm when asked (inhibitory control) to leave a project when asked (attention shifting), and to concentrate well (attention focusing)—and academic outcomes. They found that time 1 effortful control was associated with time 3 achievement, mediated by time 2 school engagement.

This study extends work on the pathways through which social–emotional comprehension is associated with academic outcomes. The broad hypothesis tested in this study is that the relationship between social–emotional comprehension and academic outcomes is mediated by socially skilled and problem behaviour. Study hypotheses are tested in the context of two independent ethnically and socioeconomically diverse samples of elementary-aged children. To test the relevance of the hypothesis across a broad age range, Sample 1 included children

in kindergarten through fifth grade. To replicate these findings in a more focused age range, Sample 2 included children in kindergarten through third grade. We chose the elementary school years because many social–emotional learning policies and programmes focus on this age range (Weissberg, Goren, Domitrovich, & Dusenbury, 2013). In the present study, social–emotional comprehension was conceptualized as a broad construct encompassing emotion recognition, perspective-taking, social problem-solving, and, in one sample, self-control, all measured with performance-based direct assessments. Furthermore, the present study conceptualized social–emotional execution as socially skilled and problem behaviour. Teacher report of social–emotional execution was examined as mediators of the relationship between social–emotional comprehension and academic outcomes.

METHODS

Study Sampling and Design

Informed consent

For both samples, the Rush University Medical Center Institutional Review Board approved all procedures. Parent informed consent and child assent were obtained for all participants.

Recruitment

Both samples were recruited from Chicago-area urban and suburban school districts with which the investigative team had developed research and consultation collaborations. Through those partnerships, we worked with students from diverse ethnic and socioeconomic backgrounds, from schools spanning urban to suburban, and serving mainly low-income to serving mainly affluent students. In participating elementary schools, consent forms and a letter inviting children to participate in the study were sent home to parents.

Design

In both samples, direct assessments of social–emotional comprehension and teacher report of social–emotional execution were gathered over the course of a single academic year. In Sample 1, standardized test score data from the same year were also gathered. In Sample 2, all participating students completed achievement testing as part of the study. In both samples, verbal or intellectual ability was also collected to be used as a covariate.

Sample 1 Characteristics

Parents of 139 children from kindergarten through fifth grade ($M_{age} = 7.8$, $SD = 1.6$) from a suburban public school (School A) and an urban parochial school (School B) consented to their children's participation. The schools totalled approximately 220 children in kindergarten through fifth grades. Consenting children completed individual social–emotional comprehension assessments between October and January. Thirteen teachers (six from School A and seven from School B) completed behaviour rating scales in the winter (January and February). Each school administered a standardized achievement test, described later.

Among 139 children whose parents consented to their participation, three children were missing all achievement data and three were missing more than half of

the social–emotional comprehension data. Those children were excluded from analyses, leaving a total sample of 133 children. A subset of the sample ($n = 75$) from both schools took a standardized achievement test during the study year. Participant characteristics are described in Table 1.

Sample 1 Measures

Verbal ability

Children from Sample 1 were given the 30-item Vocabulary subtest of the Wechsler Intelligence Scale for Children, Third Edition (WISC-III; Wechsler, 1991). For this task, children were asked to say the meaning of words. This subtest is strongly correlated with Full Scale IQ ($r = .79$; Sattler, 1992).

Social–emotional comprehension

In Sample 1, to assess emotion recognition, children viewed photographs of 16 faces and 24 body postures, listened to pre-recorded voices making 22 statements, and selected the emotion reflecting the facial expression and tone of voice (Weiner, Gregory, Froming, Levy, & Ekman, 2006), or posture (Heberlein, Gläescher, &

Table 1. Sample characteristics

Characteristic	Sample 1 ($n = 133$)		Sample 2 ($n = 207$)	
	n	%	n	%
Grade				
K	26	19.5	46	20.9
1	25	18.8	54	24.5
2	22	16.5	65	29.5
3	36	27.1	55	25.0
4	10	7.5	–	–
5	14	10.5	–	–
Sex				
Male	61	45.9	101	45.9
Female	72	54.1	119	54.1
Ethnicity				
White	61	45.9	136	61.8
Black	34	25.6	13	5.9
Hispanic	14	10.5	53	24.1
Asian	7	5.3	13	5.9
Mixed race	17	12.8	5	2.3
Measure	M	SD	M	SD
Age	7.8	1.6	7.4	1.1
Vocabulary	10.8	3.4	–	–
IQ	–	–	106.3	13.9
Socially skilled behaviour	101.4	16.4	104.3	15.1
Problem behaviour	99.1	14.2	94.9	10.7
SSRS/SSIS reading	3.4	1.1	3.6	1.2
SSRS/SSIS math	3.4	1.0	3.5	1.1
Reading test	5.5	2.3	56.6	26.2
Math test	5.1	2.2	60.3	24.3

SSRS = Social Skills Rating System; SSIS = Social Skills Intervention System.

Adolphs, 2007). Children also viewed 20 point-light displays, which are brief video clips of humans walking with only reflective dots on limbs representing the walking person (Heberlein, Adolphs, Tranel, & Damasio, 2004). The raw score for each measure was the percentage of correct items. Internal consistencies for these assessments were moderate to good ($\alpha_{NA} = .61$, $\alpha_{MEPEF} = .61$; $\alpha_{postures} = .81$; $\alpha_{point\text{-}light} = .59$).

To assess children's ability to interpret social meaning, two assessments were administered. First, perspective-taking was assessed using 12 vignettes from Strange Stories (Happé, 1994; White, Hill, Happé, & Frith, 2009). In each story, a character says one thing but means something else. Children were asked why the character said what he or she did. Accurate inferences about the speaker's intent were scored as correct. Average pairwise Kappa between raters was .78. Internal consistency reliability was $\alpha = .72$. Children also completed the 60-item Pragmatic Judgment subtest of the Comprehensive Assessment of Spoken Language (Carrow-Woolfolk, 1999). This test assesses knowledge of social language conventions such as greeting, requesting information, expressing sympathy, joining a conversation, and polite interruption. Internal consistency reliability was $\alpha = .96$.

Social problem-solving skill was assessed through a vignette-based interview (Bauminger, Edelsztein, & Morash, 2005; Crick & Dodge, 1994; McKown, Gumbiner, Russo, & Lipton, 2009; Russo-Ponsaran, Berry-Kravis, McKown, & Lipton, 2014) consisting of five vignettes reflecting social problems that children are likely to encounter, including peer entry, peer pressure, peer provocation, and differences of opinion. After each vignette, children defined the problem, identified a social goal, generated potential solutions, and indicated which solution he or she would choose. Independent raters coded children's verbatim responses. Raters assigned a score for the following: (a) how well each problem was defined; (b) the quality of social goals; (c) each proposed solution; and (d) the congruence between the social goal and preferred solution. All protocols were coded by at least two raters. Average inter-rater covariance across raters ranged from .83 to .95. A final raw score for each child on each item was the average score across raters summed across the vignettes.

In terms of validity, as reported by McKown, Allen, Russo-Ponsaran, and Johnson (2013), the social–emotional comprehension assessments demonstrated a theoretically coherent factor structure and convergent and discriminant validity; composite scores yielded expected age-group and diagnostic-group differences.

Social–emotional execution

Social–emotional execution was assessed with the Social Skills Rating System (SSRS; Gresham & Elliott, 1990). The Social Skills and Problem Behavior raw scores were used as indicators of socially skilled and problem behaviour, respectively.

Academic outcomes

On the SSRS, two items reflecting the teacher's assessment of reading competence exhibited high internal consistency ($\alpha = .98$). The two reading items were averaged to yield an SSRS reading skill composite. Two additional items reflecting the teacher's assessment of math competence exhibited similarly high internal consistency ($\alpha = .98$). The two math items were averaged to yield an SSRS math skill composite.

Achievement test data were obtained from each school. Second graders and beyond took ITBS (Hoover, Dunbar, & Frisbie, 2001) in the fall at one of the two

Sample 1 schools. In the second Sample 1 school, first, third, and fifth graders and students eligible for Title 1 funding (in grades K–5) completed the TerraNova Achievement Test (TerraNova 3; CTB/McGraw-Hill, 2007) in the Spring. Both the ITBS and TerraNova were normed on a nationally representative sample of school children. They included similar content coverage in reading and math and produced grade-normed stanines in reading and math. In total, 75 Sample 1 children completed a standardized achievement test (56.4% of sample).

Sample 1 Procedures

Research staff administered the social–emotional comprehension assessment battery to children individually in quiet rooms at their school. Testing lasted 2.5–3 h divided over two or three sessions. To minimize fatigue, more and less demanding assessments were alternated and were administered in the same order for all participants. Breaks were offered on an as-needed basis to prevent testing fatigue. Each individual session was limited to a maximum of 1 h. In many cases, the sessions were shorter, depending on the child's engagement and activity level. Teacher report questionnaires and academic achievement data were completed within the same academic year.

Sample 2 Characteristics

Students from Sample 2 were recruited from seven urban and suburban elementary schools. Parents of 222 children (M_{age} = 7.4, SD = 1.1) from the second sample consented to their children's participation in the study. Of children whose parents consented, 199 had teacher report data and 192 had direct assessment of reading and math performance.

Sample 2 Measures

Intellectual ability

The Information and Matrix Reasoning subtests of the Weschler Intelligence Scale for Children, Fourth Edition (WISC-IV; Wechsler, 2003) were administered. For the Information subtests, children answered factual questions. For Matrix Reasoning, children selected from a group the part of a design that best fit an incomplete design. Sattler (2008) reported that IQ derived from these two subtests is correlated at r = .87 with Full Scale IQ derived from the core WISC-IV subtests. We used procedures described in Table A-9 of Sattler (2008) to convert the sum of scaled scores on these subtests into an estimated IQ.

Social–emotional comprehension

Children completed several modules from a web-based assessment called 'SELweb' designed to assess children's social–emotional comprehension (McKown, Russo-Ponsaran, Allen, Johnson, & Russo, *under review*). For one module, assessing emotion recognition, children viewed 44 children's faces and indicated from multiple choice options what emotion each face displayed. For a second module, assessing perspective-taking, children listened to 11 illustrated vignettes and answered multiple choice questions in which correct responding required them to infer a story character's mental state. For a third module, assessing social problem-solving, children listened to six illustrated vignettes

about peer entry and ambiguous provocation and answered multiple choice questions pertaining to the nature of the problem, their social goals, and their solution preferences. Two additional modules assessed self-control. One was a choice delay task. In 10 trials, children received more points for selecting items that required greater patience. A second was a frustration tolerance task in which children completed a timed shape-matching task in which several items were programmed to become 'stuck' such that the computer was not responsive to mouse clicks. The raw score was the number of correct items completed in 90 s.

In terms of SELweb psychometric properties, McKown et al. (*under review*) reported that (a) module scores exhibited internal consistency ranging from .69 to .82, (b) factor score reliability ranged from $r_{yy} = .78$ to $r_{yy} = .91$, (c) together, assessment scores fit a four-factor model, (d) factor scores demonstrated convergent and discriminant validity, and (e) performance on the assessments was positively related to peer acceptance and teacher report of social skills, and negatively related to teacher report of problem behaviours.

Social–emotional execution

Teachers completed the SSIS (Gresham & Elliott, 2008) rating scale, which replaced the SSRS between the time Sample 1 and Sample 2 data were collected. The Social Skills and Problem Behavior raw scores were used as indicators of social–emotional execution.

Academic outcomes

Children completed reading and math items from Aimsweb, a standardized web-based assessment system (Pearson Education, 2010–2012). Children in kindergarten completed Tests of Early Literacy (Letter Naming, Letter Sound, Phonemic Segmentation, and Nonsense Word). Children in first grade completed two measures from the Test of Early Literacy (Phonemic Segmentation and Nonsense Words). Children in first through third grades also completed Reading Curriculum-Based Measurement. To assess math skills, children in kindergarten and first grades completed the Tests of Early Numeracy (Oral Counting, Number Identification, Quantity Discrimination, and Missing Number). Children in second and third grades completed Mathematics Concepts and Applications. To place performance on a common metric, national percentile scores for reading and math were used in all analyses.

Sample 2 Procedures

In three of four Sample 2 districts, representing six of seven collaborating schools, school staff opted to administer SELweb to all students in kindergarten through third grade for programme planning purposes. In those schools, the Rush University Medical Center IRB granted a waiver of informed consent for study staff to use de-identified SELweb and academic data. In all schools, parents of children in kindergarten to third grade were invited to have their children participate in an 'add-on' study. Children in the add-on study were tested individually on validation measures, and data from the add-on study were linked to SELweb data using a district identifier.

Data Analysis

For both samples, a social–emotional comprehension factor score was created from bifactor confirmatory models described in the Results section. Bifactor modelling was used in lieu of a second-order model because prior work suggests that the fit of data to bifactor models is often better than to second-order models and the interpretation of factor scores from these two kinds of models is equivalent (Chen, West, & Sousa, 2006). That factor score was saved and used in computing descriptive statistics and zero-order correlations and in comparing children with missing data with those with complete data.

To evaluate relationships between social–emotional comprehension and socially skilled and problem behaviour, zero-order correlations were calculated. Next, we used MPlus (Muthén & Muthén, 2011) to test a model in which the broad social–emotional comprehension latent factor is associated with both socially skilled and problem behaviour, and those two dimensions of social–emotional execution are in turn associated with reading and math scores, indicated by test performance and teacher report. We used the Social Skills scale on the SSRS and SSIS for Samples 1 and 2, respectively, as the indicator of socially skilled behaviour, and the Problem Behavior scale as the indicator of problem behaviour. We also controlled for age and verbal ability in Sample 1 and age and IQ in Sample 2. For reading achievement, we constructed a reading achievement latent variable using teacher report of reading skill on the SSRS and standardized reading test score for Sample 1, and teacher report of reading skill on the SSIS and reading test performance on Aimsweb for Sample 2. Similarly, for math achievement, we constructed a math achievement latent variable using teacher report of math skill on the SSRS and standardized math test score for Sample 1, and teacher report of math skill on the SSIS and math test performance on Aimsweb for Sample 2. We tested the significance of mediation effects using bootstrapping procedures (Preacher & Hayes, 2008).

Missing Data

Sample 1

Of 133 participating children, 116, or 87.2%, of the total sample had complete social–emotional comprehension and teacher report data. Posture recognition data were available for all but one case. Strange Stories data were available for 91.7% of the sample. Children who were missing data were not significantly different from children who were not missing data in terms of teacher report of social skills, problem behaviour, reading, or math. Children with missing social–emotional comprehension data were older (8.7 vs. 7.6 years, $F(1, 131) = 5.56$, $p < .05$). In addition, children with missing social–emotional comprehension data scored higher on the Vocabulary test (12.8 vs 10.5, $F(1, 131) = 7.23$, $p < .05$). Children who were missing standardized test data were younger than children who were not (6.5 vs 8.5 years, $t(71) = 7.52$, $p < .05$), and scored lower on Strange Stories (102 vs. 109, $t(71) = 7.24$, $p < .05$), teacher report of social competence (103 vs 110, $t(71) = 7.07$, $p < .05$), and teacher report of reading skills (3.3 vs 3.9, $t(71) = 7.24$, $p < .05$).

Sample 2

Of 220 participating children, 171, or 77.7%, had complete data. Of the students with missing data, 28, 12.7%, were missing IQ and Aimsweb data, and 21, or 9.5%, were missing SSIS data. Children with missing data were significantly and slightly

older than children with no missing data (7.3 years for no missing data vs 7.7 years for children with missing data, $t(218) = 2.6$, $p < .05$). Children with missing data did not differ from children with no missing data on a composite measure of social–emotional comprehension ($t(218) = 1.8$, *ns*) or on a measure of social preference ($t(218) = 0.6$, *ns*).

Estimation

In general, levels of missing data were low and the absence of data was usually uncorrelated with measured variables. Accordingly, we estimated all confirmatory and structural models using maximum likelihood estimation. This method generally produces results that are non-biased and equivalent to results produced from analyses with multiple stochastically imputed data sets (McArdle, 1994).

RESULTS

Zero-Order Correlations

Table 2 revealed that, in both samples, social–emotional comprehension, socially skilled and problem behaviour were all significantly associated with teacher-reported reading and math skills and reading and math test performance.

Structural Modelling

First, we estimated bifactor models in which raw scores from each assessment loaded onto both a single broad social–emotional comprehension factor and onto more granular factors reflecting emotion recognition, perspective-taking, problem-solving, and, in the case of Sample 2, self-control. The bifactor components of the SEMs are depicted in the left half of Figures 1 and 2. The bifactor model fit Sample 1 and 2 data well (Sample 1 $\chi^2(30) = 35.1$, *ns*, CFI = .99, RMSEA = .036, 90% CI = .000 to .078; Sample 2 $\chi^2(15) = 22.0$, *ns*, CFI = .98, RMSEA = .049, 90% CI = .000 to .091).

Table 2. Zero-order correlations between variables

	1	2	3	4	5	6	7	8	9
1. Age	–	.13[†]	.17*	.03	.64*	.02	.02	.20*	.26*
2. Vocabulary/IQ	−.01	–	.22*	−.23*	.48*	.40*	.40*	.36*	.54*
3. Social skills	.05	.31*	–	−.74*	.30*	.35*	.37*	.23*	.36*
4. Problem behaviour	−.08	−.22*	−.74*	–	−.19*	−.30*	−.45*	−.19*	−.33*
5. SE composite	.64*	.42*	.33*	−.24*	–	.26*	.22*	.40*	.41*
6. SSRS/SSIS reading	.02	.42*	.44*	−.37*	.25*	–	.72*	.55*	.45*
7. SSRS/SSIS math	.01	.35*	.38*	−.29*	.24*	.73*	–	.33*	.53*
8. Reading test	−.03	.67*	.57*	−.44*	.56*	.77*	.56*	–	.57*
9. Math test	−.02	.64*	.46*	−.37*	.49*	.67*	.69*	.77*	–

SE composite = social–emotional comprehension; SSRS = Social Skills Rating System; SSIS = Social Skills Intervention System. Sample 1 correlations are below the diagonal; Sample 2 correlations are above the diagonal.
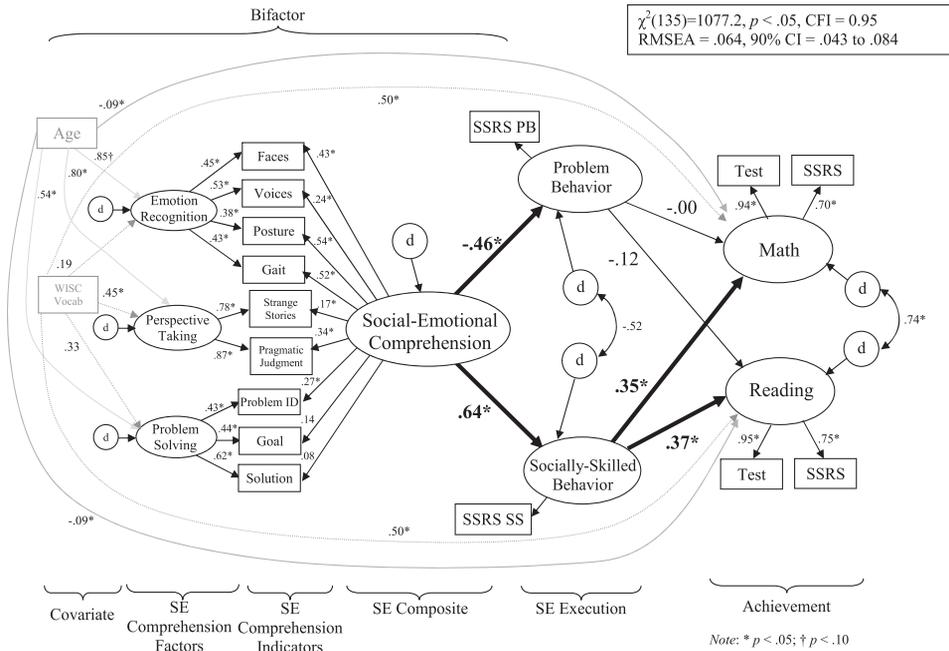*$p < .05$.

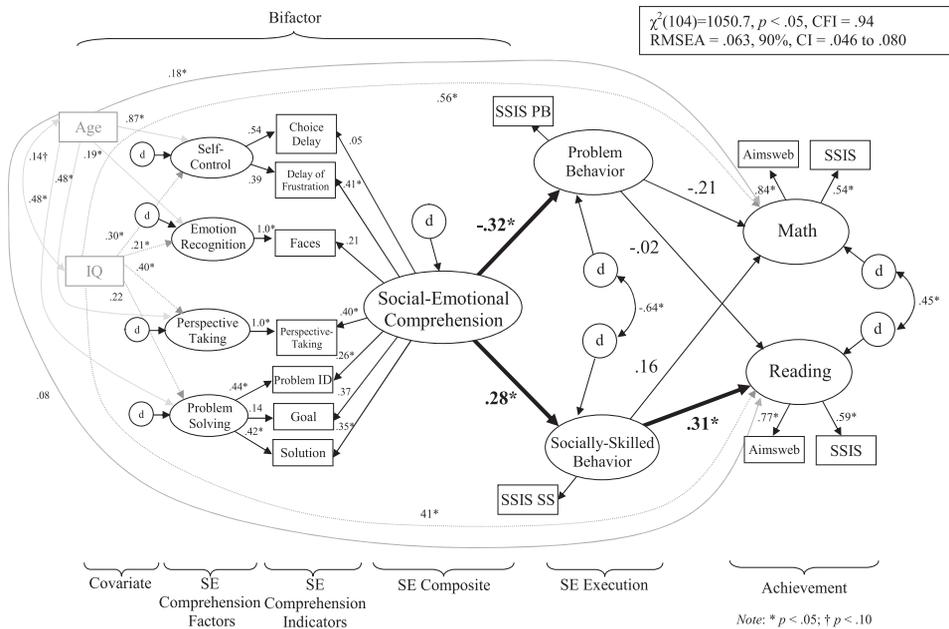Figure 1. Structural model of the relationship between social–emotional comprehension, socially skilled and problem behavior, and academic outcomes, Sample 1. SSRS = Social Skills Rating System; WISC = Wechsler Intelligence Scale for Children.

Figure 2. Structural model of the relationship between social–emotional comprehension, socially skilled and problem behaviour, and academic outcomes, Sample 2. SSIS = Social Skills Improvement System.

Models for Samples 1 and 2 are depicted in Figures 1 and 2, respectively. In both samples, the overall fit of the model to the data was good (Sample 1 $\chi^2(135)$ = 1077.2, $p < .05$, CFI = 0.95, RMSEA = .064, 90% CI = .043 to .084; Sample 2 $\chi^2(104)$ = 1050.7, $p < .05$, CFI = .94, RMSEA = .063, 90%, CI = .046 to .080).

The relationships between the social–emotional comprehension factor score, teacher report of socially skilled and problem behaviour, and academic outcomes were similar but not identical in both samples. In terms of similarities, in both samples, social–emotional comprehension was significantly positively associated with socially skilled behaviour, which was in turn significantly associated with reading. In both samples, social–emotional comprehension was significantly negatively associated with problem behaviour. In addition, in both samples, problem behaviour was not associated with reading or math. In terms of differences, in Sample 1 but not Sample 2, socially skilled behaviour was significantly and positively associated with math.

Mediation

In Sample 1, the relationship between social–emotional comprehension and reading achievement was mediated by skilled behaviour. Standardized indirect effects computed from 1000 bootstrapped samples were significant (Standardized Indirect Effect = .24, SE = .08, $p < .05$). The relationship between social–emotional comprehension and math achievement was also mediated by skilled behaviour. Standardized indirect effects computed from 1000 bootstrapped samples were also significant (Standardized Indirect Effect = .23, SE = .09, $p < .05$). No other mediating relationships between social–emotional comprehension and achievement were significant. In Sample 2, the indirect effect of social–emotional comprehension on reading achievement, mediated by skilled behaviour, was marginally significant (Standardized Indirect Effect = .09, SE = .06, $p = .10$). No other mediating relationships between social–emotional comprehension and achievement were significant.

DISCUSSION

This study supports a growing body of work that demonstrates a consistent relationship between social–emotional factors and academic outcomes (Caprara et al., 2000; DiPerna, Volpe, & Elliott, 2005; Elias et al., 1997; Raver et al., 2009; Romano, Babchishin, Pagani, & Kohen, 2010; Wentzel, 1993). Prior research has largely focused on demonstrating that social–emotional comprehension or social–emotional execution is related to academic outcomes (Iyer et al., 2010; Rhoades et al., 2011). Less work has examined mediating pathways linking these social–emotional factors to achievement. The present study extended that work by examining the pathways through which social–emotional factors are associated with academic outcomes (Duncan et al., 2007; Hinshaw, 1992; Raver et al., 2009; Romano et al., 2010).

This study was novel in its use of multiple performance-based direct assessments to index broadly several dimensions of social–emotional comprehension. In addition, this study included two independent samples on which hypotheses were tested. Despite differences in the measures and participant characteristics, there were striking similarities in the findings in both samples. In the context of structural equation models, in both samples, the relationship between social–emotional comprehension and reading was mediated by socially skilled

behaviour. In both samples, social–emotional comprehension was negatively associated with problem behaviours, but problem behaviour was not associated with math or reading. The relationship between social–emotional comprehension and math was mediated by socially skilled behaviour in Sample 1.

In contrast to prior work examining teacher report of student engagement and focus (Iyer et al., 2010; Trentacosta & Izard, 2007; Rhoades, Warren, Domitrovich & Greenberg, 2011), the present study examined teacher report of socially skilled and problem behaviour as candidate mediators. Collectively, prior work and the present study suggest that the relationship between social–emotional comprehension and academic outcomes is mediated by the classroom behaviours children routinely display.

It is striking that while social–emotional comprehension was associated with both problem behaviour and socially skilled behaviour, only socially skilled behaviour was associated with academic achievement. Furthermore, socially skilled behaviour was associated with math in Sample 1 but not Sample 2, but was associated with reading achievement in both samples. It may be that the mental processes underlying in reading the social world and engaging in socially skilled behaviour also underlie the ability to read and understand narrative. Perhaps, for example, language skill, which is so critical to social interaction in human society, gives rise both to socially skilled behaviour and to reading skills. If future work replicates this general finding, then longitudinal and intervention studies may help to clarify the reasons that social–emotional pathways to reading appear stronger than pathways to math.

Study Strengths and Limitations

Strengths

This study applied the same analytical framework to two independent samples. Consistent findings across samples suggest that findings were robust and not idiosyncratic to a particular sample or measurement method. We used multiple indicators of social–emotional comprehension to provide broad representation of the underlying construct. In Sample 1, indicators included tests of emotion recognition, pragmatic judgement, perspective-taking, and social problem-solving. In Sample 2, we broadened our conceptualization of social–emotional comprehension to include self-control. Furthermore, all of those indicators were measured with performance assessments. In other words, skill in each of these areas was indicated by children's ability to demonstrate mastery. This contrasts with self-report, in which students rate their own skill, or teacher, parent, or peer report, in which a third party rates a child's skill.

In both samples, we controlled for age and a simple index of IQ. In terms of IQ, in Sample 1, we elected to administer only the Vocabulary subtest of the WISC-III that is the subtest most highly correlated with Full Scale IQ, accounting for 62% of the variability in Full Scale IQ (Sattler, 2008). In Sample 2, we administered two subtests of the WISC-III, Information and Matrix Reasoning from the WISC-IV (Wechsler, 2003). Sattler (2008) reported that IQ derived from these two subtests accounts for 76% of the variability in Full Scale IQ. In the models depicted in Figures 1 and 2, the associations between estimated IQ scores and academic outcomes were robust and similar in magnitude. By controlling for IQ, we were able to estimate the relationship between social–emotional execution, social–emotional comprehension, and academic outcomes above and beyond a proxy measure of intellectual ability. We can be more confident, then, that the mediating relationships

reported between social–emotional comprehension and academic outcomes are not spurious associations.

Limitations

There were differences in the sample characteristics between Sample 1 and Sample 2 and, in each sample, between children in different schools and classrooms. That the findings were similar across the two samples lends greater confidence that they are robust to differences in sample.

Sample 1 participants spanned a broad age range, including children in kindergarten to fifth grade. Sample 2 included a more limited age range, and findings were largely consistent with those of Sample 1. Nevertheless, an important unanswered question concerns the extent to which the findings from this study are similar or different at different ages. Future research using the social–emotional comprehension measurement strategies of the present study should focus on smaller age bands and larger samples within each age band so that age differences can be explored with sufficient statistical power to detect interactions.

Cross-sample measures of academic achievement were imperfect. In Sample 1, standardized achievement tests were different at the different sites. Along with achievement test scores, we used teacher report of reading and math skills as indicators of latent variables reflecting achievement. The use of multiple indicators may mitigate the shortcomings of any one indicator. In contrast, in Sample 2, achievement test scores were consistently derived from one assessment system. Findings from Samples 1 and 2 were quite consistent with one another, lending greater confidence in the findings from each sample. Nevertheless, future research using the social–emotional comprehension measurement strategy of the present study should include more consistent, rigorous academic outcome measurement.

Both samples used a cross-sectional, correlational design. As a result, it is important not to draw strong conclusions about the causal relationships among social–emotional comprehension, social–emotional execution, and academic outcomes. Longitudinal research and field trials of social–emotional learning programmes will clarify the mechanisms through which social–emotional factors are related to academic outcomes.

In Sample 2, the indirect effect of social–emotional comprehension on reading, mediated by socially skilled behaviour, did not achieve traditional significance ($p = .10$). Nevertheless, the path from social–emotional comprehension to socially skilled behaviour was significant and in the predicted direction. Furthermore, the path from socially skilled behaviour to reading achievement was significant and in the predicted direction. Further work with larger samples, using longitudinal designs, will help determine the robustness and consistency of this mediating pathway.

Social skills and problem behaviours were highly correlated, as were reading and math. On the one hand, this suggests that these pairs of measures reflect a common underlying process. On the other hand, that we found distinct and largely consistent mediating pathways across two independent samples suggests that despite their correlations, socially skilled behaviour is distinct from problem behaviour, math is distinct from reading, and the pathways through which these factors influence one another are also unique.

It would have been optimal to account for the nesting of students within classrooms in structural modelling. In both samples, the number of degrees of freedom in the structural model exceeded the number of classroom units. As a result, multilevel structural equation estimates would have been susceptible to bias. It will be

important that future studies sample enough classrooms to replicate these models while accounting for the nested data structure.

CONCLUSIONS

Despite these shortcomings, this study adds to a growing body of research on the mechanisms through which social–emotional factors shape academic outcomes. Common to both samples was the finding that children's social–emotional comprehension was associated with the display of socially skilled behaviour, which was in turn associated with academic outcomes. These findings echo other research that suggests that investing in children's social–emotional development as part of education will likely yield academic benefit. For this reason, educators should consider incorporating evidence-based social–emotional instruction into their ongoing practice. Based on the current findings, school personnel and investigators should consider using performance assessment strategies to ascertain the level of social–emotional comprehension that children bring to school and the academic challenges before them. In so doing, practitioners and researchers alike may achieve a richer understanding of the nature and magnitude of the association between social–emotional factors and academic outcomes.

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