ORIGINAL PAPER

Prospective Relations of Temperament and Peer Victimization with Changes in Social Competence in Early Childhood: The Moderating Role of Executive Functioning

Gabriela V. Memba[1] · Jamie M. Ostrov[1]

Abstract

Background Early childhood is a key developmental period to assess social competence (SC) as experiences of peer interactions begin to accumulate. Past work suggests that temperament and forms of peer victimization (physical and relational) are independently associated with changes in SC, but less work has examined the differential effects of these factors.

Objective This school-based study examined how peer victimization and temperament influence changes in SC. Temperament was operationalized using Lahey and colleagues' (J Clin Child Adolesc Psychol, 37(4):794–807, 2008) developmental propensity model and was characterized as negative emotionality, prosociality, and daring. It was hypothesized that forms of peer victimization and negative emotionality would be inversely related, whereas prosociality would be positively related with SC. Prospective links with daring were exploratory. Hypotheses examined prospective relations with an overall SC latent variable and with its individual components (cooperation, social dominance, and positive peer interactions). Given its links with social development, executive functioning was thought to moderate these relations.

Methods The sample consisted of 300 preschoolers ($M = 44.72$ months old, 44% female, 62.1% White). Data was collected from multiple informants (i.e., behavioral observations, teacher-report, research assistant-report) across a 12–15-month span.

Results Negative emotionality was negatively associated with cooperation, and both negative emotionality and daring were positively associated with social dominance. Executive functioning did not moderate these associations.

Conclusions This study provides a nuanced approach to the study of SC by accounting for both dispositional and interpersonal effects on SC. Moreover, these findings highlight that development of SC may be better understood by examining its individual components.

Keywords Temperament · Peer victimization · Social competence · Executive functioning · Early childhood

✉ Gabriela V. Memba
  gvmemba@buffalo.edu

[1] Department of Psychology, University at Buffalo, The State University of New York, Park Hall, Buffalo, NY 14260, USA

Introduction

Social skills are theorized to be critical in one's ability to successively form positive relationships with others (Denham et al., 2009) and are the focus of many school-based early intervention programs (Thomson & Carlson, 2017). Early childhood (defined as ages 3–5 for this study) is a key period in development of social competence (SC), as many children enter preschool and experience an increase in frequency of interactions and complexity of relationships (Denham et al., 2009). SC itself is a multifaceted construct characterized by cooperative, socially dominant and appropriate behavior, as well as skillful participation in groups (McKown et al., 2009; Vaughn et al., 2009). With this in mind, the ability to achieve social goals *while* facilitating positive peer interactions is a critical element of SC (Sebanc et al., 2003). This emphasis on social dominance corresponds with definitions that posit SC allows for the accomplishment of social goals (Vaughn et al., 2009). Given its complex nature, the current study is interested not only in examining factors that are prospectively associated with overall SC, but also with its components (e.g., cooperation, social dominance). The development of social skills in early childhood is thought to foster both social and emotional adjustment and to ultimately maximize a child's school readiness (Sallquist et al., 2009; Vaughn et al., 2009; Yoleri, 2014). As such, understanding the factors that foster SC development may provide insight on how to maximize children's socio-emotional development more broadly. In fact, these positive correlates of SC are why many school-based interventions focus on promoting SC (Thomson & Carlson, 2017). Given that increases in SC may lead to decreases in maladaptive social behaviors (e.g., aggression; Fabes et al., 2006), identifying the factors that promote SC may also provide insight on how to limit risk of developing negative social behaviors. Although SC skills grow throughout childhood, individual differences in SC tend to be stable across early childhood (Fabes et al., 2006; Santos et al., 2014). That said, evidence from intervention studies suggest that children may experience growth in SC skills that go beyond normative SC development (Domitrovich et al., 2007; Thomson & Carlson, 2017). With this in mind, it may be that certain factors also have lasting impacts on SC growth that is not better accounted for by stability. Despite the consensus in the literature that SC is an important aspect of development, there is still uncertainty regarding how to best predict it.

Development of Social Competence

SC has been measured in children as young as 3-years-old (Santos et al., 2014), and is thought to grow as children learn from experiences with peers and broaden their social skill set (Denham et al., 2009; Fabes et al., 2006). Indeed, peer engagement is theorized to be foundational in developing SC, as this provides opportunities to learn how to effectively achieve one's social goals while maintaining a positive interaction with one's peers (Santos et al., 2014; Vaughn et al., 2009). As such, socialization is key in the development of SC, but is one of many factors that are conceptualized to play a role. Beauchamp and Anderson (2010) developed the socio-cognitive integration of abilities (SOCIAL) model to describe the emergence of socially competent behavior. Under this framework, social development is dependent on dynamic relations among biopsychosocial factors. According to the SOCIAL model, internally-driven factors, such as temperament, and externally-driven factors, such as peer experiences, independently influence how a child communicates and behaves around others and may be used to identify factors that put a child at increased risk

for development of poor SC. Self-regulatory skills have also been studied in relation to SC and are thought to influence the degree that a child is able to skillfully socialize with others (Healey et al., 2010; Stifter et al., 2008).

Influence of Temperament and Peer Victimization on SC

Temperament is a widely studied construct that may be defined as individual differences in ones' behavioral styles that are evident early in life (Rothbart et al., 2000). Temperament profiles in early childhood have been demonstrated to be stable from infancy and predictive of future socioemotional adjustment (Laible et al., 2014). Due to the early development of temperament, it is often studied as a way to predict social development and is especially relevant as children enter school given that these individual differences influence how pre-schoolers interact with their peers (Denham et al., 2009). Notably, there are differences across the literature in how temperament is best conceptualized (Sanson et al., 2004). The current study operationalizes temperament based on Lahey and colleagues (2008) developmental propensity model, which is commonly used within the developmental psycho-pathology and clinical psychology literatures. Under this framework, temperament may be characterized by three relatively unrelated and enduring emotional dispositions—prosociality (e.g., sympathetic concern for others, helping and sharing, respect for social rules), negative emotionality (e.g., negative emotional response to threat and frustration), and daring (e.g., positive response to novel and risky situations). This model proposes that certain dimensions of temperament are relevant given their influence on the development of anti-social behaviors. We aim to expand on this theory by exploring whether these temperament dimensions not only contribute to maladaptive behaviors, but also influence those that are adaptive, such as SC.

Although prosociality is not a typically studied dimension of temperament, prior work has demonstrated it to fulfill similar criteria to that of other temperamental dimensions (Knafo & Israel, 2012). In line with Rothbart and colleagues' (2000) conceptualization of temperament, prosociality may be observed in children as early as infancy (Brownell, 2016) and has been found to have a dispositional quality given its stability across time and contexts (Eisenberg et al., 1999). In addition, though prior work has often focused on the influence of socialization on prosociality (Brownell, 2016), genetics have also been found to significantly account for individual differences in prosociality, suggesting that these differences are partially innate in nature (Knafo et al., 2011). This corresponds with other dimensions of temperament, such as effortful control, in which both genetic and environmental (e.g., parenting, interventions) factors have both been found to contribute to a child's temperament (Rothbart et al., 2006). Although prosociality is seemingly similar to SC, there are key differences between these constructs. First, prosociality is character-ized by both behavioral (e.g., sharing) and psychological (e.g., sympathy) factors, whereas SC is defined by motivational (e.g., achievement of personal goal) and interpersonal (e.g., maintenance of positive peer interaction) factors. For instance, a child high in prosociality may be more likely to engage in prosocial behaviors, but this does not ensure that they will also be able to find a balance between achieving their social goal and maintaining a positive interaction with their peers. In addition, whereas SC grows across development (McKown et al., 2009), prosociality has been demonstrated to be a moderately stable emotional disposition (Eisenberg et al., 1999; Lahey et al., 2008), suggesting that it is better conceptualized as a temperamental individual difference rather than a skill to be learned.

As such, we are interested in whether these individual differences in prosociality facilitate increased display of SC.

As for daring, though there is research to support its presence in early childhood (Mathesius et al., 2016) and link with antisocial behavior (Lahey et al., 2008), the current body of literature is limited regarding the effects of daring on SC. That said, this construct is conceptually similar to the more widely studied temperament dimension of surgency. Similar to daring, surgency is characterized by being high in approach to novel stimuli (Degnan et al., 2011). The effect of daring on social development is mixed as it's been shown to be related to both adaptive and maladaptive (Degnan et al., 2011) social behaviors across early childhood. Thus, due to ambiguity in the literature, we adopted an a priori plan to examine the effect of daring in an exploratory manner. That is, effects of daring were examined in the current study, though it was unclear whether its influence on SC would mimic that of surgency. As such, hypotheses for the link between daring and SC were limited regarding the direction of effect.

As mentioned, preschool serves as an introduction to socializing with peers and social problem-solving (Denham et al., 2009). Prior longitudinal research suggests negative emotionality in early childhood is predictive of decreased SC as children transition to middle childhood (Laible et al., 2014). Children high in negative emotionality are thought to become easily overwhelmed when their needs conflict with those of their peers, and as a result, fail to use socially competent skills (Laible et al., 2014). Unlike negative emotionality, research is scant regarding prosociality's relation to SC. Instead, previous early childhood work demonstrated an aspect of prosociality—dispositional empathy—to be positively related to SC within and across time points (Sallquist et al., 2009). This is thought to be because sympathetic concern for others allows for SC by facilitating positive social interactions (Sallquist et al., 2009). When examining prosociality as a whole, it's often studied in relation to conduct problems such as aggression. Longitudinal research testing relations from childhood to early adulthood demonstrates that low prosociality is indicative of increased antisocial behavior (Lahey et al., 2008). When considering the inverse association between antisocial behaviors and SC (Malti, 2006), this work suggests that prosociality may be positively related to SC. As such, our study will build upon this gap in the literature, by explicitly examining prospective relations between prosociality and SC, and will also expand on Lahey et al.'s model by assessing these relations in early childhood.

Environmental factors, such as peer victimization, are also theorized to impact social behavior in early childhood (Beauchamp & Anderson, 2010; Fabes et al., 2006). Peer victimization in school settings is widely studied in its relation to adaptive and maladaptive behaviors in children (see Hawker & Boulton, 2000). It is defined as the recipient of aggression (i.e., the intent to harm or threaten an individual), where the relationship between aggressor and victim is that of non-familial age-mates (Crick & Grotpeter, 1996; Eisner & Malti, 2015; Ostrov, 2010). Prior research suggests there are two main forms of peer victimization– physical (i.e., aggressor uses or threatens to use physical force to harm the victim) and relational (i.e., aggressor targets the victim's social status or relational ties with others; Crick & Grotpeter, 1996).

Although there is a general consensus that both forms of peer victimization are prospectively related to psychosocial maladjustment in early childhood (Casper & Card, 2017; Ostrov, 2010), less is known about its link with adaptive social behavior. Longitudinal work conducted in older samples suggests a negative relation between peer victimization and social skills. For instance, in adolescent and middle childhood samples, both forms of peer victimization were associated with decreased SC (Romera et al., 2016, Sukhawathankul & Leadbeater, 2020). Furthermore, increased victimization has been

associated with less gains in SC skills when compared with low levels of victimization (Sukhawathankul & Leadbeater, 2020). Conversely, there is also research to suggest that low levels of SC increase the risk of experiences of peer victimization in early childhood, suggesting that there may be a bidirectional relation between peer victimization and SC (Garner & Lemerise, 2007). As such, we will also examine this reverse effect between SC and peer victimization.

Executive Functioning and Social Competence

Executive functioning (EF) may be defined as a set of neurocognitive skills that are necessary to enact goal-directed control of thought, action, and emotion (Zelazo et al., 2016). EF is typically conceptualized as a hierarchical construct that is composed of a latent factor and dissociable components, such as working memory and inhibitory control (Diamond, 2013). Importantly, two forms of EF are often studied—"cool" (i.e., use of EF in non-emotionally/motivationally salient contexts) and "hot" (i.e., use of EF in emotionally/motivationally salient contexts) EF (Zelazo et al., 2016). Although prior work supports the role of hot EF in the development of social skills (Di Norcia et al., 2015; Willoughby et al., 2011), there is ambiguity regarding cool EF's link with SC. When not accounting for hot EF, prior work suggests cool EF is significantly related to SC (Fong & Iarocci, 2020). In contrast, when examining cool and hot EF within the same model, results indicate that hot, but not cool, EF is linked with increased SC (Di Norcia et al., 2015). Given constraints of conducting a secondary analysis in which we had access to only certain measures of EF, our study will only examine the moderating role of cool EF. As such, the reported literature below is exclusively based on the cool EF literature.

Early childhood is an important developmental period to study possible moderating effects, given the rapid gains in EF skills during this time (Zelazo et al., 2016). Indeed, much work examining EF in early childhood has demonstrated the emergence of independent and increasingly persistent use of the self-regulatory skills in preschoolers (Diamond, 2013; Garon et al., 2008). Adequate development of EF skills is crucial for socioemotional success in preschool and is thought to allow for increased understanding of social situations and effective use of social skills (Zelazo et al., 2016). Relatedly, deficits in EF are associated with difficulty regulating behavior and engaging in both social and academic problem-solving (Séguin & Zelazo, 2005; Zelazo et al., 2016).

Research in early childhood suggests a moderating role of EF on social behaviors. Work by Healey and colleagues (2010) demonstrated that the effect of negative emotionality on socially adaptive behaviors was mitigated by high EF. Thus, perhaps increased cognitive functioning buffers the negative impact of negative emotionality on SC. Research is scant regarding prosociality's interaction with EF, though it may be that the moderating role of EF is more nuanced for prosociality, relative to negative emotionality. This is because poor EF skills do not always appear to be associated with decreased SC (Zelazo et al., 2016). In fact, there may be differential effects based on the component of SC examined. Compared to children with higher EF, children with EF deficits display similar levels of cooperation, though less socially dominant behaviors (Voyer et al., 2018). With this in mind, perhaps the positive link between prosociality and SC is present regardless of the child's cognitive ability, but increased EF allows for more effective display of social dominance, and thus, a stronger association among these constructs.

The current study is also interested in examining whether EF moderates the relation between forms of peer victimization and SC. Whereas peer victimization is often

associated with maladaptive social behaviors (Hawker & Boulton, 2000), effective use of EF skills may buffer these effects by allowing victims to resist impulsive reactions and think through how to respond adaptively (McQuade, 2017). For children who experience physical victimization, high EF was found to protect against development of maladaptive social behaviors (McQuade, 2017). On the other hand, physical victimization in children with poor EF is concurrently associated with impulsive responding and increased hostile attribution bias (Séguin & Zelazo, 2005), thus, limiting SC.

Whereas there are robust associations between physical victimization and poor social development, findings from the study of relational victimization and social behavior outcomes are more mixed. Longitudinal work demonstrates that relational victimization is positively related to both maladaptive social behaviors, such as aggression (Casper & Card, 2017) and prosocial behaviors (Kamper-DeMarco & Ostrov, 2017). These conflicting results may be explained by the moderating role of EF. Given low EF's association with poor social problem-solving and emotion regulation difficulties (Séguin & Zelazo, 2005), it is thought to promote maladaptive behaviors in relationally victimized children, and ultimately a decrease across all components of SC (i.e., cooperation, social dominance, positive peer interactions). On the other hand, while relationally victimized children with high EF have also been shown to use antisocial behaviors (McQuade, 2017), this increased aggressive behavior may not be at the expense of socially adaptive behaviors. Some relationally victimized children have been shown to enact both aggressive and sociable behaviors, a balance which is suggested to indicate sophisticated social cognition (Nelson et al., 2010). High EF may be what allows relationally victimized children to have this nuanced understanding of social interactions and thus, still effectively engage in socially competent behaviors. Though these children may be able to effectively use cooperative and socially dominant behaviors, the robust association between relational victimization with peer rejection (Casper & Card, 2017) suggests that even with high EF, children with frequent experiences of victimization will still have decreases in positive peer interactions. In other words, there may be differential effects on the moderating role of EF when examining overall SC versus its individual components.

Current Study

The current school-based study aims to examine the prospective associations among temperament, peer victimization, and SC in early childhood, as well as whether EF difficulties moderate this link. Although past work has examined the social effects of these variables separately, we will expand on the literature by examining the differential effect of these factors when controlling for the other. Furthermore, the current analyses will address the paucity of research surrounding how EF interacts to influence positive social skills development. With this in mind, the aims of our study are to first, test whether there are prospective relations between temperament/peer victimization and SC, and second, test whether deficits in EF moderate these relations. Regarding the first aim, it's hypothesized that: (1) negative emotionality and both forms of peer victimization will be negatively related to SC and (2) prosociality will be positively related to SC. Importantly, these paths are expected to hold for both overall SC and when examining links with its separate components. The examination of daring will be exploratory and all models (including those regarding the second aim) will be run with this variable. However, given statistical power concerns and limited theoretical justification, parsimonious models will also be run without including

daring. In order to account for bidirectional associations, we will also test whether SC is prospectively related to forms of peer victimization.

As for the second aim of this study, generally, it's hypothesized that deficits in EF will moderate both temperament and peer victimization's effect on SC. More specifically, it is hypothesized that: (1) both forms of peer victimization and negative emotionality will be negatively related to SC for children with increased EF deficits, (2) and positively related to SC for children with fewer EF deficits, whereas (3) prosociality will be positively related to SC at all levels of EF, but this association will be strongest for children with fewer EF difficulties. Our study will also examine temperament and peer victimization's link with the separate components of SC. As mentioned previously, it is hypothesized that relations with the indicators of SC will correspond with the aforementioned hypotheses; however, there are some expected deviations. Specifically, it's hypothesized that even in children with fewer EF deficits, both forms of peer victimization will be negatively related to positive peer interactions. The adopted design is rigorous not only due to the longitudinal nature of the study, but also due to the use of multiple informants including teachers, research assistants, and school-based behavioral observations.

Method

Participants

This study was a secondary analysis of existing longitudinal data collected from four early childhood cohorts in 2014–2018. Portions of the data were previously used (Ostrov et al., 2022), however, the current study is the first to examine these specific research questions. The sample consists of 300 preschoolers ($M = 44.72$ months old, $SD = 4.39$; 44% female) from ten early childhood centers in a large northeastern U.S. city. These structured preschools were chosen based on accreditation status as well as quality in order to mitigate differences across sites. Similarly, classroom size was generally consistent across centers ($M = 14$ children; range $= 10–22$). The sample was somewhat diverse: 7.6% were Asian or Pacific Islander, 3.0% were Black/African American, 62.1% were Caucasian/White, 1.0% were Hispanic/Latinx, 11.3% were multiracial, and 15% were missing/unknown. The sample was middle to upper-middle class based on parental education (median $=$ graduate/professional degree), household income (range $= \$15,000$ to over \$100,000; median $=$ over \$100,000), and parental occupation (91.7% were classified in executives, professional specialty, administrative categories; Hollingshead, 1975). Due to the varying indicators of socioeconomic status (SES), it was operationalized as a composite of these variables.

Data were assessed for attrition concerns and systematic missingness. At T1, for purposes of the larger project, all participants in multi-age classrooms were invited to participate even though it was known a priori based on age that some would likely transition to kindergarten and not be available for T2 data collection at preschool. Thus, a large sample was initially enrolled because a high rate of attrition was anticipated. Other reasons for attrition were primarily due to families changing schools for free or reduced cost universal pre-kindergarten programs, or moving from the area during the study. From T1 to T2, data were missing for 29.3% of the participants (41 girls, 50 boys). Importantly, preliminary analyses showed attrition was not significantly related to gender [F (1, 298) $= 0.43$, $p = .51$, $\eta^2 = .001$], age [F (1, 294) $= .73$, $p = .39$, $\eta^2 = .002$], cohort [F (1, 298) $= .01$, $p = .93$, $\eta^2 < .001$] nor race/ethnicity [F (1, 253) $= 0.14$, $p = .71$, $\eta^2 = .001$];

though, not surprisingly given the rationale for moving schools, it was related to SES [F (1, 150) = 6.22, p = .01, η^2 = .04], where those with lower SES were more likely to be missing at T2. As such, the SES composite was included as a covariate in all models. Missingness was unrelated to key study variables such as initial levels of prosociality [F (1, 290) = 1.41, p = .24, η^2 = .01], negative emotionality [F (1, 290) = .88, p = .35, η^2 = .003], physical victimization [F (1, 292) = 1.90, p = .17, η^2 = .01], relational victimization [F (1, 292) = .99, p = .32, η^2 = .003], cooperation [F (1, 295) = .02, p = .89, η^2 < .001], social dominance [F (1, 292) = .03, p = .88, η^2 < .001], and positive peer interactions [F (1, 295) = .10, p = .75, η^2 < .001]. However, attrition did have small effects on T1 daring [F (1, 290) = 7.52, p = .01, η^2 = .03], where lower scores were associated with missingness. According to Cohen's (1988) guidelines, the magnitude of the effect was small. Furthermore, because the effect of missingness was related to a known variable in the model, it was acceptable to accommodate missing data within the sample using Full Information Maximum Likelihood (FIML) procedures (Little, 2013), thus allowing all cases to be included in the analyses.

Procedures

Each cohort was followed across a 12–15-month timespan and were assessed using the same procedures, unless noted otherwise. Data were originally collected from three time points– during the spring (Time 1, T1), in the fall of the next academic year, and in the following spring (Time 2, T2). The present study used data exclusively from T1 and T2, save for one exception which is described below. Initial data collection was approved by the local institutional review board. Consent forms were distributed to families and teachers at the start of the project. Parents provided written consent for their child to participate. Teachers also provided written consent and received a $10–$25 compensation in gift cards at each time point, depending on the number of students for which they provided information.

Measures

Observations of Peer Victimization

Peer victimization was assessed through naturalistic observations conducted by trained undergraduate and graduate students. These observations were operationalized using the Early Childhood Observation System introduced by Ostrov and Keating (2004), which uses focal child sampling with continuous recording procedures. Observers were trained extensively through readings and video observation discussions, vignettes assessing both forms of victimization, six practice observation sessions, and a coding examination. During observations at T1 and T2, the focal participant was assessed for 10 min per session for a total of 8 sessions (i.e., 80 min). Observations of the same focal child were limited to once per day, and observers used a standard observation form to record instances of relational and physical victimization experienced by the focal child. Given the variability in child attendance during observation days, a child's observational data were only used if the child was observed for a minimum of 4 sessions. Of the observed sample, 87% and 82% had 8 total sessions at T1 and T2 respectively. In order to take into account the varying number of observation sessions, we used a mean composite of each form of victimization (i.e., total frequency/number of sessions completed) during analyses.

Reliability was assessed using intraclass correlation coefficients (ICCs) in order to measure both the degree of correlation and agreement between raters (Koo & Li, 2016). Specifically, ICCs with absolute agreement were completed for approximately 15% of the sessions spread across the total participants. These checks revealed adequate reliability for physical (ICC = .85/.64) and relational (ICC = .80/.66) victimization at T1 and T2, respectively. Validity of this measure is supported by prior work which have also demonstrated adequate convergence with teacher reports in early childhood samples (see Godleski et al., 2015; Vaillancourt et al., 2018).

Teacher Report of Temperament

Dimensions of temperament were assessed using teacher ratings on the Child and Adolescent Disposition Scale (Lahey et al., 2008). This included 11 items to assess prosociality (e.g., "Cares about others feelings"), 8 items assessing negative emotionality (e.g., "Gets upset easily"), and 5 items measuring daring (e.g., "Enjoys risky and dangerous things"). Notably, research examining the factor structure of the original prosociality subscale demonstrated that some items (e.g., "Tries to do excellent work") weakly load onto the main factor (Waldman et al., 2011). Informed by this work, we modified the subscale accordingly and ultimately 7 items were used in analyses. Teachers responded using a 4-point Likert scale (1 = *Not at all;* 4 = *Very much*). Analyses for each dimension were based on a mean composite across the items. Internal consistency was demonstrated to be good for prosociality (Cronbach's α = .93/.93), negative emotionality (Cronbach's α = .90/.90), and daring (Cronbach's α = .92/.93) at T1 and T2, respectively. Validity of this measure is supported by factor analytic work conducted in a prior study (Mathesius et al., 2017). Research in an early childhood sample demonstrated not only the presence of these three dimensions, but also that they were significantly related to future social development.

Teacher Report of Executive Functioning Deficits

EF was examined using the Child Executive Functioning Inventory (CHEXI, Thorell & Nyberg, 2008). This measure included 24 items (e.g., "Has difficulty thinking ahead or learning from experience") that assessed difficulty with working memory, planning, regulatory, and inhibitory skills in generally non-emotionally/motivationally salient contexts, thus, aligning with a cool conceptualization of EF deficits. Teachers rated their responses using a 5-point Likert scale (1 = *Definitely not true*; 5 = *Definitely true*). The subscale of this variable was created by calculating a mean composite across items. Of note, the decision to include this measure in the original project was not made until data collection had already begun. As such, there was a substantial amount of missing data at T1 (47.2% missing) and T2 (35.3% missing), leading the current study to operationalize these scores for each participant by averaging across both time points, as well as the intermediate time point in the fall that was noted previously. All time points were used in order to account for missing data and was not expected to contradict the temporal precedence of the moderating variable, as EF is found to be a robustly stable construct (Zelazo et al., 2016). Indeed, in the current sample, moderate to high correlations were found among the three time points of teacher reports (r's = .39–.79). Reliability analyses also revealed adequate internal consistency for this composite measure (Cronbach's α = .98). Furthermore, validity of the composite teacher-reported variable was supported through correlational analysis with T1

parent report ($r = .35$, $p = .002$). Beyond the current data, validity of the CHEXI has been established in a large and diverse preschool sample (Camerota et al., 2018).

Research Assistant Report of Social Competence

Trained undergraduate research assistants reported on SC. At each time point, research assistants spent approximately 2 months total in the classrooms to ensure that they were adequately familiar with the focal child. There was some overlap among research assistants who completed this measure and the behavior observations, however, this was minimal across time points. SC was operationalized according to three dimensions– cooperation, social dominance, and positive peer interactions. Scores for each dimension were calculated by creating a composite mean across items. A formal assessment of cooperation was not included in the original project; thus, this variable was operationalized using 3 items from the prosocial subscale of the Child Behavior Scale (CBS; Ladd & Profilet, 1996; e.g., "Cooperative with peers") and 1 item from the Preschool Social Behavior Scale (PSBS; Crick et al., 1997; e.g., "This child is helpful to peers"). Research assistants rated participants on a 3-point Likert scale on the CBS (1 = *Doesn't apply;* 3 = *Certainly applies*), and on a 5-point Likert scale on the PSBS (1 = *Never or almost never true*; 5 = *Always or almost always true*). Social dominance was measured using the Ratings of Resource Control and Influence Among Peers (Hawley, 2003). This included 6 items (e.g., "S/he get what s/he wants from others") on a 5-point Likert scale (1 = *Never or almost never true*; 5 = *Always or almost always true*). Lastly, positive peer interaction was operationalized as the reversed interpretation of a loneliness and social dissatisfaction scale (Cassidy & Asher, 1992). Four items were included (e.g., "Does this child have kids to play with at school?"), and research assistants responded using a 3-point Likert scale (0 = *No;* 2 = *Yes, many*). Assessment of reliability demonstrated good internal consistency at T1 and T2 for cooperation (Cronbach's α's = .83/.77), social dominance (Cronbach's α's = .85/.86) and positive peer interactions (Cronbach's α's = .86/.85). A latent variable was created with each of the three dimensions acting as an indicator, and CFA procedures were used to ensure acceptable use of this variable—the results of which are discussed below.

Data Analysis

All models were analyzed in Mplus version 8.4 (Muthen & Muthen, 1998–2020). Prior to testing hypotheses, a factor analysis was first conducted to ensure validity of the latent variable used to operationalize SC. Given that the structure of the latent variable was guided by prior theory (e.g., McKown et al., 2009), a confirmatory, rather than exploratory, factor analysis was conducted. In order to control for initial levels of SC, a latent variable was created at both T1 and T2. Once the latent variable was modeled, main effects of internal and external factors were modeled in order to test the first aim. Specifically, temperament (negative emotionality and prosociality) and forms of peer victimization were regressed on SC. The second aim of the study was then tested by examining the interactional effect of EF (see Fig. 1). In line with a priori plans, along with examining the effect on the overall SC latent variable, the main effect and interactional models were also run to examine effects on the three separate indictors of SC (i.e., cooperation, social dominance, positive peer interactions). Finally, following a priori plans, models described above were re-run to include the exploratory daring variable. In all models, stability coefficients were modeled in order to account for levels of temperament and peer victimization at T1. Overall

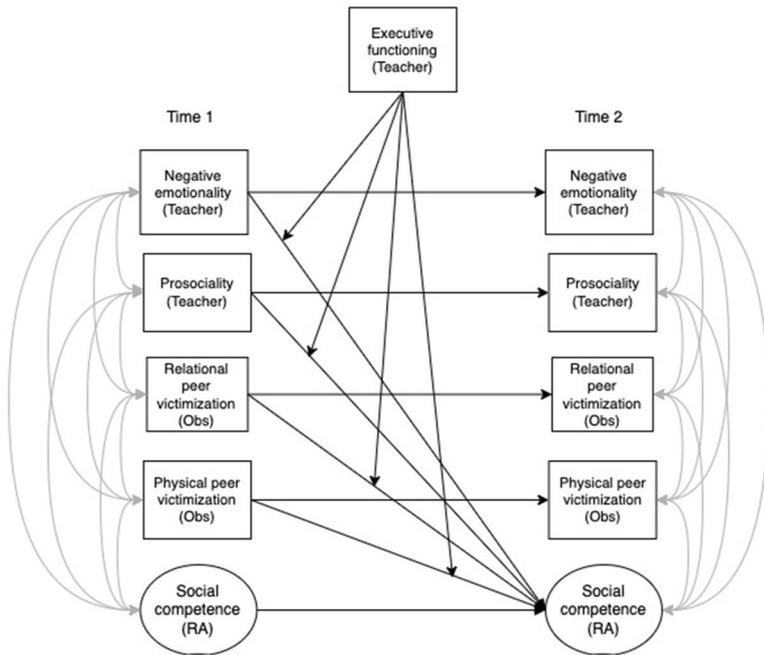*Hypothesized Model for Moderating Effect of Executive Functioning Deficits on Overall Social Competence*

Fig. 1 Hypothesized model for moderating effect of executive functioning deficits on overall social competence. For ease of communication, indicators of social competence (i.e., cooperation, social dominance, positive peer interactions) are not shown. *RA* Research Assistant, *Obs* Behavioral Observation

model fit was tested using the likelihood ratio χ^2, where $p > .05$ indicates acceptable model fit. Analyses also relied on alternative relative goodness-of-fit indices (Browne & Cudeck, 1992)—including the comparative fit index (CFI; $> .90$ = adequate fit; $> .95$ = good fit), the standardized root mean-square residual (SRMR; $< .08$ = adequate fit; $< .05$ = good fit; Hu & Bentler, 1999), and the root mean square error of approximation (RMSEA; $< .08$ = adequate fit; $< .05$ = good fit; Steiger, 1990).

The maximum likelihood estimator was used due to the relative normal distribution of the data across variables. The impact of covariates (e.g., gender, race/ethnicity) was determined using ANOVA tests and bivariate correlations. If bivariate correlations revealed $r > .30$ with any of the outcome variables, they were included in the model. Finally, methods by Aiken and West (1991) were used to probe moderation.

Results

Preliminary Analysis

First, descriptive statistics for variables were calculated and may be found in Table 1. Absolute value of skew was less than three (range $= -1.24$–1.22) and kurtosis less than 10 (range $= -.76$–1.88), suggesting that non-normality of data was not a concern (Kline,

Table 1 Descriptive statistics of key study variables

	Mean	SD	Min.	Max.
Prosociality[1]	2.79	0.74	1.00	4.00
Negative emotionality[1]	1.92	0.73	1.00	4.00
Daring[1]	2.24	0.74	1.00	4.00
Physical victimization[1]	0.22	0.22	0.00	0.89
Relational victimization[1]	0.12	0.16	0.00	0.64
Executive functioning deficits	2.37	0.64	1.00	4.25
Cooperation[1]	2.35	0.60	1.00	3.50
Social dominance[1]	2.78	0.76	1.00	5.00
Positive peer interactions[1]	1.52	0.47	0.25	2.00
Cooperation[2]	2.58	0.54	1.25	4.00
Social dominance[2]	2.94	0.76	1.17	5.00
Positive peer interactions[2]	1.67	0.42	0.25	2.00

[1]Time 1, [2]Time 2

2015). Across variables, outliers (characterized by > 3 standard deviations from the mean) were rare (range = 0.33–1.33%) and were all adjusted by being set to three standard deviations from the mean value. As mentioned above, missing data were accommodated with FIML estimation, thus allowing all cases to be included in the analyses.

Second, inter-correlations across study variables were calculated (Table 2). Not shown in the table is the stability correlations across time points for prosociality ($r = .32$, $p < .001$), negative emotionality ($r = .38$, $p < .001$), relational victimization ($r = .25$, $p < .001$), and physical victimization ($r = .23$, $p = .001$). Correlation analyses revealed weak ($r < .30$) associations among the study variables and possible covariates (i.e., age, gender, SES, race/ethnicity, cohort). ANOVA tests demonstrated significant differences across gender in EF difficulties [$F(1, 242) = 19.86$, $p < .001$, $\eta^2 = .08$; boys > girls], prosociality [$F(1, 207) = 27.75$, $p < .001$, $\eta^2 = .12$; boys < girls], and physical victimization [$F(1, 206) = 16.48$, $p < .001$, $\eta^2 = .07$; boys > girls]. Thus, along with the SES composite, gender was included as a covariate in all analyses. Lastly, post-hoc power analyses were conducted in which the sample size and degrees of freedom of the various models were used to estimate power (MacCallum et al., 1996). Based on these analyses, our models were demonstrated to be adequately powered (.78–.99).

Confirmatory Factor Analysis of Social Competence

A confirmatory factor analysis was run to ensure the validity of the SC latent factor at both time points. In order to evaluate the factor loadings of the three indicators of SC, a fully saturated model was initially run where each indicator loaded onto the latent factor. At T1, the standardized factor loadings were significant for cooperation ($\beta = .32$, $p = .001$) and social dominance ($\beta = .32$, $p = .001$), though these paths were both nonsignificant for the T2 latent factor ($ps = .48$ and $.49$ respectively). However, in both models, the factor loading for positive peer interactions was found to be greater than 1 (e.g., T1 $\beta = 1.31$, $p < .001$) and to have a negative residual variance (e.g., T1 $\sigma^2 = -.03$, $p = .39$). The residual variance of this Heywood case was small and nonsignificant; therefore, the models were run with setting the variance of positive peer interactions to zero (Kline, 2015). Upon making this modification, model fit was good at T1, $\chi^2(1) = 2.39$, $p = .12$, CFI = .99, SRMR = .03,

Table 2 Correlations among key study variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. Pro[1]	1											
2. NE[1]	−.18**	1										
3. Dar[1]	17**	.32**	1									
4. PV[1]	−.07	.07	.07	1								
5. RV[1]	.04	.13*	.04	.26**	1							
6. EF	−.32**	.32**	.29**	.15*	.13*	1						
7. Coop[1]	.09	−.12*	−.13*	.08	.06	−.16*	1					
8. Dom[1]	.07	.02	.05	.09	.003	−.10	.10	1				
9. PPI[1]	.25**	−.20*	.01	.05	.01	−.17**	.42**	.42**	1			
10. Coop[2]	.08	−.23**	−.15*	−.11	−.17*	−.16*	.14*	−.06	.18*	1		
11. Dom[2]	.04	.13	.15*	−.02	.01	−.04	−.04	.29**	.08	.02	1	
12. PPI[2]	.01	−.07	.03	.04	−.05	−.07	.03	.18**	.25**	.34**	.44**	1

Pro Prosociality, *NE* Negative emotionality, *PV* Physical peer victimization, *RV* Relational peer victimization, *EF* Executive functioning deficits, *Coop* Cooperation, *Dom* Social dominance, *PPI* Positive peer interactions

[1]Time 1, [2]Time 2

*p<.05., **p<.01

RMSEA = .07 [95% CI .00–.19], and adequate at T2, $\chi^2(1) = 4.56$, $p = .03$, CFI = .95, SRMR = .04, RMSEA = 0.13 [95% CI 0.03–0.26]. Deviations in excellent model fit were expected given the nonsignificant correlation between social dominance and cooperation. Still, factor loadings were significant for cooperation ($\beta = .42$, $p < .001$; $\beta = .34$, $p < .001$) and social dominance ($\beta = .42$, $p < .001$; $\beta = 0.44$, $p < .001$) at both time points respectively. Thus, this model specification was used in all future analyses of the SC latent factor.

Main Effect of Temperament and Peer Victimization on Social Competence

A model testing the main effects of internal (prosociality and negative emotionality) and external (forms of peer victimization) factors on the SC latent factor evidenced adequate model fit, $\chi^2(55) = 110.79$, $p < .001$, CFI = .90, SRMR = .06, RMSEA = .06 [95% CI .04–.07]. Stability paths were significant for SC ($\beta = .33$, $p = .004$), prosociality ($\beta = .23$, $p < .001$), negative emotionality ($\beta = .40$, $p < .001$), and relational victimization ($\beta = .20$, $p = .003$); though was nonsignificant for physical victimization ($\beta = .11$, $p = .12$). Both internal and external factors were also demonstrated to have a nonsignificant effect on SC (ps range = .35–.85).

A model was then run where temperament and peer victimization predicted the three indicators of SC. This model resulted in good fit to the data, $\chi^2(41) = 66.65$, $p = .007$, CFI = .95, SRMR = .05, RMSEA = .05 [95% CI .02–.07], and led to significantly improved model fit ($\Delta\chi^2(14) = 44.14$, $p < .001$) when compared to the SC latent factor model. Stability paths were significant for positive peer interactions ($\beta = .23$, $p < .001$), social dominance ($\beta = .20$, $p < .001$), prosociality ($\beta = .23$, $p < .001$), negative emotionality ($\beta = .40$, $p < .001$), relational peer victimization ($\beta = .20$, $p = .002$), marginally significant for cooperation ($\beta = .13$, $p = .05$), and nonsignificant for physical victimization ($\beta = .11$, $p = .12$). Regarding main effects, negative emotionality predicted decreases in cooperation ($\beta = -0.22$, $p = .002$) and increases in social dominance ($\beta = .20$, $p = .006$). Prosociality and both forms of victimization were evidenced to have nonsignificant effects (ps range = .12–.89).

In order to account for possible bidirectional effects between peer victimization and SC, a separate model was run in which SC predicted forms of peer victimization. Results revealed poor model fit when SC was operationalized as a latent variable, $\chi^2(32) = 85.71$, $p < .001$, CFI = .83, SRMR = .06, RMSEA = .07 [95% CI 0.06–0.09], and its three separate indicators, $\chi^2(26) = 74.13$, $p < .001$, CFI = .72, SRMR = 0.06, RMSEA = .08 [95% CI 0.06–0.10]. Thus, our findings did not support direct effects of SC on physical and relational victimization.

When predicting SC as a latent factor, the inclusion of daring led to poor model fit, $\chi^2(79) = 230.10$, $p < .001$, CFI = .78, SRMR = 0.08, RMSEA = .08 [95% CI 0.07–0.09]. However, model fit was good when daring was included in the model predicting the three indicators of SC, $\chi^2(56) = 92.93$, $p = .001$, CFI = .95, SRMR = .06, RMSEA = 0.05 [95% CI 0.03–0.06] and significantly improved model fit [$\Delta\chi^2(15) = 26.28$, $p = .03$] compared to the complimentary model excluding daring. Stability paths and main effects for this model are depicted in Fig. 2.

Moderating Role of Executive Functioning Deficits

The moderating role of EF deficits on the latent factor of SC demonstrated poor model fit, $\chi^2(135) = 407.30$, $p < .001$, CFI = .64, SRMR = .09, RMSEA = 0.08 [95% CI 0.07–0.09]. Similarly, when testing whether EF difficulties moderated the effect on the indicators of

Path Model for Main Effects of Internal and External Factors on Indicators of Social Competence
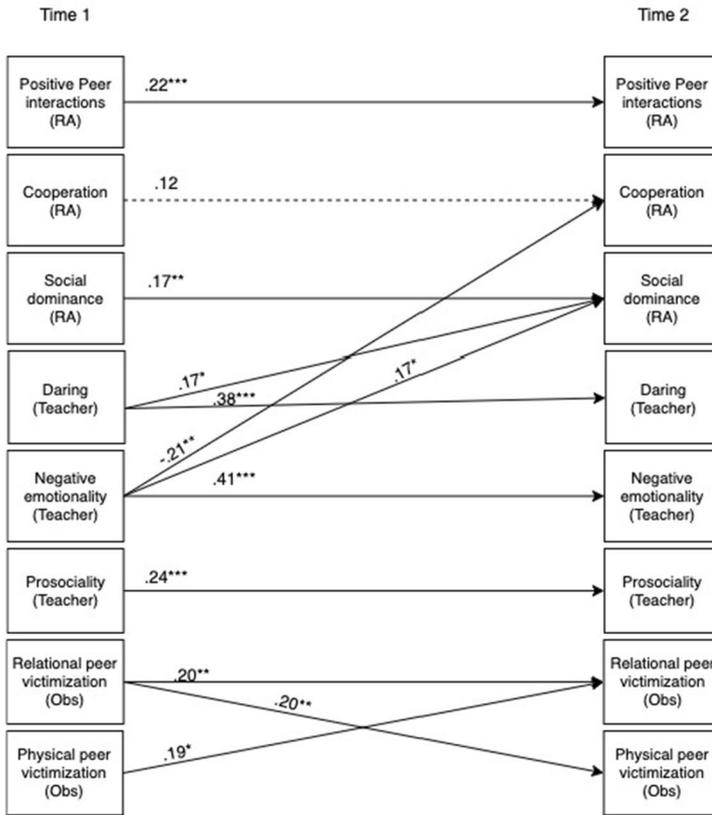

Fig. 2 Path model for main effects of internal and external factors on indicators of social competence. Only main effects are shown for ease of communication of results. Although not shown, within-time correlations at both Time 1 and Time 2 were also estimated. Dotted paths denote $p < .10$. *RA* Research Assistant, *Obs* = Behavioral Observation. $*p < .05., **p < .01., ***p < .001$

SC, model fit was poor, $\chi^2(106) = 328.15$, $p < .001$, CFI = .70, SRMR = .08, RMSEA = .08 [95% CI 0.07–0.09]. Again, analyses revealed that model fit did not improve when adding daring to either model.

Discussion

Our study aimed to examine how negative emotionality, prosociality, daring, and forms of peer victimization differentially influence changes in SC in early childhood and whether EF deficits moderate these paths. Preschool provides ample opportunities to examine the emergence of SC, which consequently aids in identifying risk factors for poor social development. An analysis of the results lends partial support for these hypotheses, as temperament, but not peer victimization, predicted changes in SC one year later. Specifically, negative emotionality was negatively related to cooperation and positively related to social

dominance. The difference in direction of effect may explain why negative emotionality did not predict changes in overall SC. The inclusion of social dominance in the operationalization of SC might also explain the lack of change in SC. Along with being related to adaptive social functioning, social dominance has also been linked to aggressive and controlling behaviors (Sebanc et al., 2003). Thus, though social dominance is an indicator of SC (Vaughn et al., 2009), its association with negative social behaviors may obscure effects on overall SC. Perhaps children who are high in negative emotionality reject cooperative strategies of peer interaction in favor of more coercive behaviors. This corresponds with prior work which suggests that increased negative emotionality leads children to become easily over-aroused across social situations, limiting use of prosocial and cooperative behaviors (Laible et al., 2014).

A priori exploratory analyses revealed that daring also predicted changes in SC—specifically, increases in social dominance. As mentioned, research is mixed regarding the effects of daring on SC. These differing effects may be explained by theory which suggests that temperamental positive reactivity to novel stimuli contributes to a greater motivation to achieve social goals, as well as greater frustration when these social goals are not met (Degnan et al., 2011). That is, although these children may be more willing to approach social situations and consequently have greater opportunities to exercise SC, this propensity towards frustration may increase risk of maladaptive social behaviors. Thus, it's unclear whether the positive association found in this study is indicative of prosocial use of social dominance or coercive/aggressive behaviors.

Our results found no relation between prosociality and SC, which is contrary to hypotheses and ultimately awaits replication. These null findings may be due to the conceptual similarity between prosociality and aspects of SC. As mentioned, SC and prosociality are not synonymous. Whereas prosociality reflects stable individual differences and is a dispositional tendency towards prosocial and empathic behaviors, SC is a skill that develops over time and is characterized by achievement of social goals (Lahey et al., 2008; McKown et al., 2009). That said, the operationalization of prosociality may be compromised when also controlling for the prosocial aspects of SC (e.g., cooperation), thus impacting its construct validity. Although the current study is notable in its extension of the developmental propensity model to examine adaptive social development, it also highlights the need for a detailed examination of the overlap between prosociality and SC. This may allow for a more nuanced conceptualization of prosociality that ensures the preservation of its enduring dispositional characteristics that distinguish it from SC.

Findings also showed that peer victimization did not predict changes in SC. These null effects may be due to a change in peer group at T2. Perhaps peer victimization leads to immediate effects on SC, but these consequences become attenuated when interacting with different peers in new classrooms. Change in peer context may also explain the lack of stability for physical victimization and the relatively weak stability for relational victimization, compared to temperament. Alternatively, null findings for both peer victimization and negative emotionality on overall SC may be a result of the developmental period of the sample. Generally, SC develops across preschool (Denham et al., 2009). Thus, perhaps rather than these risk factors leading to a decrease in SC, it instead impedes development of these skills– ultimately contributing to a lack of change in SC.

Analyses revealed EF deficits moderated neither temperament nor peer victimization's influence on SC. As stated, the current study relied on a cool conceptualization of EF and thus, the results and literature below refer exclusively to cool EF. A possible explanation is that rather than EF, emotion regulation may better account for this relation. Although EF is partially characterized by the control of emotions for goal-directed behaviors (Zelazo et al.,

2016), it does not fully speak to a child's ability to problem-solve in emotionally-charged situations (e.g., when experiencing peer victimization). Indeed, prior work suggests that emotion regulation allows children to regulate arousal, and consequently, their behavior in social situations (Blair et al., 2015). This is especially relevant for peer victimization and negative emotionality's effect on SC, given both are linked with increased emotional arousal (Crick & Grotpeter, 1996; Lahey et al., 2008). In addition, some view self-regulation to be an aspect of temperament itself (Rothbart et al., 2000), that interacts with other dimensions of temperament (Laible et al., 2014). It is also possible that EF may not be best defined as a moderator in its association with SC, but rather as a mediator. Indeed, prior work has found both peer victimization (i.e., physical and relational) and temperament (i.e., negative emotionality) to have effects on EF (Holmes et al., 2016; Leve et al., 2013) which in turn is theorized to affect how children process and respond to social situations (Beauchamp & Anderson, 2010).

Overall, the current school-based study has the strength of using a multi-informant longitudinal design to examine the relevant research questions. In addition, it is noteworthy that the study demonstrated effects across a full academic year and differing peer and classroom contexts. Along with these strengths, there are certain limitations to consider. First, it would be worthwhile to examine if these associations can be replicated in a larger and more diverse sample in order to enhance generalizability of results as well as to mitigate the chance of null results being a function of low power. In addition, restricted range of observations of peer victimization may explain peer victimization's lack of effect on SC. More generally, given the nature of secondary data analyses, our study was limited in its operationalization of constructs such as SC, EF, and temperament. First, the non-standardized measure of SC may limit its construct validity. This is relevant given the relatively small correlations among the components of SC as well as the lack of stability in cooperation. Second, given that deficits in hot EF are related to maladaptive social development (Zelazo et al., 2016), our study was limited in its use of only a cool conceptualization of EF. Third, this study could be improved by examining other dimensions of temperament, such as effortful control, which has been found to be implicated in adaptive social development (Sanson et al., 2004). Effortful control is characterized by the ability to inhibit a dominant response in favor of a subdominant response (Rothbart et al., 2000) and is conceptually related to EF and self-regulation (Zelazo et al., 2016). Furthermore, this study focused on negative experiences, though neglected positively-valanced experiences such as received prosocial behaviors or peer acceptance, which may better account for changes in SC. Lastly, the overlap in informants between SC and peer victimization may have created bias in which their report in one domain (e.g., peer victimization) influences their report in another (e.g., SC). Although research assistants may have a more construct valid perception of children's social behaviors (relative to teachers who may conflate social competence with its correlates such as peer acceptance) it may be that their limited contact with participants does not allow them to fully capture a child's social behaviors. Similarly, teachers are crucial informants for EF deficits and temperament, given the increased demand for EF skills in the classroom and their greater familiarity with students (relative to research assistants). That said, the sole use of teacher-report for these variables may have limited our ability to account for children's behaviors outside of the classroom. Thus, it would be worthwhile to examine if these effects replicate when using multiple informants for each predictor and outcome variable.

Despite these limitations, the current study provides valuable insight regarding the development of SC in early childhood. If these results do indeed replicate, it indicates that SC itself is a complex construct that may be better understood when examining its

components. This has implications for future research, as it suggests that some gains in social skills (e.g., social dominance), may not always be indicative of positive psychosocial adjustment (e.g., may be driven by increased negative emotionality). This information can in turn inform early childhood educators and interventions (i.e., Thomson & Carlson, 2017) that aim to increase social skills in young children. For instance, it may be more beneficial for teachers to focus on promoting cooperative, as opposed to assertive, behaviors in the classroom. Furthermore, results suggest that internal factors, such as temperament, may more strongly impact social development relative to environmental factors. This information can in turn inform interventions that aim to increase social skills in young children. Indeed, prior work supports the efficacy of temperament-based interventions, which specifically aim to help educators and parents understand the link between a child's disposition and their behaviors as well as teach strategies that foster responsiveness from the caregiver and self-regulation in the child (Iverson & Gartstein, 2018). This aim to improve SC would be bolstered by continuing to explore the differential effect of other internal and external factors that contribute to a child's social development.

Declarations

References

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Sage Publications, Inc.

Beauchamp, M. H., & Anderson, V. (2010). SOCIAL: An integrative framework for the development of social skills. *Psychological Bulletin, 136*(1), 39–64. https://doi.org/10.1037/a0017768

Blair, B. L., Perry, N. B., O'Brien, M., Calkins, S. D., Keane, S. P., & Shanahan, L. (2015). Identifying developmental cascades among differentiated dimensions of social competence and emotion regulation. *Developmental Psychology, 51*(8), 1062–1073. https://doi.org/10.1037/a0039472

Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods and Research, 21*(2), 230–258. https://doi.org/10.1177/0049124192021002005

Brownell, C. A. (2016). Prosocial behavior in infancy: The role of socialization. *Child Development Perspectives, 10*(4), 222–227. https://doi.org/10.1111/cdep.12189

Camerota, M., Willoughby, M. T., Kuhn, L. J., & Blair, C. B. (2018). The childhood executive functioning inventory (CHEXI): Factor structure, measurement invariance, and correlates in US preschoolers. *Child Neuropsychology, 24*(3), 322–337. https://doi.org/10.1080/09297049.2016.1247795

Casper, D. M., & Card, N. A. (2017). Overt and relational victimization: A meta-analytic review of their overlap and associations with social-psychological adjustment. *Child Development, 88*(2), 466–483. https://doi.org/10.1111/cdev.12621

Cassidy, J., & Asher, S. R. (1992). Loneliness and peer relations in young children. *Child Development, 63*(2), 350–365. https://doi.org/10.2307/1131484

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Crick, N. R., Casas, J. F., & Mosher, M. (1997). Relational and overt aggression in preschool. *Developmental Psychology, 33*, 579–588. https://doi.org/10.1037/0012-1649.33.4.579

Crick, N. R., & Grotpeter, J. K. (1996). Children's treatment by peers: Victims of relational and overt aggression. *Development and Psychopathology, 8*(2), 367–380. https://doi.org/10.1017/s0954579400007148

Diamond, A. (2013). Executive Functions. *Annual Review of Psychology, 64*(1), 135–168. https://doi.org/10.1146/annurev-psych-113011-143750

Degnan, K. A., Hane, A. A., Henderson, H. A., Moas, O. L., Reeb-Sutherland, B. C., & Fox, N. A. (2011). Longitudinal stability of temperamental exuberance and social–emotional outcomes in early childhood. *Developmental Psychology, 47*(3), 765–780. https://doi.org/10.1037/a0021316

Denham, S., Wyatt, T., Bassett, H., Echeverria, D., & Knox, S. (2009). Assessing social-emotional development in children from a longitudinal perspective. *Journal of Epidemiology and Community Health, 63*(Suppl 1), i37–i52.

Di Norcia, A., Pecora, G., Bombi, A. S., Baumgartner, E., & Laghi, F. (2015). Hot and cool inhibitory control in Italian toddlers: Associations with social competence and behavioral problems. *Journal of Child and Family Studies, 24*(4), 909–914. https://doi.org/10.1007/s10826-014-9901-z

Domitrovich, C. E., Cortes, R. C., & Greenberg, M. T. (2007). Improving young children's social and emotional competence: A randomized trial of the preschool '"PATHS"' curriculum. *Journal of Primary Prevention, 28*, 67–91. https://doi.org/10.1007/s10935-007-0081-0

Eisenberg, N., Guthrie, I. K., Murphy, B. C., Shepard, S. A., Cumberland, A., & Carlo, G. (1999). Consistency and development of prosocial dispositions: A longitudinal study. *Child Development, 70*(6), 1360–1372. https://doi.org/10.1111/1467-8624.00100

Eisner, M. P., & Malti, T. (2015). Aggressive and violent behavior. In M. E. Lamb & R. M. Lerner (Eds.), *Handbook of child psychology and developmental science: Socioemotional processes* (pp. 794–841). John Wiley & Sons Inc.

Fabes, R. A., Gaertner, B. M., & Popp, T. K. (2006). Getting along with others: Social competence in early childhood. In K. McCartney & D. Phillips (Eds.), *Blackwell handbook of early childhood development* (pp. 297–316). Blackwell Publishing.

Fong, V. C., & Iarocci, G. (2020). The role of executive functioning in predicting social competence in children with and without autism spectrum disorder. *Autism Research*. https://doi.org/10.1002/aur.2350

Garner, P. W., & Lemerise, E. A. (2007). The roles of behavioral adjustment and conceptions of peers and emotions in preschool children's peer victimization. *Development and Psychopathology, 19*(1), 57–71. https://doi.org/10.1017/S0954579407070046

Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: A review using an integrative framework. *Psychological Bulletin, 134*(1), 31–60. https://doi.org/10.1037/0033-2909.134.1.31

Godleski, S. A., Kamper, K. E., Ostrov, J. M., Hart, E. J., & Blakley-McClure, S. J. (2015). Peer victimization and peer rejection during early childhood. *Journal of Clinical Child and Adolescent Psychology, 44*(3), 380–392. https://doi.org/10.1080/15374416.2014.940622

Hawker, D. S., & Boulton, M. J. (2000). Twenty years research on peer victimization and psychosocial maladjustment: A meta-analytic review of cross-sectional studies. *Journal of Child Psychology and Psychiatry, 41*(4), 441–455. https://doi.org/10.1017/s0021963099005545

Hawley, P. H. (2003). Prosocial and coercive configurations of resource control in early adolescence: A case for the well-adapted machiavellian. *Merrill-Palmer Quarterly, 49*(3), 279–309. https://doi.org/10.1353/mpq.2003.0013

Healey, D. M., Brodzinsky, L. K., Bernstein, M., Rabinovitz, B., & Halperin, J. M. (2010). Moderating effects of neurocognitive abilities on the relationship between temperament and global functioning. *Child Neuropsychology, 16*(1), 20–31. https://doi.org/10.1080/09297040902984490

Hollingshead, A. A. (1975). *Four-factor index of social status* [Unpublished manuscript]. Yale University, New Haven, CT.

Holmes, C. J., Kim-Spoon, J., & Deater-Deckard, K. (2016). Linking executive function and peer problems from early childhood through middle adolescence. *Journal of Abnormal Child Psychology, 44*(1), 31–42. https://doi.org/10.1007/s10802-015-0044-5

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Iverson, G., & Gartstein, M. (2018). Applications of temperament: A review of caregiver-focused temperament-driven interventions. *Early Education and Development, 29*(1), 31–52. https://doi.org/10.1080/10409289.2017.1341805

Kamper-DeMarco, K. E., & Ostrov, J. M. (2017). Prospective associations between peer victimization and social-psychological adjustment problems in early childhood. *Aggressive Behavior, 43*(5), 471–482. https://doi.org/10.1002/ab.21705

Kline, R. B., (2015). *Principles and practice of structural equation modeling* (4th ed.). Guilford Press.

Knafo, A., & Israel, S. (2012). Empathy, prosocial behavior, and other aspects of kindness. In M. Zentner & R. L. Shiner (Eds.), *Handbook of temperament* (pp. 168–179). Guilford Press.

Knafo, A., Israel, S., & Ebstein, R. P. (2011). Heritability of children's prosocial behavior and differential susceptibility to parenting by variation in the dopamine receptor D4 gene. *Development and Psychopathology, 23*(1), 53–67. https://doi.org/10.1017/s0954579410000647

Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine, 15*(2), 155–163. https://doi.org/10.1016/j.jcm.2016.02.012

Ladd, G. W., & Profilet, S. M. (1996). The Child Behavior Scale: A teacher-report measure of young children's aggressive, withdrawn, and prosocial behaviors. *Developmental Psychology, 32*(6), 1008–1024. https://doi.org/10.1037/0012-1649.32.6.1008

Lahey, B. B., Applegate, B., Chronis, A. M., Jones, H. A., Williams, S. H., Loney, J., & Waldman, I. D. (2008). Psychometric characteristics of a measure of emotional dispositions developed to test a developmental propensity model of conduct disorder. *Journal of Clinical Child and Adolescent Psychology, 37*(4), 794–807. https://doi.org/10.1080/15374410802359635

Laible, D., Carlo, G., Murphy, T., Augustine, M., & Roesch, S. (2014). Predicting children's prosocial and cooperative behavior from their temperamental profiles: A person-centered approach. *Social Development, 23*(4), 734–752.

Leve, L. D., DeGarmo, D. S., Bridgett, D. J., Neiderhiser, J. M., Shaw, D. S., Harold, G. T., Natsuaki, M. N., & Reiss, D. (2013). Using an adoption design to separate genetic, prenatal, and temperament influences on toddler executive function. *Developmental Psychology, 49*(6), 1045–1057. https://doi.org/10.1037/a0029390

Little, T. D. (2013). *Longitudinal structural equation modeling.* Guilford Press.

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods, 1*(2), 130–149. https://doi.org/10.1037/1082-989X.1.2.130

Malti, T. (2006). Aggression, self-understanding, and social competence in Swiss elementary-school children. *Swiss Journal of Psychology/schweizerische Zeitschrift Für Psychologie/revue Suisse De Psychologie, 65*(2), 81–91. https://doi.org/10.1024/1421-0185.65.2.81

Mathesius, J., Lussier, P., & Corrado, R. (2017). Child and adolescent disposition model: An examination of the temperament factor structure within early childhood. *International Journal of Offender Therapy and Comparative Criminology, 61*(13), 1500–1526. https://doi.org/10.1177/0306624X16672931

McKown, C., Gumbiner, L., Russo, N., & Lipton, M. (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. https://doi.org/10.1080/15374410903258934

McQuade, J. D. (2017). Peer victimization and changes in physical and relational aggression: The moderating role of executive functioning abilities. *Aggressive Behavior, 43*(5), 503–512. https://doi.org/10.1002/ab.21708

Muthén, L. K., & Muthén, B. O. (1998–2020). *Mplus user's guide: Statistical analysis with latent variables* (8th ed.). Muthén & Muthén.

Nelson, D. A., Robinson, C. C., Hart, C. H., Albano, A. D., & Marshall, S. J. (2010). Italian preschoolers' peer-status linkages with sociability and subtypes of aggression and victimization. *Social Development, 19*(4), 698–720. https://doi.org/10.1111/j.1467-9507.2009.00551.x

Ostrov, J. M. (2010). Prospective associations between peer victimization and aggression. *Child Development, 81*(6), 1670–1677. https://doi.org/10.1111/j.1467-8624.2010.01501.x

Ostrov, J. M., & Keating, C. F. (2004). Gender differences in preschool aggression during free play and structured interactions: An observational study. *Social Development, 13*(2), 255–277. https://doi.org/10.1111/j.14679507.2004.000266.x

Ostrov, J. M., Murray-Close, D., Perry, K. J., Blakely-McClure, S. J., Perhamus, G. R., Mutignani, L. M., Kesselring, S., Memba, G. V., & Probst, S. (2022). The development of forms and functions of aggression during early childhood: A temperament-based approach. *Development and psychopathology*. https://doi.org/10.1017/S0954579422000177

Romera, E. M., Gómez-Ortiz, O., & Ortega-Ruiz, R. (2016). The mediating role of psychological adjustment between peer victimization and social adjustment in adolescence. *Frontiers in Psychology*. https://doi.org/10.3389/fpsyg.2016.01749

Rothbart, M. K., Ahadi, S. A., & Evans, D. E. (2000). Temperament and personality: Origins and outcomes. *Journal of Personality and Social Psychology, 78*(1), 122–135. https://doi.org/10.1037/0022-3514.78.1.122

Rothbart, M. K., Posner, M. I., & Kieras, J. (2006). Temperament, attention, and the development of self-regulation. In K. McCartney & D. Phillips (Eds.), *Blackwell handbook of early childhood development* (pp. 338–357). Blackwell Publishing.: https://doi.org/10.1002/9780470757703.ch17

Sallquist, J., Eisenberg, N., Spinrad, T. L., Eggum, N. D., & Gaertner, B. M. (2009). Assessment of preschoolers' positive empathy: Concurrent and longitudinal relations with positive emotion, social competence, and sympathy. *The Journal of Positive Psychology, 4*(3), 223–233. https://doi.org/10.1080/17439760902819444

Sanson, A., Hemphill, S., & Smart, D. (2004). Review of connections between temperament and social development: A Review. *Social Development, 13*(1), 142–170. https://doi.org/10.1046/j.1467-9507.2004.00261.x

Santos, A. J., Vaughn, B. E., Peceguina, I., Daniel, J. R., & Shin, N. (2014). Growth of social competence during the preschool years: A 3-Year longitudinal study. *Child Development, 85*(5), 2062–2073. https://doi.org/10.1111/cdev.12246

Sebanc, A. M., Pierce, S. L., Cheatham, C. L., & Gunnar, M. R. (2003). Gendered social worlds in preschool: Dominance, peer acceptance and assertive social skills in boys' and girls' peer groups. *Social Development, 12*(1), 91–106. https://doi.org/10.1111/1467-9507.00223

Séguin, J. R., & Zelazo, P. D. (2005). Executive function in early physical aggression. In R. E. Tremblay, W. W. Hartup, & J. Archer (Eds.), *Developmental origins of aggression* (pp. 307–329). Guilford Press.

Steiger, J. H. (1990). Structural model evaluation and modification: An interval estimation approach. *Multivariate Behavioral Research, 25*(2), 173–180. https://doi.org/10.1207/s15327906mbr2502_4

Stifter, C. A., Cipriano, E., Conway, A., & Kelleher, R. (2009). Temperament and the development of conscience: The moderating role of effortful control. *Social Development, 18*(2), 353–374. https://doi.org/10.1111/j.1467-9507.2008.00491.x

Sukhawathanakul, P., & Leadbeater, B. (2020). Trajectories of peer victimization in elementary school children: Associations with changes in internalizing, externalizing, social competence, and school climate. *Journal of Community Psychology, 48*(6), 1751–1769. https://doi.org/10.1002/jcop.22365

Thomson, R. N., & Carlson, J. S. (2017). A pilot study of a self-administered parent training intervention for building preschoolers' social–emotional competence. *Early Childhood Education Journal, 45*(3), 419–426. https://doi.org/10.1007/s10643-016-0798-6

Thorell, L. B., & Nyberg, L. (2008). The Childhood Executive Functioning Inventory (CHEXI): A new rating instrument for parents and teachers. *Developmental Neuropsychology, 33*(4), 536–552. https://doi.org/10.1080/87565640802101516

Vaillancourt, T., Brittain, H., Haltigan, J. D., Ostrov, J. M., & Muir, C. (2018). Cortisol moderates the relation between physical peer victimization and physical aggression in preschoolers attending high- quality child care: Evidence of differential susceptibility across informants. *Merrill-Palmer Quarterly, 64*(1), 101–134. https://doi.org/10.13110/merrpalmquar1982.64.1.0101

Vaughn, B., Shin, N., Kim, M., Coppola, G., Krzysik, L., Santos, A., Peceguina, I., Daniel, J., Veríssimo, M., DeVries, A., Elphick, E., Ballentina, X., Bost, K., Newell, W., Miller, E., Blake Snider, J., & Korth, B. (2009). Hierarchical models of social competence in preschool children: A multisite, multinational study. *Child Development, 80*(6), 1775–1796. https://doi.org/10.1111/j.1467-8624.2009.01367.x

Voyer, A.-P., Nadeau, L., & Tessier, R. (2018). Social dominance in children with cerebral palsy during a problem-solving task with peers. *Disability and Rehabilitation, 40*(19), 2288–2292. https://doi.org/10.1080/09638288.2017.1334237

Waldman, I. D., Tackett, J. L., Van Hulle, C. A., Applegate, B., Pardini, D., Frick, P. J., & Lahey, B. B. (2011). Child and adolescent conduct disorder substantially shares genetic influences with three socioemotional dispositions. *Journal of Abnormal Psychology, 120*(1), 57–70. https://doi.org/10.1037/a0021351

Willoughby, M., Kupersmidt, J., Voegler-Lee, M., & Bryant, D. (2011). Contributions of hot and cool self-regulation to preschool disruptive behavior and academic achievement. *Developmental Neuropsychology, 36*(2), 162–180. https://doi.org/10.1080/87565641.2010.549980

Yoleri, S. (2014). The role of child's temperament predictor on preschool social competence. *Creative Education, 5*, 1160–1169. https://doi.org/10.4236/ce.2014.513131

Youssef, G. J., Whittle, S., Allen, N. B., Lubman, D. I., Simmons, J. G., & Yücel, M. (2016). Cognitive control as a moderator of temperamental motivations toward adolescent risk-taking behavior. *Child Development, 87*(2), 395–404. https://doi.org/10.1111/cdev.12480

Zelazo, P.D., Blair, C.B., & Willoughby, M.T. (2016) Executive function: Implications for education. *Institutes of Education Sciences.*