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RESEARCH ARTICLE

A dyadic investigation of shy children's behavioral and affective responses to delivering a speech

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Abstract

Shyness is typically associated with avoidant social behavior and restricted affect in new social situations. However, we know considerably less about how one child's shyness influences another child's behavior and affect in new social situations. Children's shyness was parent-reported when children were age 3 ($N = 105$, 52 girls, $M_{age} = 3.50$ years), and children were tested approximately 1 year later ($M_{age} = 4.76$ years) in same-gender dyads where they were asked to give an impromptu speech about their most recent birthday in front of an experimenter and the other member of the dyad. We examined whether children's shyness and speech order influenced their own and their social partner's observed behavior and affect during the speech. Regardless of speech order, children's own shyness was positively associated with their own avoidant social behavior and gaze aversion. Regardless of shyness, children who gave their speech second averted their gaze more than children who gave their speech first. We also found that children who gave their speech second displayed less positive affect if their social partner who they watched give the speech first was shyer. We speculate that some 4-year-old children may be sensitive to the avoidant behaviors of their shy peers and, in turn, respond with less animation when it is their turn to participate in the same activity.

KEYWORDS
APIM, shyness, social learning, speech

Research Highlights

- We examined whether preschool children's shyness and speech order influenced their own and their social partner's observed behavior and affect during a dyadic speech task
- Children's own shyness was positively associated with their own avoidant social behavior and gaze aversion
- Children who gave their speech second averted their gaze more than children who gave their speech first.
- Children who gave their speech second displayed less positive affect if their social partner who they watched give a speech first was shyer
- These findings suggest that preschool-aged children are sensitive to learning about their environment indirectly through social observation

1 | INTRODUCTION

Being the center of attention is a common experience across development. A child may be observed by others when "Happy Birthday" is sung to her or when she opens gifts during the holidays. Parents may sign their child up for activities requiring a stage performance. A preschool teacher may tell a young boy that it is his turn to participate in "Show and Tell" the next day. While some children enjoy taking the center stage, other children may experience anxiety and discomfort when they are the center of attention. A trait that is important to consider in children's responses to being the center of attention is shyness.

Shyness is a temperamental trait characterized by fear and discomfort in anticipation of or during interactions with unfamiliar individuals (Henderson et al., 2018; Melchior & Cheek, 1990; Poole & Schmidt, 2021). Shy children typically experience social fear and feel self-conscious when they are the center of attention (Crozier, 1995). Given shy children's dispositional tendencies, several research groups have examined the relation between shyness and observed behavior and physiology in various social contexts, including contexts that require a child to be the center of attention. Often, this is elicited in the laboratory by asking children to give a speech about a benign topic like their most recent birthday (Fox et al., 1995; Theall-Honey & Schmidt, 2006). To increase potential social threat, children are sometimes told that their speech will be video recorded and shown to others in the future. Children's shyness has been positively related to self-reported anxiety in anticipation of giving a speech at ages 7–8 (Poole & Schmidt, 2021). During speech delivery, children's shyenss has also been associated with observed nonverbal physical avoidance at ages 7–8 (Poole & Schmidt, 2022), verbal avoidance at age 4 (Theall-Honey & Schmidt, 2006), observed anxiety at age 7 (Schmidt et al., 1999), and decreases in activity level from speech anticipation to delivery at ages 4–11 (Poole & Schmidt, 2019). Each of these behavioral observations can be conceptualized as an indicator of fear or discomfort. In addition to subjective nervousness, children's shyness has also been positively associated with increases in heart rate in anticipation of delivering a speech (Poole & Schmidt, 2021) and while delivering a speech (Schmidt et al., 1999). Collectively, these studies suggest shy children experience discomfort when they are the center of attention, and their discomfort manifests behaviorally and physiologically.

Some models of fear development suggest that much of learning is social or vicarious rather than learned entirely through first-hand experiences (Olsson & Phelps, 2007; Rachman, 1977). In support of this, when two groups of children were shown either a video of an animated figure failing versus doing well in front of three evaluators, there was an increase in self-reported social fear when children saw the negative video compared to the neutral video (Askew et al., 2015). Similarly, when 1-year-old infants watched their mothers behave in a socially anxious manner toward a stranger, infants were more avoidant and had a less positive tone during their own interactions with the same stranger compared to when their mothers did not behave in a socially anxious manner (de Rosnay et al., 2006). Vicarious learning of emotions other than fear, like disgust, have also been observed in children (Askew et al., 2014). Given this body of research, shy children's observable responses to perceived social threat may communicate information to other children and influence their peers' responses to social situations.

To our knowledge, only one study has examined the role of shyness in a dyadic self-presentation task where children aged 9–11 delivered a speech (Poole et al., 2023). In this study, the observer child's shyness was related to increases in heart rate from baseline to watching their peer prepare for their speech. The observer child's shyness also interacted with the amount of anxious behavior exhibited by the presenter during their speech to predict changes in heart rate from the peer's speech preparation to the peer's speech delivery. When the presenting child displayed relatively high levels of anxious behavior during their speech, shyness was associated with an increase in heart rate from their peer's speech preparation to their speech delivery. When the presenting child displayed relatively low levels of anxious behavior during their speech, shyness was associated with a decrease in heart rate from their peer's speech preparation to their speech delivery. One interpretation of these findings is that shyness may be related to higher levels of vicarious anxiety observed on a physiological level. Other groups have examined preschool-aged children's responses to a self-presentation task in quartets, but speech-related behaviors were aggregated with other social behaviors from different contexts, and the quartet was not accounted for in the reported analyses (Coplan et al., 1994; Fox et al., 1995; Henderson et al., 2004).

While the aforementioned study provides us with important information about shy children's sensitivity to other children's anxious behaviors during a speech (Poole et al., 2023), there are still several important gaps that warrant investigation. First, the focus of the Poole et al. (2023) study was whether the relation between one child's shyness and their physiological arousal was influenced by watching another child prepare for and deliver a speech. This does not provide us with information about whether one child's shyness influences their own and their social partner's behavior during speech delivery. This is an important gap because one child's feelings about being the focus of others' attention likely influences their own social behavior. Given previous studies demonstrating the social nature of fear learning (Askew et al., 2015; de Rosnay et al., 2006), these responses may also influence another child's responses to the same task. Further, the focus on changes in heart rate in the previous study provides important information regarding a child's fear-related physiological responses, but examining children's behavioral and affective responses can provide us with additional information about how children respond to being the center of attention on an observable level.

Another gap in previous work examining the relation between shyness and observed behavior during a self-presentation task is the lack of focus on preschool-aged children. Most work in this domain has focused on early and middle childhood, when children were between 7 and 11 years old (Poole et al., 2023; Poole & Schmidt, 2021, 2022). Previous work has focused on middle childhood because this period is marked by a more sophisticated social cognitive understanding relative to toddlerhood and the preschool period in terms of experiencing and understanding self-conscious emotions (Crozier, 2010; Crozier & Burnham, 1990). Self-conscious emotions such as embarrassment and

shame are important in the context of shyness because these emotions can be elicited in response to real or imagined social transgressions (Tangney et al., 2007) and may also facilitate a sensitivity toward future novel social situations. While self-conscious emotions may be more developed by middle childhood relative to the preschool period, they emerge before middle childhood. The basis for self-conscious emotions is an understanding of the "self," which emerges well before middle childhood (Eisenberg, 2000; Lewis et al., 1989; Luby et al., 2009). Guilt, shame, and embarrassment may be experienced as early as during the second and third year of life (Kochanska et al., 1994; Lewis et al., 1989; Luby et al., 2009), and rudimentary forms of embarrassment such as coy smiling are observable in infancy (Reddy, 2000). Given the early-developing nature of self-conscious emotions, and the importance of the preschool period given that shy children have yet to enter formal school and tend to have more difficulty with school entry (Coplan et al., 2008; Coplan & Arbeau, 2008), the preschool period is an important time to examine the relation between shyness and dyadic affective and behavioral responses to a self-presentation task.

In light of these gaps, the goal of the present study was to examine the relation between shyness and the child's own (i.e., actor effects) and their partner's (i.e., partner effects) observed behavior and affect during a speech delivered in a dyad. Based on previous research using a similar self-presentation task, regardless of speech order, we predicted that shyness would be related to more avoidant behaviors and less positive affect in the actor (Poole & Schmidt, 2019, 2021, 2022; Schmidt et al., 1999; Theall-Honey & Schmidt, 2006). Based on previous work demonstrating the social nature of fear learning as early as the first year of life (Askew et al., 2015; de Rosnay et al., 2006), when children gave their speech second, we predicted that the social partner's shyness (who gave their speech first) would be related to the child's own avoidant behaviors and less positive affect during their own speech delivery.

2 | METHOD

2.1 | Participants

Participants were 105 typically developing 3-year-old children (52 girls, $M_{age} = 3.50$ years, $SD_{age} = 0.19$ years) and their parents who were recruited from the Child Database in the Department of Psychology, Neuroscience & Behavior at McMaster University in Southern Ontario, Canada. This database contains the names and contact information of parents of healthy, full-term newborn infants recruited from hospitals across the greater Hamilton metropolitan area who agreed to be contacted in the future to participate in infant and child studies conducted at McMaster University. Most of the children were White (87%), and their families had a mean household income of between $75,000 and $100,000 in Canadian dollars. Data collection occurred between 2017 and 2019. Participants and a portion of the procedures were identical to those used in two recent papers examining different research questions and are presented here in the same way for consistency (Hassan & Schmidt, 2021, 2024).

2.2 | Procedure

The present study was part of a larger study examining the influence of temperament on children's prospective social and emotional outcomes across the preschool period. Children and their parents visited the Child Emotion Laboratory at McMaster University at Time 1 (T1) when the children were 3 years old. At T1, the child, parent, and one female experimenter began in a room together. While the child played with a puzzle, the experimenter explained the study procedures to the parent. Once the child was acclimated to the laboratory room, the parent went into a separate room in the laboratory to complete a series of questionnaires. During this visit, the child completed a battery of behavioral tasks and physiology was collected as part of the larger study and were not included in the present study.

Parents and their children returned to the laboratory for a second time approximately 1 year later (Time 2; T2) where the child was paired with another same-gender and unfamiliar child who had also participated in the T1 visit (M_{age} at T2 = 4.76 years $SD_{age} = 0.38$ years). The dyad met for the first time in the playroom and proceeded to engage in different activities, including a speech task. The parent was present for the first portion of the play activities not included in the present study, then left the room to complete a series of questionnaires. The parents were not present for the speech task. All families were provided with small toys, *Junior Scientist* certificates, and $30 gift cards as tokens of appreciation for their participation. Parents provided written permission for their children to participate and consented to participate themselves and children provided verbal assent for both visits. All procedures were approved by the McMaster Research Ethics Board (Title: Private Speech and Physiological Measures of Self-Regulation, Protocol Number: 2052).

2.3 | Measures

2.3.1 | Shyness (T1)

Parent report

Parents completed the Children's Behavior Questionnaire (CBQ), which is a parent-rated questionnaire evaluating 3- to 7-year-old children's temperament. Of particular interest to the present study was the 6-item shyness subscale from the CBQ. Statements were rated by parents on a scale ranging from 1 (never) to 7 (always). A sample item from this scale includes "Acts shy around new people." The shyness subscale demonstrated good internal consistency ($\alpha = 0.89$).

2.3.2 | Observed behavior and affect during the speech (T2)

After the parents left the playroom and only the two children and a female experimenter remained, the children were told they had to give an impromptu speech about their most recent birthday. The birthday speech is a self-presentation task that has previously been used to

elicit social stress in preschoolers and young children (Fox et al., 1995; MacGowan & Schmidt, 2021; Poole & Schmidt, 2019; Theall-Honey & Schmidt, 2006). More specifically, children were told:

> *Now you are going to give a speech to other children about your most recent birthday. We will videotape this presentation so that other boys and girls can see and hear all about your birthday using special cameras on the wall. Before we videotape your presentation, I want you to think about your last birthday without talking and think about what you want to say in your speech for other children to see.*

Children were given approximately 1 min to think about their speech before one child was told that they would give their speech first. The child giving the speech first was told:

> *When I say go, I'd like you to give a speech about your last birthday for two whole minutes. You can tell me if you had a party, if there were cake or presents, and who was there. Remember, we are going to videotape your speech using this special camera on the wall so that later we can show this speech to other boys and girls, and they will be able to watch your speech and learn about what you did on your last birthday. Go!*

The experimenter and the other child sat in front of the presenting child and watched the speech presentation. Speech order was randomly selected by flipping a coin before the visit began. After the first child delivered their speech, the children switched spots and the instructions were repeated to the second child. Children were prompted approximately every 30 s if they did not speak to the experimenter. Experimenters did not provide verbal feedback until the end of the speech (e.g., by saying "uh huh" while the child gave their speech). At the end of the child's speech, regardless of performance, the experimenter clapped for the child, and told them they did a great job.

Behavioral coding

Children's speeches were video recorded and later behaviorally coded. Although children were asked and prompted to speak for 2 min, few children spoke for more than 60 s. As such, only the first 60 s of the speech were coded for behavior and affect. Coding of behaviors and affect during the speech was conducted using an epoch-based approach (e.g., every 10 s) or using a continuous approach, depending on the variable.

Children's gaze aversion and nervous fidgeting were coded using an epoch-based approach every 10 s for the first 60 s of the speech. For each epoch, raters indicated where children's gaze was for the majority of the epoch. If children were looking toward the experimenter, the other child, or the camera, they received a score of 0 (i.e., social gaze); if children were looking away from the experimenter, the other child, or the camera, they received a score of 1 (i.e., non-social gaze). These categories were informed by previous studies examining the direction of children's gaze while they gave a speech (MacGowan et al., 2022; Poole et al., 2023; Poole & Schmidt, 2022, 2023). For each epoch, raters also indicated whether the child displayed no nervous fidgeting (coded as 0, when the child stood relatively still), a mild or moderate amount of nervous fidgeting (coded as 1, e.g., small hand movements, slow rocking back and forth or front to back, hands fidgeting with clothes or hair), or a high amount of nervous fidgeting (coded as 2, e.g., kicking, fast rocking back and forth, bouncing up and down). Interrater reliability was established on ~22% of the videos by two independent coders (ICC fidgeting = 0.925, ICC gaze aversion = 0.761).

Children's time spent speaking, physical avoidance, positive affect, and negative affect were coded continuously on a second-to-second basis using the Behavioral Observation Research Interactive Software (BORIS) (Friard & Gamba, 2016) by two independent coders. BORIS allows for the assignment of keyboard buttons to specific behaviors so coders can turn a behavior or coded emotion "on" and "off" to capture the number of seconds children spent engaging in a behavior or displaying a particular emotion. *Time spent speaking* was coded when children were speaking about their birthday or a related subject, and not when the children were speaking to the experimenter about another topic (e.g., "I'm all done"). *Physical avoidance* was coded when children crossed their arms over their chest, leaned away from the camera, experimenter or other child, took steps away from where they were told to stand in front of the camera, tucked their face in their chest, covered their face or mouth, or said verbally that they did not want to participate in the speech task. *Positive affect* was coded when children displayed verbal or non-verbal instances of positivity, including smiling, laughing, and giggling. *Negative affect* was coded when children displayed verbal or non-verbal instances of negativity, including frowning, crying, or heavy brow furrowing. Interrater reliability was established on ~19% of the videos by two independent coders (ICC time spent speaking = 0.973, ICC physical avoidance = 0.913, ICC positive affect = 0.996, ICC negative affect = 0.632).

Our decision to use an epoch-based approach versus a continuous approach was based on several factors. An epoch-based approach was employed when different levels or the intensity of a behavior were most informative. For nervous fidgeting, for example, we reasoned that small hand movements (a score of 1 during an epoch) were qualitatively different than rocking back and forth (a score of 2 during an epoch). Because of this variability, we did not wish to use a continuous approach where we only indicated the number of seconds spent engaging in a behavior. For other behaviors, we used a continuous approach because we felt the different levels of a behavior were either not possible to record (e.g., time spent speaking; a child is either speaking or not) or different levels of a behavior were not meaningful (e.g., smiling versus giggling during the child's speech). We acknowledge that some behaviors could have been coded as continuous that were coded using an epoch-based approach (e.g., observed affect, avoidance) and some behaviors that were coded using an epoch-based approach could have been coded consciously (e.g., gaze aversion). The decision to use an epoch-based approach versus a continuous approach was one we made based on previous coding

schemes that included a speech component (MacGowan et al., 2022; Poole et al., 2023; Poole & Schmidt, 2022, 2023), coded behavior and affect in non-speech-related studies in developmental psychology (Calkins et al., 2004; Degnan et al., 2011; Hassan et al., 2023), the research question, and our subjective judgment.

Children's *latency to speak* was coded as the number of seconds before a child began speaking during the speech. Complete agreement was established on ~19% of the videos coded by two independent coders for latency to speak. Of note, four children refused to give their speech. For those children, latency to speak was coded as 60 s and behavioral avoidance was coded as 60 s, and all other behavioral and affect codes were entered as missing.

Importantly, only nine children displayed any negative affect, and only two of those children displayed negative affect for more than 1 s. Because the proportion of negative affect was so low, we elected not to use negative affect in any analyses. All coded behaviors except for negative affect were entered into a factor analysis using a Varimax rotation (Abdi, 2004) (Table S1). To create composites, we used a combination of a data-driven and theoretical approach. Three potential factors emerged from the factor analysis. The first factor included physical avoidance, latency to speak, and time spent speaking (reversed). The second factor included positive affect and nervous fidgeting. Nervous fidgeting and positive affect loading on a single factor suggested that nervous fidgeting may reflect global activity rather than increased activity due to anxiety. Indeed, high levels of activity and positive affect typically both load highly onto a factor of extraversion/surgency during the preschool period (Rothbart et al., 2001). As a result, we elected to analyze positive affect alone and did not include nervous fidgeting in any further analyses. The final factor included only gaze aversion. Accordingly, physical avoidance, latency to speak, and time spent speaking (reversed) were z-scored and a sum was computed. We labeled this factor behavioral avoidance. Higher values on this composite represented relatively higher levels of avoidant behavior during speech delivery.

2.4 | Missing data and loss to follow-up

This present study was part of a larger study examining the influence of temperament on prospective social behavior in preschool children and included both a dyadic and individual visit at T2. The outcome variables of interest in the present study occurred during the dyadic portion of T2. Because it was difficult to align schedules of families with children of the same gender for the dyadic portion, of the 105 children at T1, 62 children returned for their T2 dyad visit. Two children at T2 were matched with a same-gender, same-age child who had not been tested at the T1 visit because we were unable to align the schedules of these two children with any of the children tested at T1, so a total of 64 children had the potential to contribute dyad data. At T2, videos were recorded using a closeup and overview camera angle, and behavior and affect were coded using the closeup view. For one dyad (two participants), the closeup video file was corrupted so we were unable to code any behaviors during the speech except for latency to speak, which was coded from the overview angle. Four participants refused to participate in the speech task, so they were missing data for all coded variables except for latency to speak and physical avoidance. Of the 105 at T1, two were missing maternal-report of shyness data due to children's refusal to participate.

The children who did not complete the T2 dyadic portion did not differ from those children who did based on age ($t(104) = 0.40$, $p = 0.693$), gender (X^2 $(1, N = 105) = 1.01$, $p = 0.31$), household income ($t(98) = -0.48$, $p = 0.629$), or maternal-report of shyness ($t(102) = 0.41$, $p = 0.682$). Little's Test of Missing Completely at Random (MCAR) was not significant, $\chi 2 = 180.67$, $df = 159$, $p = 0.115$, suggesting that patterns of missing data did not violate the assumption that data were missing completely at random. To handle missing data, children who did not return for the second visit were given a dyad pairing value with a member of the same gender who also did not attend their T2 visit. Those pairs were then randomly assigned a speech order variable in the same way that speech order was randomly assigned to the children who did attend their second visit. Then, missing data were imputed using the expectation-maximization (EM) algorithm to avoid the biased parameter estimates that can occur with pairwise or listwise deletion (Schafer & Graham, 2002). Table 1 includes information about how many observations were available before imputation for all study variables.

2.5 | Statistical analyses

We used APIMs (Cook & Kenny, 2005) to examine the influence of a child's shyness at T1 and speech order at T2 on their own and their partner's observed behavior and affect during a speech at T2. The APIM treats the dyad as the unit of analysis rather than the individual child, accounting for dyadic interdependence (Cook & Kenny, 2005). APIMs provide estimates of how one child-level factor (e.g., temperament) influences the child's own and their social partner's behavior or affect. Of note, the birthday speech context is technically triadic but statistically dyadic. Said in another way, although there were three rather than two individuals in the room during the speech, we opted for a dyadic statistical approach because the experimenter's behavior was standardized and did not change meaningfully based on the behavior of the children during the speech.

An important step in conducting an APIM is first determining whether dyads are distinguishable or indistinguishable on some meaningful variable. Distinguishability can be determined conceptually and empirically (Kenny et al., 2006). In the present study, dyads were conceptually distinguishable based on whether they went first or second in the speech. In multilevel modeling, empirical distinguishability is determined by comparing a model where the variance is set to be homogeneous with a CSR estimator or heterogeneous with a CSH estimator in SPSS using a chi-square difference test (Kenny, 2013). The chi-square difference test was non-significant for observed avoidance ($X^2 = 0.69$, $df = 1$, $p = 0.406$), gaze aversion ($X^2 = 1.02$, $df = 1$, $p = 0.312$), and positive affect ($X^2 = 0.04$, $df = 1$, $p = 0.845$), indicating that the models were not significantly worsened by forcing homogeneous

TABLE 1 Descriptive statistics for study variables.

Variables	Mean (SD)	Range	Range of difference within dyads	Kurtosis	Skew	*n* contributed	*n* winsorized
Parent-reported shyness	3.52 (1.25)	1–6.67	0–4.5	−0.63	0.22	103	0
Observed avoidant behavior	−0.02 (2.39)	−4.27 to 7.38	0–7.05	1.97	1.16	62	3 high[a]
Observed positive affect	23.43 (13.72)	−7.83[b] to 54.10	0.17–37.07	−0.34	0.23	59	0
Observed gaze aversion	1.34 (1.27)	−0.47 to 5.15	0–5	0.99	1	59	1 high

Note: Parent-reported shyness was collected at Time 1 (M_{age} = 3.50 years) and observed behaviors and affect were collected during a birthday speech at Time 2 (M_{age} = 4.76 years).

[a]Four high latency to speak outliers were winzorized before creating the observed avoidant behavior composite.

[b]The expectation-maximization algorithm used to impute missing values can produce values outside of the possible observed minimum and maximum values.

variances. Therefore, the dyads in the present study were considered empirically indistinguishable and children were included as both actors and partners in a pairwise dataset.

Before conducting analyses, shyness was grand-mean centered. Speech order was coded so −1 indicated that a child went first and 1 indicated that a child went second. APIMs were conducted using multilevel modeling in SPSS version 29, with a REML estimator and CSR (homogenous) variance structure. Predictor variables were either mixed or within-dyad (Kenny et al., 2006). Shyness was included as a mixed variable because it varied between and within dyads. Speech order was included as a within-dyad variable because it only varied within the dyad, such that each member of each dyad either went first or second.

First, models were estimated using actor and partner shyness and speech order as predictors to identify the main effects only. Then, actor and partner shyness, speech order, and the interaction between actor shyness and speech order, and partner shyness and speech order were entered in separate models. The outcome variables across APIMs were observed behavioral avoidance, gaze aversion, and observed positive affect during the speech task. Analyses controlled for child gender because gender was associated with significant mean-level differences in positive affect, $t(102) = 2.68$, $p = 0.009$, where girls ($M = 27.06$, SD = 13.84) displayed more positive affect during their speech than boys ($M = 20.05$ SD = 12.79).

3 | RESULTS

3.1 | Preliminary analyses

Outliers were winsorized, and variables were evaluated for normality using skewness and kurtosis statistics. Table 1 presents descriptive normality statistics for study variables, and Table 2 presents intercorrelations among study variables. All reported analyses were conducted with the imputed dataset.

To ensure that there was equality across assigned speech order in shyness, we ran a one-way ANCOVA with speech order as the between-subjects factor and shyness as the dependent factor, and children's gender as a covariate. We found that there were no mean level differences in shyness based on speech order, $F(1, 101) = 0.66$, $p = 0.520$, $\eta_p^2 = 0.004$.

TABLE 2 Pearson's correlations among study variables.

Variables	2	3	4
1. Parent-reported shyness	0.24*	0.32**	−0.05
2. Observed avoidant behavior	–	−0.07	−0.05
3. Observed gaze aversion	–	–	−0.06
4. Observed positive affect	–	–	–

Note: Parent-reported shyness was collected at Time 1 (M_{age} = 3.50 years) and observed behaviors and affect were collected during a birthday speech at Time 2 (M_{age} = 4.76 years).

*$p < 0.05$.

**$p < 0.01$.

3.2 | Dyadic similarity

Partner and actor shyness were unrelated within dyads ($r = -0.04$, $p = 0.721$). During the birthday speech, gaze aversion ($r = 0.02$, $p = 0.805$) and positive affect ($r = 0.18$, $p = 0.063$) were not significantly related between the actor and the partner. However, partner and actor observed avoidance during the birthday speech were related ($r = 0.502$, $p < 0.001$). Table 1 also includes the range of absolute difference scores within dyads.

3.3 | Actor partner interdependence models

3.3.1 | Observed avoidance

The actor effect of shyness was significantly associated with actor observed avoidance during the speech ($B = 0.58$, SE = 0.19, $p = 0.008$). The partner effect of shyness ($B = 0.25$, SE = 0.19, $p = 0.192$) and speech order ($B = -0.14$, SE = 0.16, $p = 0.388$) were not significant predictors of the actor's observed avoidance during the speech. The interaction between actor shyness and speech order ($B = -0.06$, SE = 0.19, $p = 0.751$) and partner shyness and speech order ($B = 0.16$,

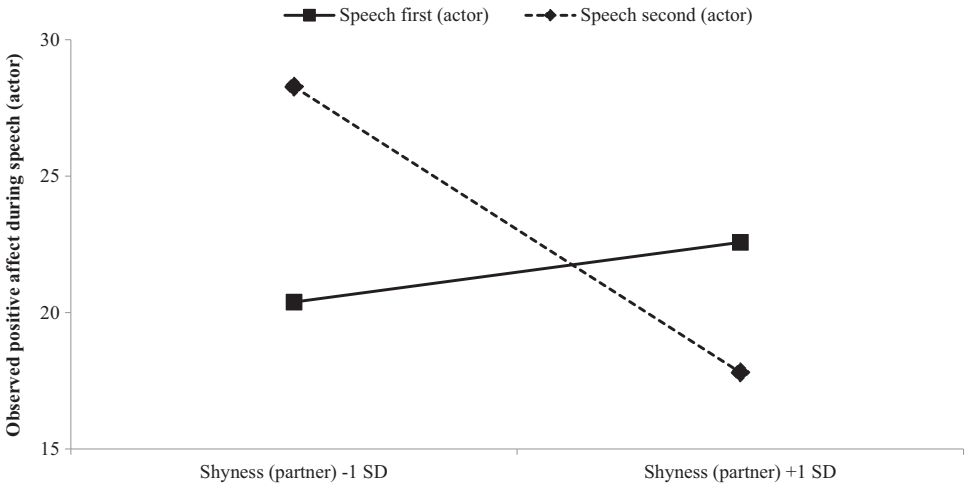

FIGURE 1 Actor-partner interdependence model depicting the influence of partner's shyness at Time 1 (M_{age} = 3.50 years) and speech order at Time 2 (M_{age} = 4.76 years) on partner's positive affect during a speech at Time 2.

SE = 0.19, p = 0.395) were also not significant predictors of the actor's observed avoidance during the speech.

3.3.2 | Observed gaze aversion

The actor effect of shyness (B = 0.30, SE = 0.10, p = 0.002) and speech order (B = 0.22, SE = 0.11, p = 0.049) were significantly associated with actor-observed gaze aversion during the speech, where children who went second had relatively higher gaze aversion. The partner effect of shyness was not significantly associated with the actor's gaze aversion (B = −0.10, SE = 0.10, p = 0.291). The interaction between actor shyness and speech order (B = 0.001, SE = 0.10, p = 0.993) and partner shyness and speech order (B = 0.06, SE = 0.10, p = 0.551) were also not significant predictors of the actor's observed gaze aversion during the speech.

3.3.3 | Observed positive affect

The actor (B = −1.00, SE = 1.07, p = 0.348) and partner (B = −1.96, SE = 1.09, p = 0.074) effect of shyness and speech order (B = 0.77, SE = 1.21, p = 0.635) were not significant predictors of observed positive affect during the speech. The interaction between partner shyness and speech order (B = −2.54, SE = 1.04, p = 0.016), but not actor shyness and speech order (B = −1.70, SE = 1.02, p = 0.099), was a significant predictor of observed positive affect during the speech. Figure 1 depicts the significant interaction.

We used a simple slopes analysis where we examined the relation between the partner's shyness on the actor's observed positive affect when the child gave their speech first (plotted at −1) versus when the child gave their speech second (plotted at 1). When the child gave their speech first, the partner's shyness was not significantly associated with observed positive affect in the actor (B = 0.87, p = 0.581). When the child gave their speech second, the partner's shyness was negatively associated with observed positive affect in the actor (B = −4.21, p = 0.003).

3.3.4 | Post-hoc analysis

We were interested in determining whether the observed relations among shyness, speech order, and positive affect could be explained by shy children's tendency to display more avoidance during their speech delivery. To clarify these relations, we conducted a post-hoc APIM that included the actor and partner effect of observed avoidance and speech order on the actor's observed positive affect. We found that observed actor (B = −0.39, p = 0.532) and partner (B = −0.61, p = 0.323) avoidance and speech order (B = 0.689, p = 0.571) were not significantly associated with the actor's positive affect. The interaction between observed avoidance in the actor and speech order was also not significantly associated with the actor's observed positive affect (B = 0.60, p = 0.368). However, the interaction between partner avoidance and speech order was significantly associated with the actor's observed positive affect (B = −1.48, p = 0.028). Figure S1 depicts the significant interaction.

To decompose the interaction, we used a simple slopes analysis where we examined the relation between the partner's observed avoidance on the actor's observed positive affect when the child gave their speech first (plotted at −1) versus when the child gave their speech second (plotted at 1). When the child gave their speech first, the partner's avoidance during their speech delivery was not significantly associated with observed positive affect in the actor (B = 0.88, p = 0.317). When the child gave their speech second, the partner's avoidance during their speech delivery was negatively associated with observed positive affect in the actor (B = −2.96, p = 0.028). This suggests that partner shyness may have been negatively associated with actor's positive affect when the actor gave their speech second because

shy children were more avoidant during their speech. Regardless of shyness, avoidance in the partner was associated with less positive affect in the actor when the actor gave their speech second.

4 | DISCUSSION

In the present study, we used an APIM to examine whether shyness at age 3 was associated with the child's own and a same-gender peer's observed behavior and affect during a self-presentation task at age 4.5, and whether these relations depended on speech order. Regardless of speech order, the child's own shyness was positively associated with their own behavioral avoidance and gaze aversion during their speech delivery. Regardless of shyness, children who delivered their speech second exhibited more gaze aversion during their speech than children who delivered their speech first. We also found that the partner's shyness was negatively associated with the child's own positive affect during their speech only when the actor delivered their speech second.

In the context of a self-presentation speech task, shyness has been associated with verbal and non-verbal indices of avoidance during the preschool period (Theall-Honey & Schmidt, 2006) and in early childhood (Poole & Schmidt, 2019, 2021, 2022; Schmidt et al., 1999). In the present study, shyness was similarly positively associated with greater behavioral avoidance (i.e., greater latency to speak and physical avoidance, less time spent speaking) and gaze aversion. Our results extend previous work by measuring shyness at age 3 and prospectively predicting behaviors and affect during a speech and embedding the task within a social context by asking children to give their speech in front of a same-gender peer. Consistent with previous interpretations, we speculate that shy children are more fearful about being the center of attention and respond to self-presentation contexts with more avoidance.

Avoidance in and of itself is not problematic. However, if shy children's avoidance during this self-presentation task is reflective of their response to different situations in preschool or kindergarten, given the importance of engagement for adjustment in classroom settings (Hughes & Coplan, 2010; Ladd et al., 1999), shy children's avoidance may have negative consequences for children's adjustment. Important future considerations for researchers are to examine shy children's behaviors in a more naturalistic setting, examine how shy children's avoidant behaviors are perceived by peers, and what strategies from teachers and peers support shy children's engagement during self-presentation tasks. For example, does the familiarity of the teachers, peers, or broader environment support engagement for shy children?

We extended previous work by examining how shyness was related to children's own *and* their partner's observed behavior and affect during a self-presentation task in a laboratory context. The partner's shyness was associated with less positive affect in the actor when the actor gave their speech second, after watching the partner give their speech first.

The findings can be interpreted through a social learning lens. Very early on, infants and children have the capacity to learn about threats in their environment indirectly (Askew et al., 2014; de Rosnay et al., 2006; Olsson & Phelps, 2007). We speculate that shyer children who delivered their speech first signaled to observing children that the task was threatening. As a result, children who delivered their speech second, following a shyer child, displayed less enthusiasm and were more positively affectively restricted. Children who delivered their speech second may have been more apprehensive about the task due to social learning from their shy peers. Because we found that 1) shyness was associated with greater avoidance and gaze aversion during speech delivery, and 2) for children who delivered their speech second, the partner's avoidance during their speech delivery was negatively associated with observed positive affect in the actor, we speculate that children who delivered their speech second were learning from shy children's avoidant behaviors, perhaps leading to more cautiousness in their overt expressions. Expressions of avoidance may act as signals to group members about present threats in social contexts. Accordingly, from an adaptive perspective, expressing avoidance and averting gaze by one partner and observed by the other might ultimately serve an important function in preserving group well-being (see, for example, Boyd et al., 2011)

Importantly, no partner effect of shyness was observed when the target child (i.e., actor) delivered their speech first. This suggests that *just* having a shy partner during a speech task is not related to differences in behavior and affect; rather, something about watching a shyer child deliver their speech first is an important contributor. Regardless of shyness, we found that avoidance in the partner was associated with less positive affect in the actor when the actor gave their speech second. Four-year-old children appear to be sensitive to avoidant behaviors and respond to the same context with less positive affect.

It is also possible that children who gave their speech second and displayed less positive affect were responding to something other than avoidance that was not measured in the present study. Given previous work demonstrating the social nature of fear learning (Askew et al., 2014; de Rosnay et al., 2006; Olsson & Phelps, 2007), we have mainly interpreted our findings in the context of the second speech giver learning from their shy partner's social avoidance and internalizing the speech task as threatening. However, without children's subjective reports of their own anxiety before delivering their speech, it is difficult to substantiate our speculations.

There are at least two alternative explanations regarding the reported findings. It is possible that watching a shy child display avoidant behaviors when giving their speech first may signal that the speech is not fun to deliver, thereby dampening the second child's enthusiasm for delivering their speech. It is also possible that watching a child display social discomfort (inferred via observation of avoidant behavior), may globally lower the second speech giver's mood. In response to either of these alternative explanations, the child giving their speech second may display less positive affect. We cannot determine from these data alone whether our results reflect peer-to-peer learning or emotion contagion (Nakahashi & Ohtsuki, 2015). However, there were no direct effects of actor or partner shyness on actor or partner positive affect, nor an interaction between actor shyness and

speech order on positive affect. Therefore, children giving their speech second would have to "pick up" on something other than a lack of positive affect in the shy actor (e.g., behavioral avoidance, gaze aversion). Regardless of whether the child giving the speech second with a relatively shyer social partner internalized the task as threatening or boring, or whether watching a shy child look "uncomfortable" while giving a speech dampened the second speech giver's mood more globally, the social nature of peer-to-peer learning or emotion contagion as a function of temperament contributes to our theoretical understanding of temperament's influence on social behavior.

The results from the present study also have practical implications. Given the potential for shy children's avoidant behaviors to impact their peers' responses to a self-presentation task, it may be helpful for preschool and kindergarten teachers to structure self-presentation tasks so children who are less shy present before shyer children. This is particularly important given previous work suggesting that shy children are sensitive to the anxious behaviors of their presenting peers such that their physiological arousal decreases when their social partner exhibits relatively low levels of anxious behavior (Poole et al., 2023). Structuring self-presentation tasks so that shy children who are less shy present before shyer children may decrease shy children's anxiety when they deliver their presentation, potentially resulting in less behavioral avoidance.

4.1 | Strengths, limitations, and future directions

The reported results should be interpreted while considering the study's strengths and limitations. Strengths of the present study included the longitudinal investigation of temperamental shyness in relation to *observed* behavior and affect during a prospective dyadic self-presentation task during a relatively understudied developmental period. We also used an analytical approach that allowed us to model actor and partner effects to more completely capture whether and how shyness was related to the expressed behavior and affect of shy children's peers. Compared to using a child confederate or adult experimenter, including a same-gender peer in the study more closely reflect the social dynamics in the children's everyday environments.

In terms of limitations, the present study had a relatively high level of attrition from T1 to T2. This was in part due to the difficulty of recruiting a longitudinal dyadic sample and subsequently aligning participants schedules for the dyad testing portion of the study. Although missingness was not associated with any of the T1 variables of interest or sociodemographic variables, patterns of missing data did not violate the assumption that data were missing completely at random, and our use of missing data handling techniques should be theoretically less biased than listwise deletion (Schafer & Graham, 2002), the high attrition rate is worth noting. Of note, missing data handling techniques have been shown to perform well even in cases where a large proportion (up to 50%) of data are missing in a relatively small sample (as low as 50 participants; Schafer & Graham, 2002), and several other dyadic studies have used EM to handle missing data (e.g., Mushquash et al., 2013; Popp et al., 2008; Windle & Windle, 2014; Zhou et al., 2017). Despite our inclusion of missing data, we acknowledge that our sample size was limited given that our analyses used a dyadic approach. As such, the results of the present study should be interpreted with this limitation in mind and are in need of replication with a large sample to ensure the reliability of these findings.

The children who participated in the study were also primarily White and came from socioeconomically privileged backgrounds. Accordingly, the results may not be generalizable to a more racially and socioeconomically heterogeneous population. Further, while we speculate that shy children were more avoidant during their speech due to relatively higher anxiety about being the center of attention, we did not directly ask children to rate their anxiety before giving the speech. It is possible that shy children may have been more avoidant, for example, because they were generally more avoidant or restricted regardless of anxiety. Similarly, while we speculate that the partner's shyness was negatively associated with the actor's positive affect when the actor delivered their speech second because shy presenters were more avoidant, we did not test a formal moderated-mediation model due to limited power in the APIM.

One final area that should be discussed as a potential limitation relates the nature the speech as a self-presentation task in the present study. Although children are exposed to situations where they are the center of attention, it can be difficult to recreate these situations in the laboratory. We chose the birthday speech task because it has been previously used in developmental psychology research (Fox et al., 1995; MacGowan & Schmidt, 2021; Poole & Schmidt, 2019; Theall-Honey & Schmidt, 2006) and allowed us to extend previous work by adding a second child as both an observer and eventual presenter. We expected that adding a second observer would increase the stress of the situation, which would be relevant to eliciting shy-related behaviors. The addition of a second child allowed us to examine partner and order effects.

On balance, however, the birthday speech task is a very specific context. Children were asked to give a speech about their most recent birthday while being watched by an experimenter and another same-gender child of a similar age whom they had never met before. The experimenter only provided standardized responses and feedback. This is an important limitation to acknowledge because the standardized behaviors of the experimenter may have influenced children's behavior, especially children who are very sensitive to scaffolding. Typically, social interactions with others include subtle, non-intrusive, communicative feedback through backchannelling (Yngve, 1970). Backchanneling can include smiling, head nodding, or vocalizations (e.g., "uh huh, mmm") that function to communicate engagement from the listener. The birthday speech task, by design, did not include standardized backchanneling. The oddness of the context is an example of a trade-off between the goals of the study, experimenter control, and ecological validity. Nonetheless, the lack of ecological validity is a limitation that should be acknowledged.

Further, we elected not to have the parents in the room during the birthday speech because we were interested in shyness. Shyness reflects fear and anxiety in response to social novelty (Henderson et al., 2018; Melchior & Cheek, 1990; Poole & Schmidt, 2021). Although

children often rely on their parents for scaffolding and support during difficult situations, having the parents in the room reduces the novelty of the laboratory context. Because of children's reliance on parents for support, children who have poorer language abilities, regardless of shyness, may have avoided the birthday speech task because they felt they would not have succeeded at the task. While we cannot entirely rule this out as a possibility, we found that receptive language ability measured via NIH's Picture Vocabulary Test during the same visit as the birthday speech task was not significantly associated with the child's own observed avoidance ($r = -0.23$, $p = 0.083$), gaze aversion ($r = -0.03$, $p = 0.835$), or positive affect ($r = -0.11$, $p = 0.403$) during the speech.

Future studies should replicate and extend the present study by directly asking children about their level of anxiety during different self-presentation tasks in a dyadic context in a larger and more heterogeneous sample. Future work can also better understand the social implications of shy children's avoidance by asking dyads their impressions of each other following the observation of performance on a self-presentation task.

5 | CONCLUSION

In the present study, we used an APIM to examine the relation between T1 shyness and actor and partner's observed behavior and affect at T2 during a speech task. We also observed whether these relations depended on the order of speech delivery. Regardless of speech order, the child's own shyness was negatively associated with their own behavioral avoidance and gaze aversion during the speech delivery. Regardless of shyness, children who delivered their speech second averted their gaze more than children who delivered their speech first. When children delivered their speech second, they exhibited less positive affect if their social partner was relatively shyer. We speculate that children who deliver their speech second are sensitive to their shy peers' avoidance and interpret this avoidance as a signal of social threat. In response, children who watched a shyer child give their speech first were more restricted in positive affect when delivering their own speech. In light of these findings, and recent work suggesting shy children are sensitive to their social partner's anxious behaviors during a speech (Poole et al., 2023), it may be helpful for educators to structure self-presentation tasks so relatively less shy children present before shyer children.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data supporting the findings are available upon request from the corresponding author.

REFERENCES

Abdi, H. (2004). Factor rotations in factor analyses. In M. S. Lewis-Beck, A. Bryman, & T. F. Liao (Eds.), *Encyclopedia of social sciences research methods*. Sage Publications, Inc. https://doi.org/10.4135/9781412950589

Askew, C., Çakır, K., Põldsam, L., & Reynolds, G. (2014). The effect of disgust and fear modeling on children's disgust and fear for animals. *Journal of Abnormal Psychology*, *123*(3), 566–577. https://doi.org/10.1037/a0037228

Askew, C., Hagel, A., & Morgan, J. (2015). Vicarious learning of children's social-anxiety-related fear beliefs and emotional Stroop bias. *Emotion*, *15*(4), 501–510. https://doi.org/10.1037/emo0000083

Boyd, R., Richerson, P. J., & Henrich, J. (2011). The cultural niche: Why social learning is essential for human adaptation. *Proceedings of the National Academy of Sciences*, *108*(supplement_2), 10918–10925. https://doi.org/10.1073/pnas.1100290108

Calkins, S. D., Hungerford, A., & Dedmon, S. E. (2004). Mothers' interactions with temperamentally frustrated infants. *Infant Mental Health Journal*, *25*(3), 219–239. https://doi.org/10.1002/imhj.20002

Cook, W. L., & Kenny, D. A. (2005). The Actor–Partner Interdependence Model: A model of bidirectional effects in developmental studies. *International Journal of Behavioral Development*, *29*(2), 101–109. https://doi.org/10.1080/01650250444000405

Coplan, R. J., & Arbeau, K. A. (2008). The stresses of a "brave new world": Shyness and school adjustment in kindergarten. *Journal of Research in Childhood Education*, *22*(4), 377–389. https://doi.org/10.1080/02568540809594634

Coplan, R. J., Arbeau, K. A., & Armer, M. (2008). Don't fret, be supportive! Maternal characteristics linking child shyness to psychosocial and school adjustment in kindergarten. *Journal of Abnormal Child Psychology*, *36*(3), 359–371. https://doi.org/10.1007/s10802-007-9183-7

Coplan, R. J., Rubin, K. H., Fox, N. A., Calkins, S. D., Stewart, S. L., Coplan, R. J., Rubin, K. H., Fox, N. A., Calkins, S. D., & Stewart, S. L. (1994). Being alone, playing alone, and acting alone: Distinguishing among reticence and passive and active solitude in young children. *Child Development*, *65*(1), 129–137. https://doi.org/10.2307/1131370

Crozier, W. R. (1995). Shyness and self-esteem in middle childhood. *British Journal of Educational Psychology*, *65*(1), 85–95. https://doi.org/10.1111/j.2044-8279.1995.tb01133.x

Crozier, W. R. (2010). Shyness and the development of embarrassment and the self-conscious emotions. In K. H. Rubin & R. J. Coplan (Eds.), *The development of shyness and social withdrawal* (pp. 42–63). The Guilford Press.

Crozier, W. R., & Burnham, M. (1990). Age-related differences in children's understanding of shyness. *British Journal of Developmental Psychology*, *8*(2), 179–185. https://doi.org/10.1111/j.2044-835X.1990.tb00832.x

de Rosnay, M., Cooper, P. J., Tsigaras, N., & Murray, L. (2006). Transmission of social anxiety from mother to infant: An experimental study using a social referencing paradigm. *Behaviour Research and Therapy*, *44*(8), 1165–1175. https://doi.org/10.1016/j.brat.2005.09.003

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

Eisenberg, N. (2000). Emotion, regulation, and moral development. *Annual Review of Psychology*, *51*, 665–697. https://doi.org/10.1146/annurev.psych.51.1.665

Fox, N. A., Rubin, K. H., Calkins, S. D., Marshall, T. R., Coplan, R. J., Porges, S. W., Long, J. M., & Stewart, S. (1995). Frontal activation asymmetry and social competence at four years of age. *Child Development*, *66*(6), 1770–1784. https://doi.org/10.2307/1131909

Friard, O., & Gamba, M. (2016). BORIS: A free, versatile open-source event-logging software for video/audio coding and live observations. *Methods in Ecology and Evolution*, *7*(11), 1325–1330. https://doi.org/10.1111/2041-210X.12584

Hassan, R., & Schmidt, L. A. (2021). Inhibitory control, dyadic social behavior, and mental health difculties in preschoolers. *Child Development*, *93*(3), e251–e265.

Hassan, R., & Schmidt, L. A. (2024). Shyness and inhibitory control in preschool dyads: An actor-partner model of social behavior. *Developmental Psychology*, *60*(2), 271–283. https://doi.org/10.1037/dev0001663

Hassan, R., Smith, C. L., Schmidt, L. A., Brook, C. A., & Bell, M. A. (2023). Developmental patterns of children's shyness: Relations with physiological, emotional, and regulatory responses to being treated unfairly. *Child Development*, *94*(6), 1745–1761. https://doi.org/10.1111/cdev.13961

Henderson, H. A., Green, E. S., & Wick, B. L. (2018). The social world of behaviorally inhibited children: A transactional account. In K. Pérez-Edgar & N. A. Fox (Eds.), *Behavioral inhibition: Integrating theory, research, and clinical perspectives* (pp. 135–155). Springer International Publishing. https://doi.org/10.1007/978-3-319-98077-5_7

Henderson, H. A., Marshall, P. J., Fox, N. A., & Rubin, K. H. (2004). Psychophysiological and behavioral evidence for varying forms and functions of nonsocial behavior in preschoolers. *Child Development*, *75*(1), 251–263. https://doi.org/10.1111/j.1467-8624.2004.00667.x

Hughes, K., & Coplan, R. J. (2010). Exploring processes linking shyness and academic achievement in childhood. *School Psychology Quarterly*, *25*(4), 213–222. https://doi.org/10.1037/a0022070

Kenny, D. A. (2013). *Test of distinguishability using multilevel modeling*. https://davidakenny.net/doc/indistinguishability_mlm.pdf

Kenny, D. A., Kashy, D. A., & Cook, W. L. (2006). *Dyadic data analysis* (pp. xix, 458). Guilford Press.

Kochanska, G., DeVet, K., Goldman, M., Murray, K., & Putnam, S. P. (1994). Maternal reports of conscience development and temperament in young children. *Child Development*, *65*(3), 852–868. https://doi.org/10.2307/1131423

Ladd, G. W., Birch, S. H., & Buhs, E. S. (1999). Children's social and scholastic lives in kindergarten: Related spheres of influence? *Child Development*, *70*(6), 1373–1400. https://doi.org/10.1111/1467-8624.00101

Lewis, M., Sullivan, M. W., Stanger, C., & Weiss, M. (1989). Self development and self-conscious emotions. *Child Development*, *60*(1), 146–156. https://doi.org/10.2307/1131080

Luby, J., Belden, A., Sullivan, J., Hayen, R., McCadney, A., & Spitznagel, E. (2009). Shame and guilt in preschool depression: Evidence for elevations in self-conscious emotions in depression as early as age 3. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *50*(9), 1156–1166. https://doi.org/10.1111/j.1469-7610.2009.02077.x

MacGowan, T. L., Colonnesi, C., Nikolić, M., & Schmidt, L. A. (2022). Expressions of shyness and theory of mind in children: A psychophysiological study. *Cognitive Development*, *61*, 101138. https://doi.org/10.1016/j.cogdev.2021.101138

MacGowan, T. L., & Schmidt, L. A. (2021). Helping as prosocial practice: Longitudinal relations among children's shyness, helping behavior, and empathic response. *Journal of Experimental Child Psychology*, *209*, 105154. https://doi.org/10.1016/j.jecp.2021.105154

Melchior, L., & Cheek, J. M. (1990). Shyness and anxious self-preoccupation during a social interaction. *Social Behavior and Personality*, *5*(2), 117–130.

Mushquash, A. R., Stewart, S. H., Sherry, S. B., Mackinnon, S. P., Antony, M. M., & Sherry, D. L. (2013). Heavy episodic drinking among dating partners: A longitudinal actor–partner interdependence model. *Psychology of Addictive Behaviors*, *27*(1), 178–183. https://doi.org/10.1037/a0026653

Nakahashi, W., & Ohtsuki, H. (2015). When is emotional contagion adaptive? *Journal of Theoretical Biology*, *380*, 480–488. https://doi.org/10.1016/j.jtbi.2015.06.014

Olsson, A., & Phelps, E. A. (2007). Social learning of fear. *Nature Neuroscience*, *10*(9), Article 9, 1095–1102. https://doi.org/10.1038/nn1968

Poole, K. L., & Schmidt, L. A. (2019). Smiling through the shyness: The adaptive function of positive affect in shy children. *Emotion*, *19*(1), 160–170. https://doi.org/10.1037/emo0000426

Poole, K. L., & Schmidt, L. A. (2021). While a shy child waits: Autonomic and affective responses during the anticipation and delivery of a speech. *Emotion*, *21*, 1103–1113. https://doi.org/10.1037/emo0000951

Poole, K. L., & Schmidt, L. A. (2022). Temperamental contributions to state expressions of shyness in children. *Personality and Individual Differences*, *186*, 111345. https://doi.org/10.1016/j.paid.2021.111345

Poole, K. L., & Schmidt, L. A. (2023). Latent profiles of children's shyness: Behavioral, affective, and physiological components. *Child Development*, *94*(4), 1068–1077. https://doi.org/10.1111/cdev.13920

Poole, K. L., Sosa-Hernandez, L., Green, E. S., Wilson, M., Labahn, C., & Henderson, H. A. (2023). Children's shyness and physiological arousal to a peer's social stress. *Developmental Psychobiology*, *65*(4), e22388. https://doi.org/10.1002/dev.22388

Popp, D., Laursen, B., Kerr, M., Stattin, H., & Burk, W. K. (2008). Modeling homophily over time with an actor-partner interdependence model. *Developmental Psychology*, *44*(4), 1028–1039. https://doi.org/10.1037/0012-1649.44.4.1028

Rachman, S. (1977). The conditioning theory of fear acquisition: A critical examination. *Behaviour Research and Therapy*, *15*(5), 375–387. https://doi.org/10.1016/0005-7967(77)90041-9

Reddy, V. (2000). Coyness in early infancy. *Developmental Science*, *3*(2), 186–192. https://doi.org/10.1111/1467-7687.00112

Rothbart, M. K., Ahadi, S. A., Hershey, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: The Children's Behavior Questionnaire. *Child Development*, *72*(5), 1394–1408. https://doi.org/10.1111/1467-8624.00355

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, *7*(2), 147–177. https://doi.org/10.1037/1082-989X.7.2.147

Schmidt, L. A., Fox, N. A., Schulkin, J., & Gold, P. W. (1999). Behavioral and psychophysiological correlates of self-presentation in temperamentally shy children. *Developmental Psychobiology*, *35*(2), 119–135. https://doi.org/10.1002/(SICI)1098-2302(199909)35:2⟨119::AID-DEV5⟩3.0.CO;2-G.

Tangney, J. P., Stuewig, J., & Mashek, D. J. (2007). Moral emotions and moral behavior. *Annual Review of Psychology*, *58*, 345–372. https://doi.org/10.1146/annurev.psych.56.091103.070145

Theall-Honey, L. A., & Schmidt, L. A. (2006). Do temperamentally shy children process emotion differently than nonshy children? Behavioral, psychophysiological, and gender differences in reticent preschoolers. *Developmental Psychobiology*, *48*(3), 187–196. https://doi.org/10.1002/dev.20133

Windle, M., & Windle, R. C. (2014). A prospective study of alcohol use among middle-aged adults and marital partner influences on drinking. *Journal of Studies on Alcohol and Drugs*, *75*(4), 546–556. https://doi.org/10.15288/jsad.2014.75.546

Yngve, V. H. (1970). On getting a word in edgewise. *Papers from the sixth regional meeting of the Chicago Linguistic Society*. Chicago: Chicago Linguistic Society.

Zhou, B., Heather, D., Cesare, A. D., & Ryder, A. G. (2017). Ask and you might receive: The actor-partner interdependence model approach to

estimating cultural and gender variations in social support. *European Journal of Social Psychology*, *47*(4), 412–428. https://doi.org/10.1002/ejsp.2251

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