Changes in preschool children's social engagement positively predict changes in social competence: A three-year longitudinal study of portuguese children

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Abstract

To test the hypothesis that social engagement is a founda- tional aspect of other peer social competence indicators during early childhood, 160 Portuguese preschool chil- dren ("3-year-olds") were observed at least in two different school years, using a battery of validated social competence assessments based on direct observations and child inter- views. Multilevel growth models tested whether social en- gagement predicted initial values and linear changes in the other social competence indicators. Results were consist- ent with the hypothesis, insofar as both initial values and changes in social engagement significantly predicted initial values and changes in other social competence indicators. Additionally, the number of children's reciprocated friend- ships was also predicted by social engagement. These re- sults are discussed from the perspectives of conceptual frameworks that consider individual differences in social competence during early childhood as a consequence of at- tachment histories and/or emotional competence.

KEYWORDS

preschool, social competence, social interaction

Correction added on 24 October 2019, after first online publication on 10 October 2019 : Author Gabrielle Coppola's name was previously incorrect and has been corrected in this version.

1 | INTRODUCTION

Humans are obligate social animals insofar as they do not survive and thrive in the absence of a social network and the support it provides throughout life. It is not surprising, therefore, that humans are born with age-appropriate skills and the motivation to initiate social engagement in their immediate contexts, as well as the capacity to respond to initiations from others in those contexts, which sustain social engagement (e.g., Bowlby, 1982; Porges, 2003; Porges & Furman, 2011). From the perspective of evolutionary developmental theory (e.g., Bjorklund & Pellegrini, 2002; Bowlby, 1982; Konner, 2010), human infants are preadapted to the social environments such that they are likely to encounter. Of course, the earliest social environments are usually populated by close biological relatives who are themselves motivated to engage and nurture the child, as well as to keep her/him safe from threats and dangers that may be present in the larger physical and social environments (e.g., Bowlby, 1973, 1982; Solomon & George, 1996).

Ainsworth and Bowlby (e.g., Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1982) argued that the normal outcome of the social transactions between infants/toddlers and their primary social partners was the coconstruction of an attachment relationship during infancy and toddlerhood that influenced social adaptation over the life course. Guided by Bowlby's and Ainsworth's insights into concerning attachment as a life course construct, Waters and Sroufe (1983) proposed that the social transactions (i.e., social engagement) leading to the construction of a secure attachment relationship should be considered as indicators of infant/toddler "social competence" (SC) and that SC was a critical developmental construct that organized behavior, affect and cognition over multiple life phases.

Waters and Sroufe (1983) argued that the infant's success in achieving the first critical developmental task (i.e., coconstruction of a secure attachment) would ground the child's success in the next critical developmental task; namely, becoming integrated into new social groups and coconstructing good quality relationships within those groups. Since 1983, a considerable body of evidence has supported this hypothesis (e.g., Veríssimo et al., 2014 and meta-analyses by Groh et al., 2014 and Pallini, Baiocco, Schneider, & Atkinson, 2014).

As the world of age peers becomes an increasingly salient context for social engagement during early childhood, peer interactions afford opportunities to practice existing suites of cognitive, behavioral, and emotional skills and to acquire new skills from the repertoires of peers and the adults (i.e., teachers and caregivers) in these new, non-familial social contexts. Within these contexts, children are selective with respect to their interaction partners, preferring to interact with specific individuals and subgroups of children within the larger peer group (e.g., Santos, Daniel, Fernandes, & Vaughn, 2015; Santos, Vaughn, & Bost, 2008; Vaughn, Colvin, Azria, Caya, & Krzysik, 2001). Moreover, these partner preferences have implications for further development of social, emotional, and cognitive skills (e.g., Daniel, Santos, Peceguina, & Vaughn, 2015; Martin et al., 2013).

Waters and Sroufe (1983) suggested that peer SC should be defined as the child's capacity to deploy personal behavioral, affective, and cognitive skills (or to appropriate the skills of peers and/or adults in new social contexts, when their own skill levels were insufficient) to attain personal goals in the peer group, without interfering too much with the goal attainment of peers and without entering onto developmental trajectories that could increase the likelihood that future, as yet unknown, goals would not be attained readily in future social groups. Defined at this level of abstraction, construct measurement possesses distinct challenges. Waters and Sroufe (1983) suggested that only "broadband" measures that both challenged the child's behavioral, cognitive, and affective capacities and required integration across them could capture the breadth of meaning implied by their SC construct (Denham et al., 2003 and Rose-Krasnor, 1997, make similar arguments). Following the suggestion made by Waters and Sroufe (1983), Vaughn and Santos and their associates have studied broadband measures to assess SC during early childhood for over 20 years (e.g., Bost, Vaughn, Washington, Cielinski, & Bradbard, 1998; Santos, Monteiro et al., 2015; Santos, Peceguina, Daniel, Shin, & Vaughn, 2013; Santos, Vaughn, Peceguina, & Daniel, 2014; Shin et al., 2011; Vaughn et al., 2009). These studies established the validity, stability, and cross-sample generality of

a hierarchical model of SC based on direct observations of behavior and child sociometric interviews, rather than on adult reports. Importantly, one of their three "families" of SC indicators included explicit assessments of social motivation and engagement, operationalized as the rate of initiating affectively positive or neutral interactions with peers.

More recently, Vaughn et al. (2016) suggested that social engagement per se was the foundational indicator of SC insofar as interactions with peers serve both as opportunities to practice and learn skills used to achieve personal goals within the group and as opportunities to advertise their current value as a social partner to their peers. To test this notion, they disaggregated the social motivation and engagement family by removing the variable indexing visual attention received from peers and created a new variable that included only initiated peer interactions without regard to affective valence of the interaction. Their analyses showed that this modified social engagement variable was associated significantly in predictable ways with the other indicators of SC across several different samples, including one from Portugal. The revised social engagement variable was also associated with other adaptive outcomes that were not used in the development of their SC model (e.g., number of reciprocated friendships, Ego-control). They concluded that social engagement appeared to have "foundational" status (i.e., antecedent and causally related to other SC indicators) with regard to SC, but that longitudinal analyses would be needed to test this conclusion, especially with reference to the idea that changes in social engagement over time should also predict changes in the set of SC and external social variables over time.

The analyses presented here were intended to test the hypothesis concerning the foundational status of social engagement for SC in the Portuguese sample reported in the earlier study. Of the several samples included in the Vaughn et al. (2016) study, only the sample from Portugal had collected data over three consecutive preschool years thus allowing the use of multilevel growth models in the analyses of individual level changes for the variables over time. In a previous group-level growth model study of these children (Santos, Vaughn, Peceguina, Daniel, & Shin, 2014), only one indicator family (i.e., profiles of behavior and personality from Q-sort data) had shown significant linear growth; however, it may be that examination of group changes obscured predictable changes at the individual level. Treating social engagement as the foundational indicator, affords an opportunity to examine more precisely whether increases over time with respect to engagement drive and predict increases in the other families of indicators, as well as other variables relevant to social adaptation (e.g., number of reciprocated friendships) that are external to the SC indicator set. Because there is some evidence in the literature that gender differences are occasionally observed in SC indicator data (e.g., Vaughn et al., 2009), it also seems prudent to test any significant models for potential moderating influences of gender.

2 | METHODS

2.1 | Participants

A total of 294 preschool children (154 girls, 140 boys) participated in this study (classroom participation rate = 74%). Children were recruited from 15 classes in two private urban preschool centers, in the Lisbon region of Portugal. For this report we selected a subsample of 160 children (83 girls, 77 boys) recruited in "3-year-olds" classes' (i.e., classes of children <48 months of age at the start of the school year; Time 0) and followed for at least two school years (122 children with data from three time points and 38 with data from two time points).

Class sizes ranged from 20 to 27 children and children in each classroom were supervised by a lead teacher and by an assistant. These preschools were affiliated with private elementary schools and served families with middle to upper socioeconomic status by the standards of the local community, in terms of education levels, occupational titles, and family incomes. All families were European and self-identified as Portuguese. Written consent for children's participation was obtained from school directors, teachers, and parents prior to data collection.

2.2 | Measures

2.2.1 | Initiated interactions and visual attention

Teams of two observers collected separate focal observations (mean focal samples per child = 146) for: (a) Interaction (15-s duration) and (b) Visual Attention (6-s duration) data in each classroom. Observers did not work in pairs and rarely observed a given child simultaneously. Rounds (i.e., an observation of every participating child present in the class was completed before any child was observed twice) of the two types of observational data were randomly interspersed. Each observer made a maximum of 10 focal observations of each type, per participating child and per day of observation. Observations were made at different times of day, across the range of activities taking place in the classroom and outdoor play periods.

For interaction data, an observer recorded identifiers for all peers with whom the focal child interacted. Codes for the initiator of the interaction episode were recorded. The variable of interest for this study is the total number of initiated interactions. To adjust for absences during the observation period, total initiated interaction scores were converted to rates by dividing the total score by the number of focal samples for which the target child was present in the classroom. These rates were standardized within classes prior to further analysis and these standardized scores were used as the indicator of Social Engagement.

For Visual Attention data, observers recorded the identity codes for all children receiving a unit of visual regard from the observation target (a visual regard "unit" corresponds to the orientation of head and eyes toward a peer). A given recipient of visual regard was credited with a single unit per focal observation. As for Interactions, total scores of visual regard units received were adjusted for absences and standardized within classrooms. These standardized scores were used as the indicator of Visual Attention.

Cross-observer agreement was estimated as the intra-class correlation for each classroom (ICC). The mean of these ICC correlations was .78 for the Interaction variable and .76 for the Visual Attention variable.

2.2.2 | Behavioral and psychological attributes

Independent teams (i.e., different from observers for attention and interaction) of two observers spent a minimum of 20 hr (each) in every classroom, observing children in a variety of settings (e.g., meals, small groups, free-play indoors, outdoor play, transition activities such as standing in lines, and picking up toys/materials after play). After completing observations, each observer described the children with both the California Child Q-sort (CCQ) (Block & Block, 1980) and Preschool Q-sort (PQ) (Bronson's adaptation of a Q-set originally used by Baumrind, 1967), according to a predetermined rectangular distribution of items to nine categories (i.e., 1 representing the behavior/personality attributes that were "most unlike" or atypical of the child and 9 representing the "most like" or typical behavior/personality attributes of the child).

The Q-sort descriptions were used to derive social competence criterion scores for each child using the criteria and procedures of Waters, Noyes, Vaughn, and Ricks (1985). A child's Q-sort was correlated with the Q-profile of a hypothetical child at the extreme for social competence, generated by aggregating the descriptions provided by experts on social development (Waters et al., 1985). The correlation between a child's Q-sort and the criterion sort for the construct become her or his Q-sort score for that construct. CCQ and PQ Q-Sort scores were averaged (Cronbach's $\alpha = 0.87$) and then standardized within classes. These standardized scores were used as the indicator of Behavioral and Psychological Attributes.

Prior to data collection, observers were trained in the meanings of the items and the sorting procedure. Mean ICC estimates (ICC[C, k] across observer pairs were .83 and .75, for the CCQ and PQ, respectively.

2.2.3 | Peer acceptance, peer rejection, and reciprocal friends

Children were asked to complete three picture sociometric tasks: (a) positive and negative nominations, (b) paired comparisons, and (c) rating scale. In each task, judgments were solicited about classmates (both boys and girls). Sociometric interviews took between 30 and 45 min to complete (usually two or three 15 min sessions).

For the nominations task, children were presented with the array of photographs of their classmates and asked to identify a peer with whom they especially liked to play. After making three such choices, children were asked to identify a classmate with whom they did not especially like to play (again repeated twice). Photographs were turned face down as the child made nominations. The acceptance/rejection scores for this task equalled the number of times a child was among her/his peers' top three choices, divided by the number of classmates completing the nominations task. To adjust for classroom size differences (i.e., for differences in the number of potential nominators) acceptance/rejection scores were standardized within the classroom.

For the paired comparisons task, all pairs of children in a given class were presented (total number of comparisons in a given class = $N[N-1]/2$), with each child's photograph appearing on the left or right hand side an equal number of times. The order of presentation was such that no child was seen twice before all other classmates were seen once. The child was asked, "which of these two children do you especially like to play with?" for each pair. As for nominations, an acceptance score was calculated from the total number of choices received, divided by the number of classmates who completed the task and then standardized within classroom.

Peer acceptance was derived within each classroom by standardizing the nominations and paired comparison sociometric scores, then taking the average of these two scores (average Cronbach's alpha across classrooms = .77). The indicator of Peer Rejection was the standardized (within classroom) dislike score from the nominations sociometric task.

For the rating scale task, children were presented with a photograph of each participating classmate in a random order and asked to sort the photos into one of three containers: Children with whom she/he child liked to play a lot, sort of liked to play, or did not like to play (scored 3, 2, and 1, respectively). Each child was given a brief training exercise using preferred versus less preferred food items to make sure that they could use the scale as designed.

We combined information across the three sociometric tasks to identify the number of Reciprocal Friends. Following Vaughn et al. (2000), to be considered as a friend a peer had to appear among the upper quintile on either the nominations or the paired comparisons sociometric tasks *and* had to receive a rating of 3 ("like to play with a lot") on the rating scale task. If a given child was also chosen as a friend by a friend she/he had identified, the dyad was categorized as a "reciprocal friend" dyad. The number of Reciprocal Friends of each child was standardized within the classroom, to adjust for class size differences (i.e., for differences in the number of potential nominators), and used as the indicator of Reciprocal Friends.

3 | RESULTS

Table 1 presents the descriptive statistics of all measured variables. This table is extensive, but briefly, the first correlation column shows that most scores used to index that the different dependent variables were significantly and positively correlated, across age groups, with the interaction rates for Social Engagement. Rejection scores were the exception—no significant correlation was found for the different age groups.

3.1 | Multilevel modelling approach

We modelled the change in the dependent variables' scores using multilevel regression models with repeated measures nested within participants (i.e., child—level 2, repeated measures—level 1). Models were fitted using the lmerTest package in R version 3.5.1 (Kuznetsova, Brockhoff, & Christensen, 2018; R Core Team, 2018). A third

TABLE 1 Means (M), standard deviations (*SD*), and correlations for measured variables by age group

	N	% missing	*M*	*SD*	1	2	3	4	5	6	7
3-year-olds											
1. Social Engagement	160	0%	0.52	0.20							
2. Visual Attention	160	0%	0.63	0.27	0.66***						
3. CCQ Q-sort	125	22%	0.10	0.19	0.32***	0.45***					
4. PQ Q-sort	131	18%	0.10	0.23	0.38***	0.38***	0.79***				
5. Nominations' acceptance	147	8%	−0.03	0.97	0.32***	0.33***	0.25**	0.20*			
6. Paired comparisons' acceptance	147	8%	−0.02	0.96	0.24**	0.25**	0.3**	0.26**	0.52***		
7. Nominations' rejection	147	8%	0.00	0.99	0.06	0.00	−0.03	−0.04	−0.18*	−0.11	
8. Reciprocal Friends	116	28%	1.22	1.23	0.13	0.27**	0.11	−0.01	0.37***	0.30***	−0.15
4-year-olds											
1. Social Engagement	142	0%	0.58	0.25							
2. Visual Attention	142	0%	0.58	0.27	0.82***						
3. CCQ Q-sort	134	6%	0.12	0.18	0.34***	0.29***					
4. PQ Q-sort	134	6%	0.12	0.23	0.28**	0.23**	0.81***				
5. Nominations' acceptance	124	13%	0.06	1.01	0.19*	0.18	0.22*	0.22*			
6. Paired comparisons' acceptance	125	12%	0.07	0.99	0.26**	0.17	0.38***	0.33***	0.66***		
7. Nominations' rejection	124	13%	−0.02	0.97	−0.08	−0.01	−0.16	−0.07	−0.31***	−0.36***	
8. Reciprocal Friends	118	17%	1.47	1.13	0.40***	0.35***	0.21*	0.23*	0.53***	0.45***	−0.13
5-year-olds											
1. Social Engagement	140	0%	0.51	0.19							
2. Visual Attention	140	0%	0.48	0.22	0.76***						

(Continues)

TABLE 1 (Continued)

	N	% missing	*M*	*SD*	1	2	3	4	5	6	7
3. CCQ Q-sort	140	0%	0.15	0.17	0.32***	0.3***					
4. PQ Q-sort	135	4%	0.14	0.21	0.22*	0.23**	0.71***				
5. Nominations' acceptance	126	10%	0.11	1.01	0.14	0.24**	0.36***	0.32***			
6. Paired comparisons' acceptance	126	10%	0.12	0.98	0.2*	0.24**	0.47***	0.38***	0.69***		
7. Nominations' rejection	126	10%	−0.13	0.90	−0.07	−0.05	−0.29**	−0.17	−0.43***	−0.67***	
8. Reciprocal Friends	126	10%	2.22	1.50	0.17	0.28**	0.25**	0.21*	0.65***	0.57***	−0.41***

Notes: CCQ and PQ Q-sort scores were used to index Behavioral and Psychological Attributes (α = 0.85); Nominations and Paired Comparisons Acceptance were used to index Peer Acceptance (α = 0.77).

*p < .05; **p < .01; ***p < .001.

level (class) was omitted from the multilevel models because the small number of different classes was not sufficient to support an additional level.

3.2 | Disaggregation of within and between child's Social Engagement effects

The major goal of this study was to test whether changes in the dependent variables were associated with changes in Social Engagement. Because Social Engagement is a time-varying covariate as it contains both within (level 1) and between child (level 2) variability. To disaggregate these effects, we regressed each child Social Engagement score on Time. Next, we used the individual intercepts (i.e., participant's estimated Social Engagement score at Time 0; level 2) and Time slope estimates (i.e., estimated Social Engagement yearly change; level 1) as predictors of the dependent variables (described below). For example, a child's intercept and slope estimates of 0.25 and 1, respectively, signify a Social Engagement at Time 0 score of 0.25 (level 2 predictor) and Social Engagement change scores of 0, 1 and 2, for Time 0, 1 and 2, respectively (level 1 predictor).

Multilevel models were built using a bottom-up approach, beginning with and unconditional random intercept and random Time slope model (Time as the only predictor; Model 1), and then adding Social Engagement predictors (Model 2; level 1: Social Engagement change, level 2: Social Engagement at Time 0), and finally, Gender and two-way interactions involving Gender to explore the moderating role of Gender in the growth trajectories (Model 3). Models were estimated using restricted maximum likelihood (REML) estimation, because this is preferred to full maximum likelihood (FML) when the number of level 1 observations is low (e.g., Hox, 1995).

To assist interpretations of model estimates Gender was entered as a covariate (boys = 0.5, girls = −0.5). This way, model intercepts represent the estimated mean values of the dependent variables at Time 0 for a child with a Social Engagement score at Time 0 equal to 0 (the class mean). Four of the dependent variables had missing values (% of missing observations: Behavioral and Psychological Attributes = 12%, Peer Acceptance and Rejection = 10%, Reciprocal Friends = 19%). We estimated models with complete pairwise observations and with imputed missing data (using multivariate imputation by chained equations; van Buuren & Groothuis-Oudshoorn, 2011).

Three main steps are involved in this multiple imputation process: Imputation, analysis, and pooling of model estimates. Time covariate and within classroom standardized scores of Social Engagement, Visual Attention, Behavioural and Psychological attributes, Peer Acceptance, Peer Rejection, and number of Reciprocal Friends were included as predictors in the imputation model. We used the 2l.pan imputation method to account for the clustering structure of the data and set child id as the clustering variable and time as a random effect. We set the mice algorithm number of iterations to 30 (the minimum recommended is between 5 and 10) and created 20 different imputed data sets. For each of the 20 data sets we fitted models similar to those presented in Tables 2–7 and subsequently pooled their estimates.

Because complete pairwise observations and imputed data gave similar results, models' estimates in Tables 4–7 refer to data sets without the imputation of missing values (model estimates using imputed data are available upon request).

3.3 | Random intercept and random Time slope models (Model 1)

Time slope estimates for Social Engagement and for the dependent variables were approximately 0, as expected due to the within class standardized nature of these variables (β Time ~ 0, *ns*; Model 1: Tables 2–7). Individual variability in the rates of change was estimated to be close to 0 (Time slope variances; Tables 2–7).

3.4 | Social Engagement effects (Model 2)

All dependent variables, except Peer Rejection, showed significant associations with Social Engagement in Model 2 (Tables 3–7). Social Engagement scores at Time 0 were significantly associated with Visual Attention, Behavioral

TABLE 2 Social Engagement growth model (random intercept and random Time Slope)

	Estimate	*SE*	*df*	*t*	*p*
Fixed effects					
Intercept	0.04	0.07	279.40	0.56	.578
Level 1 (within child)					
Time	0.03	0.04	284.09	0.67	.506
Random effects variance					
Between children	0.42				
Time slope	0.00				
Within child	0.48				
Model fit					
REML deviance	1,128				

Notes: Time fixed effect estimate equals the overall rate of change of Social Engagement between two consecutive school years (i.e., how many *SD*s in Social Engagement children were predicted to change across years in relation to their class mean); Time (covariate: 0, 1 and 2 for "3-year-olds", "4-for-year-olds" and "5-year-olds"); Children N = 160, observations = 442.

and Psychological Attributes, Peer Acceptance, and Reciprocal Friend scores at Time 0. All regression estimates were positive (0.77, 0.54, 0.44, and 0.24, respectively, all p values < 0.001; β Social Engagement at Time 0—Model 2: Tables 3–5, and 7, respectively), meaning that more socially engaged 3-year-olds scored higher on all dependent variables (except for Peer Rejection; $\beta = -0.05$, *n.s.*, Table 6). For example, children scoring 1 *SD* above (below) the Social Engagement class mean scored 0.77 *SD*s higher (lower) in Visual Attention than their average class peer.

Social Engagement changes also were associated with overall changes in Visual Attention and Behavioral and Psychological Attributes. Regression estimates were positive (0.57 and 0.28, respectively, p values < .001; β Social Engagement change—Model 2: Tables 3 and 4), meaning that children who became more socially engaged than their class peers scored higher on Visual Attention and Behavioral and Psychological Attributes.

3.5 | Moderating effects of Gender (Model 3)

All dependent variables, except Visual Attention (Table 3), showed at least marginally significant effects involving Gender (either main effects or two-way interaction effects), while controlling for Social Engagement predictors.

3.5.1 | Overall gender differences

Only Behavioral and Psychological Attributes, and Peer Rejection mean scores differed between boys and girls at the first time point (−0.35 and 0.46, respectively, p values < .05; β Gender—Model 3: Tables 4 and 6). Meaning that, for the same levels of Social Engagement, 3-year-old boys were predicted to score 0.35, Behavioral and Psychological Attributes *SD*s lower and 0.46 Peer Rejection *SD*s higher than girls in the same class. No significant main effects of Gender were found for the remaining dependent variables (Tables 3, 5, and 7).

3.5.2 | Gender differences in the effect of Social Engagement at Time 0

The moderating effect of Gender on the association between initial values of Social Engagement and dependent variables scores was non-significant in all models (β Gender × Social Engagement at Time 0—Model 3: Tables 3–7).

TABLE 3 Visual attention models (random intercept and random Time slope)

	Model 1					Model 2					Model 3				
Fixed effects	**Estimate**	*SE*	*df*	*t*	*p*	**Estimate**	*SE*	*df*	*t*	*p*	**Estimate**	*SE*	*df*	*t*	*p*
Intercept	0.02	0.07	203.55	0.28	.777	−0.01	0.05	214.32	−0.24	.809	−0.02	0.05	210.03	−0.30	.762
Level 1 (within child)															
Time	0.02	0.04	188.58	0.64	.525	0.01	0.03	197.89	0.37	.711	0.01	0.03	194.78	0.42	.674
Social Engagement change						0.57	0.06	173.10	9.38	<.001	0.58	0.06	171.92	9.41	<.001
Level 2 (between child)															
Social Engagement at Time 0						0.77	0.05	173.17	15.24	<.001	0.77	0.05	170.96	14.39	<.001
Gender											−0.10	0.11	210.03	−0.87	.386
Cross-level interactions															
Gender × Time											0.08	0.07	194.78	1.13	.262
Gender × Social Engagement at Time 0											0.02	0.11	170.96	0.16	.877
Gender × Social Engagement change											0.06	0.12	171.92	0.50	.618
Random effects variance															
Between children	0.55					0.17					0.17				
Time slope	0.03					0.02					0.02				
Within child	0.35					0.31					0.31				
Model fit															
REML deviance	1,098					926					936				

Notes: Children *N* = 160, observations = 442; Time (covariate: 0, 1 and 2 for "3-year-olds", "4-for-year-olds" and "5-year-olds"); Gender (covariate: Boys = 0.5, girls = −0.5).

TABLE 4 Behavioral and psychological attributes models (random intercept and random Time slope)

	Model 1					Model 2					Model 3				
Fixed effects	**Estimate**	*SE*	*df*	*t*	*p*	**Estimate**	*SE*	*df*	*t*	*p*	**Estimate**	*SE*	*df*	*t*	*p*
Intercept	0.00	0.08	220.96	−0.05	.957	−0.03	0.07	231.35	−0.40	.690	−0.03	0.07	225.82	−0.42	.677
Level 1 (within child)															
Time	0.04	0.04	191.92	0.87	.385	0.03	0.04	215.54	0.75	.454	0.04	0.04	212.55	0.85	.398
Social Engagement change						0.28	0.07	180.51	3.83	<.001	0.30	0.07	179.80	4.09	<.001
Level 2 (between child)															
Social Engagement at Time 0						0.54	0.06	184.49	8.42	<.001	0.59	0.07	181.21	8.76	<.001
Gender											−0.35	0.14	225.82	−2.46	.015
Cross-level interactions															
Gender × Time											0.12	0.09	212.55	1.34	.181
Gender × Social Engagement at Time 0											−0.04	0.13	181.21	−0.313	.755
Gender × Social Engagement change											0.17	0.15	179.80	1.147	.253
Random effects variance															
Between children	0.46					0.26					0.25				
Time slope	0.03					0.01					0.01				
Within child	0.41					0.43					0.43				
Model fit															
REML deviance	992					939					941				

Notes: Children *N* = 160, observations = 388; Time (covariate: 0, 1 and 2 for "3-year-olds", "4-for-year-olds" and "5-year-olds"); Gender (covariate: boys = 0.5, girls = −0.5).

TABLE 5 Peer acceptance models (random intercept and random Time slope)

	Model 1					Model 2					Model 3				
Fixed effects	**Estimate**	*SE*	*df*	*t*	*p*	**Estimate**	*SE*	*df*	*t*	*p*	**Estimate**	*SE*	*df*	*t*	*p*
Intercept	−0.05	0.07	191.01	−0.61	.540	−0.06	0.07	197.63	−0.95	.344	−0.04	0.07	197.08	−0.57	.572
Level 1 (within child)															
Time	0.07	0.04	169.76	1.72	.088	0.07	0.04	177.58	1.66	.100	0.08	0.04	175.91	1.75	.082
Social Engagement change						0.12	0.08	147.92	1.43	.155	0.14	0.08	147.21	1.67	.097
Level 2 (between child)															
Social Engagement at Time 0						0.44	0.07	164.34	6.39	<.001	0.48	0.07	164.01	6.49	<.001
Gender											−0.18	0.14	197.08	−1.29	.200
Cross-level interactions															
Gender × Time											0.11	0.09	175.91	1.24	.216
Gender × Social Engagement at Time 0											−0.18	0.15	164.01	−1.25	.214
Gender × Social Engagement change											0.31	0.17	147.21	1.86	.065
Random effects variance															
Between children	0.54					0.39					0.38				
Time slope	0.08					0.08					0.07				
Within child	0.33					0.33					0.33				
Model fit															
REML deviance	1,003					974					974				

Notes: Children *N* = 153, observations = 397; Time (covariate: 0, 1 and 2 for "3-year-olds", "4-for-year-olds" and "5-year-olds"); Gender (covariate: boys = 0.5, girls = −0.5).

TABLE 6 Peer rejection models (random intercept and random Time slope)

	Model 1					Model 2					Model 3				
Fixed effects	**Estimate**	*SE*	*df*	*t*	*p*	**Estimate**	*SE*	*df*	*t*	*p*	**Estimate**	*SE*	*df*	*t*	*p*
Intercept	0.03	0.08	213.65	0.46	.644	0.04	0.08	212.97	0.49	.624	0.02	0.08	217.11	0.25	.806
Level 1 (within child)															
Time	−0.07	0.05	191.18	−1.45	.150	−0.07	0.05	190.26	−1.47	.144	−0.07	0.05	190.91	−1.53	.129
Social Engagement change						0.02	0.09	143.43	0.18	.859	−0.01	0.09	146.31	−0.17	.864
Level 2 (between child)															
Social Engagement at Time 0						−0.05	0.07	169.32	−0.65	.518	−0.13	0.07	171.34	−1.80	.074
Gender											0.46	0.15	217.11	2.99	.003
Cross-level interactions															
Gender × Time											−0.09	0.10	190.91	−0.94	.350
Gender × Social Engagement at Time 0											0.19	0.15	171.34	1.29	.199
Gender × Social Engagement change											−0.23	0.17	146.31	−1.32	.189
Random effects variance															
Between children	0.33					0.33					0.29				
Time slope	0.00					0.00					0.00				
Within child	0.59					0.59					0.59				
Model fit															
REML deviance	1,059					1,065					1,059				

otes: Children *N* = 153, observations = 397; Time (covariate: 0, 1 and 2 for "3-year-olds", "4-for-year-olds" and "5-year-olds"); Gender (covariate: Boys = 0.5, girls = −0.5).

TABLE 7 Reciprocal friends models (random intercept and random Time slope)

	Model 1					Model 2					Model 3				
Fixed effects	**Estimate**	*SE*	*df*	*t*	*p*	**Estimate**	*SE*	*df*	*t*	*p*	**Estimate**	*SE*	*df*	*t*	*p*
Intercept	−0.04	0.08	200.28	−0.52	.602	−0.06	0.08	201.16	−0.78	.434	−0.03	0.08	208.54	−0.37	.713
Level 1 (within child)															
Time	0.08	0.06	210.56	1.43	.155	0.08	0.06	211.54	1.47	.144	0.08	0.06	213.58	1.49	.138
Social Engagement change						0.13	0.10	162.53	1.35	.179	0.14	0.09	164.89	1.55	.123
Level 2 (between child)															
Social Engagement at Time 0						0.24	0.07	169.46	3.52	<.001	0.25	0.07	172.19	3.42	<.001
Gender											−0.14	0.16	208.54	−0.86	.390
Cross-level interactions															
Gender × Time											0.21	0.11	213.58	1.83	.069
Gender × Social Engagement at Time 0											−0.16	0.14	172.19	−1.12	.263
Gender × Social Engagement change											0.42	0.19	164.89	2.25	.026
Random effects variance															
Between children	0.18					0.16					0.15				
Time slope	0.06					0.05					0.04				
Within child	0.66					0.66					0.66				
Model fit															
REML deviance	988					982					983				

Notes: Children *N* = 153, observations = 360; Time (covariate: 0, 1 and 2 for "3-year-olds", "4-for-year-olds" and "5-year-olds"); Gender (covariate: Boys = 0.5, girls = −0.5).

The difference in dependent variables scores for highly engaged and lower engaged 3-year-olds was similar for both boys and girls.

3.5.3 | Gender differences in the effect of Social Engagement change

The moderating effect of Gender on the association between Social Engagement change and dependent variable scores was significant for Reciprocal Friends (0.42, $p < .05$; β Gender × Social Engagement change—Model 3: Table 7) and marginally significant for Peer Acceptance and (0.31, $p < .07$; β Gender × Social Engagement change—Model 3: Table 5; Figure 1). This means that when considering Gender effects, Social Engagement change was associated with changes in Reciprocal Friends and Peer Acceptance scores, albeit differently for boys and girls. For the same amount of positive change in Social Engagement, boys were predicted to score 0.42 *SD*s and 0.31 *SD*s higher than girls in Reciprocal Friends and Peer Acceptance, respectively.

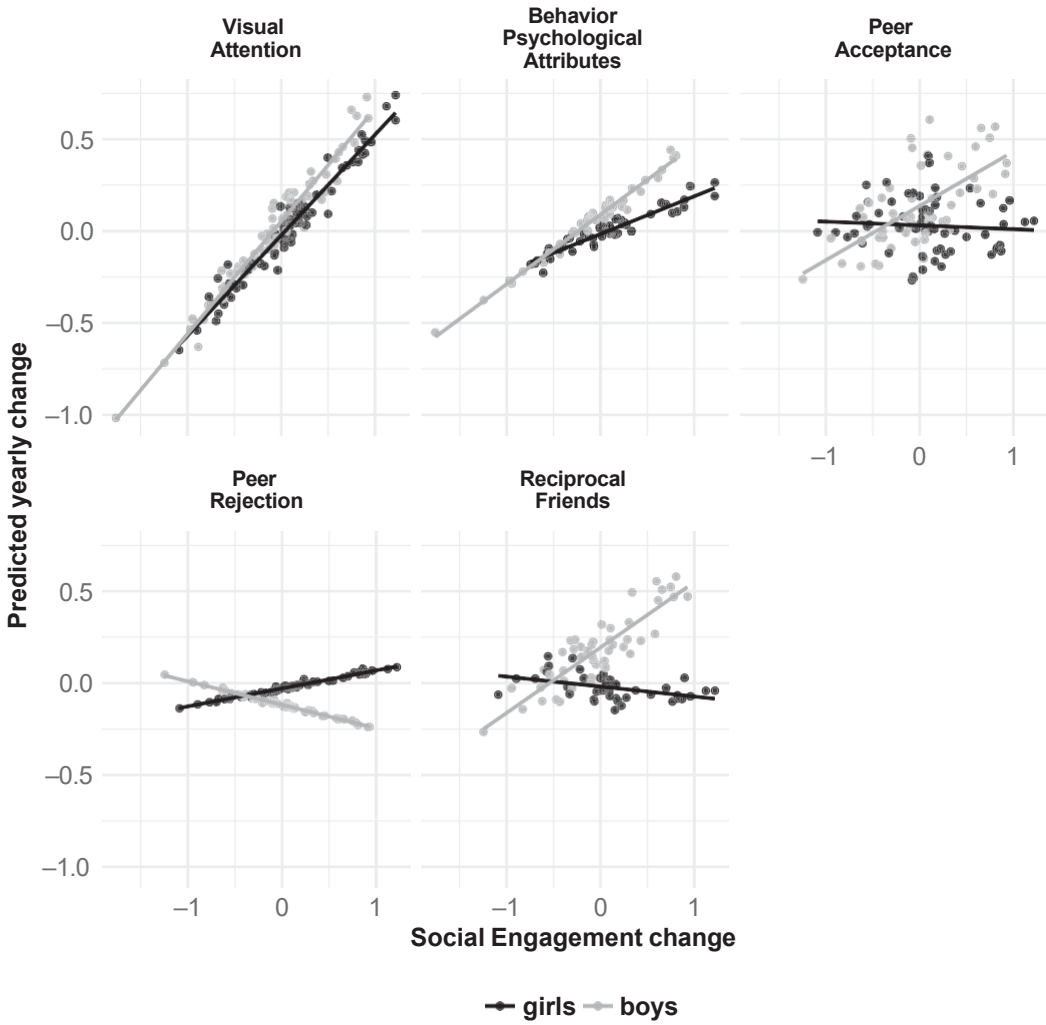

FIGURE 1 Moderating effects on the association between Social Engagement change and dependent variable scores. Predicted yearly changes in dependent variables, estimated from Model 3 predictors (Tables 3–7), were plotted against individual Social Engagement rates of change separately for boys and girls

The combination of these results with those described above for the main effect of Social Engagement change reveals that Social Engagement change significantly predicted changes in all dependent variables scores, except Peer Rejection, either directly or through a Gender interaction (for Peer Acceptance this effect was only marginally significant).

4 | DISCUSSION

This study tested Vaughn et al.'s (2016) suggestion that young children's social engagement, defined in terms of initiated interaction rates, is a foundational indicator of peer SC during early childhood. Results from our multilevel growth analyses are consistent with that interpretation but, do not necessarily prove it true. The initial value for social engagement (Social Engagement at Time 0 predictor; Tables 3–7) was associated significantly with all other SC variables and also was associated significantly with the number of reciprocated friends (for Peer Rejection this effect was only marginally significant and observed only when Gender effects were taken into account; Model 3: Table 6). As hypothesized, *changes* in social engagement over time (Social Engagement change predictor; Tables 3–7) at least marginally predicted changes in all other SC indicators and external variables either directly or through Gender interaction effects, again excepting Peer Rejection (Table 6).

We do not consider the failure to (negatively) predict Peer Rejection from either intercepts or slopes of Social Engagement (see Table 6) to be counter to our primary hypothesis that Social Engagement is a foundational aspect of peer Social Competence because rejection by peers on sociometric tests is not a priori an index of peer social incompetence (see discussion by Rubin, Bukowski, & Bowker, 2015, p. 346). Indeed, Rubin et al. (2015) noted that some peer rejected children also have relatively high Peer Acceptance scores. Similarly, Vaughn et al., (2016) found one cluster of moderately highly engaged preschoolers who had Peer Rejection scores higher than those for the lowest engaged children in their classrooms. These kinds of findings suggest that there are multiple pathways to peer disliking (i.e., rejection) on sociometric assessments and some of these are not related necessarily to the quality of children's social skills (e.g., see discussion by Hartup, 1983).

There may also be a range of antecedents to social engagement that were not included in this study, including aspects of temperament and character, such as behavioral inhibition, emotion regulation, and shyness, as well as a genuine disinterest in the activities of peers, and security of attachments (e.g., Arbeau, Coplan, & Weeks, 2010; Coplan & Armer, 2007; Coplan, Prakash, O'Neil, & Armer, 2004; Veríssimo et al., 2014; Waters & Sroufe, 1983). New studies should be mounted that examine the range of influences on social engagement and how they may interact to produce changes in engagement over time.

Our data also seem relevant to studies that have reported on relations between emotional and social competences (e.g., Denham et al., 2003). Denham and associates have characterized competence in terms of both social and emotional domains and have reported studies relating *social-emotional* competence to parenting and/or attachment variables (e.g., DeMulder, Denham, Schmidt, & Mitchell, 2000; Denham, Renwick, & Holt, 1991; Schmidt, DeMulder, & Denham, 2002). However, in some studies they have dissociated emotional competence from SC and tested emotional competence as an antecedent predictor of SC (e.g., Denham et al., 2003; Denham, Mitchell-Copeland, Strandberg, Auerbach, & Blair, 1997).

As noted above, our model presumes that aspects of emotional competence, specifically affect expression within social transactions and the capacity to modulate affect expression successfully in service of achieving goals within the social group, are elements of our broadband assessment of SC that are referenced explicitly in the Q-sorts used to derive the Behavior and Personality Attributes indicator. Consequently, we view emotional competencies as non-dissociable from SC, in part, because these are linked to attachment security and parenting practices through the same mechanisms that link SC to attachment security and parenting (Veríssimo et al., 2014; Waters & Sroufe, 1983). Although our data set cannot test these speculations directly; this could be the focus of future studies.

Our findings also are relevant to studies of the subgroup structures in preschool groups. Daniel, Santos, Peceguina, and Vaughn (2015) reported that different subgroup types (High Mutual Proximity, Low Mutual Proximity, Ungrouped) within preschool classrooms differed with respect to social engagement. High Mutual Proximity groups tended to engage peers more frequently, and had higher scores for the Behavioral and Personality Attributes composite from the SC indicator families described by Vaughn et al. (2009). Moreover, subgroup type in one year predicted changes in SC indicators in the next year. Taken together with results presented here, it appears that children with higher motivation for social engagement tend to find each other in their initial preschool year and this may afford the opportunity to ratchet up initial levels of engagement. Belonging to a High Mutual Proximity group may account for increases in social engagement over time and may help explain why social engagement predicts increases in SC and reciprocal friendships over time.

Our findings may also have implications for studies aiming to intervene with socially withdrawn and socially avoidant children, who are known to be at risk for subsequent problems in adaptive functioning (e.g., Rubin, Coplan, & Bowker, 2009). Although the data used in this study cannot address possibilities of low engagement subtypes directly due to the relatively small sample sizes for individual age levels and the relatively small number of variables available for classification, results from the Vaughn et al. (2016) study may be relevant. In their study, a cluster analysis of children along the social engagement continuum, formed using a set of items from the Q-sorts included in the Behavior and Personality Attributes family of SC indicators, identified low engaged clusters that differed from the highest social engaged cluster on both indicators of SC and on external variables indicative of psychological reactivity and behavioral regulation. The current findings supporting our hypothesis regarding effects of peer engagement on subsequent SC and on social variables associated with positive SC could be useful for designing the evaluations of intervention effects for very low socially engaged preschoolers (e.g., Chronis-Tuscano et al., 2015) by showing which intervention practices produce the greatest positive change in child social engagement (and for which low engaged children effects were observed).

To conclude, our data tested hypotheses about relations between preschool children's social engagement and indicators of SC. Both initial levels of and changes with regard to social engagement over time predicted individual differences in the SC indicators and for the child's reciprocated friendships. Although we recognize that these relations are, to an extent, presupposed by results of other work testing the model of SC in cross-sectional and in longitudinal data sets (e.g., Santos et al., 2014; Shin et al., 2011), previous studies did not test for predictors of growth over the time frames of their respective studies. Prior studies also provided the impetus for our reconsideration of the role of social engagement as foundational for peer SC during early childhood. Although we do not claim that the data confirm the veracity of our hypothesis, we are satisfied that the present results justify continued research on both the antecedents and the implications of social engagement and SC more generally for young children.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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