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Regular Article

Pathways to health: A longitudinal examination of protective factors in children with and without preschool anxiety

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Abstract

Preschool anxiety is highly prevalent and well known to predict risk for future psychopathology. The present study explores whether a diagnosis of an anxiety disorder in preschool interacts with (a) social skills and (b) cognitive ability to longitudinally predict psychopathology, two well-known protective factors, among a sample of 207 children measured at preschool (Mage = 4.34 years) and early childhood (Mage = 6.61 years). To assess social skills and cognitive ability, we utilized the Social Skills Rating Scale and the Differential Abilities Scale, respectively. To assess psychopathology, we utilized the parent report of the Preschool Age Psychiatric Assessment. Hierarchical linear regression models revealed significant interactions between both social skills and cognitive ability with preschool anxiety. We observed that social skills protected against emergent psychopathology for both children with and without anxiety, although this association was stronger for children with preschool anxiety. Contrastingly, cognitive ability served as a protective factor against future psychopathology primarily among children without preschool anxiety. Results from this study identify targets for future intervention and inform our understanding of how preschool anxiety, a common disorder among young children, shapes future psychopathology risk in childhood.

Keywords: Psychopathology; protective factors; preschool anxiety

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Introduction

Early onset psychopathology has long-lasting effects, with impairment continuing into adolescence and adulthood (Finsaas et al., 2020; Reef et al., 2010). Anxiety disorders, in particular, are among the most common disorders present in early childhood (Costello et al., 2003). Childhood anxiety disorders not only predict future anxiety but also other forms of psychopathology, including conduct disorder, depression, and attention-deficit hyperactivity disorder (Bittner et al., 2007; Copeland et al., 2009, 2014). Epidemiology studies examining the prevalence of childhood anxiety have reported that symptoms of anxiety can arise as early as preschool age, with 19% of preschool children meeting the criteria for an anxiety disorder (Franz et al., 2013). Early preschool anxiety disorders and their symptoms are highly distressing for both children and their families; these anxiety symptoms are also some of the first signs of psychopathology observed by caregivers (Towe-Goodman et al., 2014). Yet, preschool anxiety largely goes untreated (Chavira et al., 2004). One reason for this lack of treatment may be because the preschool period is a time of rapid development along almost every dimension, including physical and mental (Poulou, 2015). This rapid pace of development makes it difficult to identify enduring risk relative to stochastic variation in emotional reactivity, leading to disorders in early childhood being considered less consequential than those identified in adolescence and adulthood (Egger & Angold, 2006). However, given that early onset anxiety is a transdiagnostic risk factor for multiple forms of psychopathology, identifying pathways of risk and resilience from this early period is imperative. A better understanding of how risk and protective factors function in early childhood, in interaction with existing risk processes such as the presence of a disorder like anxiety, can help with novel intervention development and more targeted application of positive interventions.

There is substantial literature identifying the characteristics, skills, and assets that are beneficial for overall childhood development. Among these, social skills and cognitive ability have continuously emerged as important early intervention targets for children, as they are essential developmental tasks for this age group (Masten et al., 2015). These two factors also serve as protective factors (i.e., factors that predict positive outcomes; Masten et al., 2009). Multiple research studies have documented the positive impacts possessing strong social skills and cognitive skills have on development. However, to date, little research has examined whether preschool anxiety impacts the positive associations observed between well-established protective factors and psychopathology (Crews et al., 2007; Huber et al., 2019a). Accordingly, the current study seeks to evaluate the potential that

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these two well-established protective factors will function similarly for children with and without preschool anxiety.

Social skills and psychopathology

Social competence is a broad term used to describe the degree to which one effectively navigates social interactions and uses appropriate means to achieve personal and social goals (Huber et al., 2019b). Social skills, which include behaviors such as cooperation, assertion, and responsibility, enable individuals to display social competence and successfully interact with others in their environment. Importantly, developing social competence is necessary for normative development. As children move from childhood into adulthood and form relationships outside of the primary caregiver household, social skills become increasingly important. They aid in the acquisition of social acceptance, network formation, and social support. Among other outcomes, these are key factors in mitigating the effects of future stressors (Thompson & Goodvin, 2016).

Consistent with this important developmental role, early social impairment is considered a risk factor for psychopathology. Cross-sectional studies document associations between social skill deficits and psychological disorders transdiagnostically (Dupaul et al., 2001; Gadow & Nolan, 2002; Halls et al., 2015). Multiple theoretical models posit that poor social skills contribute to the development of psychopathology and are central to the etiology and maintenance of multiple disorders (Huber et al., 2019b). For children with anxiety disorders specifically, poor social skills can both give rise to and be a consequence of anxiety. Communication difficulties at age 7, for example, have been found to predict social anxiety symptoms at age 13 (Pickard et al., 2017). Similarly, lower social competence scores at age four are associated with more internalizing and externalizing behaviors at age 10 and 14, respectively (Bornstein et al., 2010).

While social deficits are associated with psychopathology, social skills can be protective against poor well-being outcomes. In the face of adversity, for example, children with strong social skills show better academic, work, and relationship outcomes (Mihalec-Adkins & Cooley, 2020). Similarly, social skills moderate the relationship between stress and depression, displaying a protective effect for children undergoing life stressors (Jaureguizar et al., 2018). Further, possessing strong social skills has positive downstream consequences, as stronger social skills aid in the development of social networks that protect against psychopathology (Thompson & Goodvin, 2016). In summary, current evidence indicates that strong social skills in childhood protect against emergent psychopathology and increase future well-being. How social skills mitigate risk for children with preschool anxiety, a group of individuals who may already struggle in this domain, has yet to be tested.

Cognitive ability and psychopathology

Cognitive ability, a heterogeneous construct that includes memory, logical reasoning, attention, and abstract thinking, is necessary for day-to-day functioning. The ability to use critical reasoning is required for successfully achieving goal-directed behavior and meeting task demands. As observed with social skills, deficits in cognitive ability are associated with risk for psychopathology. For example, a global measure of cognitive ability, IQ, is negatively associated with psychopathology (Castellanos-Ryan et al., 2016; Mahony et al., 2023). In addition, longitudinal studies document negative associations between childhood IQ and adult psychopathology (Koenen et al., 2009). Deficits in other measures of cognitive ability, including working memory, cognitive control, and language, are also associated with increased transdiagnostic psychopathology risk among children and adults (Zelazo, 2020).

Like social skills, cognitive ability is a protective factor in the context of high risk. High IQ, for example, has been found to protect against psychopathology among children who have experienced adversity (Batty et al., 2005; Koenen et al., 2009). Individuals with stronger cognitive abilities, as measured by aspects of cognitive control including inhibitory control and attention, show associations with better relative well-being outcomes in the context of environmental risk (Bardeen et al., 2015; Maciejewski et al., 2020; Wade et al., 2022). Given this literature, cognitive abilities may allow for adaptive functioning despite risk through an increased ability to problem-solve, manage, and mitigate challenges. Thus, cognition may serve as a valuable resource for children to rely on when faced with stressors that increase the risk of psychopathology. In the context of anxiety, findings between IQ and anxiety are mixed, with a body of research finding positive associations between IQ and anxiety symptoms in adults (Penney et al., 2015). The role cognitive ability plays in the development of psychopathology in young children with and without anxiety, however, remains untested.

The present study

Identifying whether well-known risk and protective factors like social skills and cognition function equality in the context of early anxiety risk using longitudinal designs is a primary way current research can contribute to identifying targets for early intervention efforts. Despite strong evidence that social skills and cognition may serve as protective factors, research has not investigated whether these protective factors are disrupted by the presence of a preschool anxiety disorder. Here we explore the impact of preschool anxiety diagnosis on future risk for psychopathology across early childhood and examine whether social skills and cognitive ability, factors known to protect against psychopathology risk in other populations, mitigate the risk conferred by early anxiety diagnosis. We hypothesized that preschool anxiety would be associated with transdiagnostic risk for psychopathology across early childhood but that this association would interact with social skills and cognitive ability. Specifically, we predicted that social skills and cognitive ability would moderate the association between preschool anxiety and later psychopathology symptoms, such that higher levels of social skills and cognitive ability would be more protective for children with preschool anxiety compared to those without preschool anxiety. Given the high prevalence of preschool-onset anxiety, its association with impairment and distress in the preschool period, and its potential for impairment into adulthood, it is imperative to identify potential protective factors to best support children and their families who experience anxiety early in development.

Methods

Participants and procedures

Participants were originally part of the Duke Preschool Anxiety Study. Children from the Duke Preschool Anxiety Study were recruited from local primary care clinics in Durham, North Carolina. Caregivers completed a brief child anxiety screening questionnaire which was used to create an initial sample enhanced for anxiety. A total of 917 caregivers and their children completed

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an initial home visit. During this visit, caregivers completed a semi-structured interview of child psychopathology (psychopathology at Time 1). A subset ($n = 502$) of the 917 children were recruited to participate in a laboratory visit where children completed measures on cognitive ability and parents reported on social skills. The laboratory visit study utilized a case–control design in which 251 children had at least one anxiety disorder (generalized anxiety, social phobia, or separation anxiety); the other 251 children in the laboratory visit were age and gender matched to the anxiety sample. Following the lab visit, participants completed a secondary psychopathology measure (psychopathology at time two). Of the subset, 207 had usable cognitive ability or social skills data from the laboratory visit; thus, the present analysis is comprised of these $N = 207$ participants. Children in the analysis sample ($N = 207$) were more likely to be older in age, $t\,(914) = 7.23$, $p < .001$ than the full sample ($N = 917$). There were also more Black ($\chi^2 = 6.47$, $p < .011$) and less Asian ($\chi^2 = 4.96$, $p < .026$) participants in the analysis sample than the full sample. Additional details about recruitment and enrollment procedures for all phases of the data have been detailed elsewhere (Carpenter et al., 2019; Franz et al., 2013). All study procedures were approved by Duke University's Institutional Review Board. A reliance agreement between the University of North Carolina at Chapel Hill and Duke University was established prior to data analysis.

Measures

Anxiety and psychopathology

Psychopathology at Time 1 and Time 2 was measured via caregiver report on the Preschool Age Psychiatric Assessment (PAPA; Egger & Angold, 2004). During the PAPA interviews, caregivers reported on children's symptoms of psychological disorders present in the past 3 months. Caregivers provided information about the onset, duration, and level of impairment of symptoms at both timepoints. Based on this information, interviewers assigned a score of 0 (not present) or 1 (present) for each symptom. Preschool anxiety was defined as the presence or absence of an anxiety disorder at Time 1, in accordance with the Diagnostic and Statistical Manual-IV. Psychopathology symptoms at Time 2 were summed across the following disorders to calculate an overall psychopathology symptom score for each participant: depression, generalized anxiety disorder, separation anxiety disorder, social phobia, oppositional defiant disorder, attention-deficit hyperactivity disorder, and conduct disorder. Higher symptom scores are indicative of a greater number of symptoms. We chose to assess symptoms of psychopathology generally, as previous research indicates that early anxiety is a transdiagnostic risk factor for multiple disorders (Reef et. al., 2009). To test the robustness of effects, separate analyses were also conducted with an internalizing (depression, separation anxiety, generalized anxiety, social phobia) and externalizing (oppositional defiance disorder, attention-deficit hyperactivity disorder, conduct disorder) symptom score.

Social skills

Social skills were measured using the social skills scale of the Social Skills Rating System (SSRS) at Time 2 (Gresham & Elliott, 1990). The SSRS includes 38 items asking caregivers to report on their child's social skills and problem behavior. The social skills scale is composed of four subscales: assertion, responsibility, cooperation, and self-control. Items are answered on a 3-point Likert scale ("*never*," "*sometimes*," and "*very often*"). Higher scores are indicative of greater social skills. In this sample, the reliability of the SSRS was good (alpha = 0.87). The SSRS has been previously used in children as young as 3 years old (Maleki et al., 2019; Mohamed, 2018; Wang et al., 2011).

Cognitive ability

Cognitive ability was measured using the Differential Ability Scales at Time 2 (Elliott, 1990). The Differential Ability Scales is comprised of three indicator scores: verbal ability, nonverbal reasoning, and spatial ability. The verbal ability scale reflects oral processing and language expression and consists of the Word Definitions and Similarities subtests. The nonverbal reasoning index reflects complex reasoning and abstract thinking abilities and consists of the Matrix Reasoning and Quantitative Reasoning subtests. The spatial ability index reflects the perception of spatial orientation and consists of the Recall of Designs and Pattern Construction subtests. Scores across the three indices are used to obtain a measure of General Conceptual Ability. The Differential Ability Scales can be administered to children as young as 2.5 years old and has previously been used to examine associations with psychopathology in preschool and early childhood (Bishop et al., 2011; Hughes & McIntosh, 2002; Reddy et al., 2008).

Data analytic plan

All statistical analyses were conducted in the SPSS program version 28. Data was missing in 5.83% of cases on average across variables (range of missing 0%–10.6%). Little's MCAR test was not significant $\chi^2 = 759.92$, $p = .063$, indicating that data was missing completely at random. Thus, we used multiple imputation to account for missing data. Multiple imputation has been validated to produce unbiased estimates for analyzing data missing at random (Schafer & Graham, 2002). Multiple imputation was conducted using fully conditional specification, an iterative Markov chain Monte Carlo procedure. In this procedure, a model including all other variables is created for each variable to predict imputed values; multiple datasets using this procedure were created over 20 iterations.

Following multiple imputation, stepwise linear regression analyses were used to examine the contributions of social skills, preschool anxiety, and cognition to psychopathology at time 2 (between 6 and 9 years of age). Three models were constructed. Model 1 was entered in three steps: (a) demographic variables and covariates (age, time between study visits, sex at birth, parent-reported race, parent-reported caregiver education, and parent-reported household composition) and preschool anxiety, (b) social skills, and (c) the interaction term of preschool anxiety and social skills. Model 2 was similarly entered in three steps: (a) demographics and preschool anxiety, (b) cognitive ability, and (c) the interaction term of preschool anxiety and cognitive ability. Model 3 tested the three-way interaction between cognitive ability, social skills, and preschool anxiety, and was entered using four steps: (a) demographics and preschool anxiety, (b) social skills and cognitive ability, (c) both interaction terms, and (d) the three-way interaction between social skills, cognitive ability, and preschool anxiety. Total psychopathology symptoms at Time 2 were entered as the dependent variable in all models. In Model 3, the three-way interaction was not significant; thus, we do not present results from this model in the main text (Supplement Table 1).

We opted to have a binary anxiety variable predict a continuous psychopathology outcome, as we were interested in exploring how *meeting diagnostic criteria* for preschool anxiety diagnosis impacts the future experience of psychopathology symptoms. Additional sensitivity analyses were conducted using (a) internalizing

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symptoms as the dependent variable, (b) externalizing symptoms as the dependent variable, (c) total number of disorders as the dependent variable, and (4) a continuous preschool anxiety symptom variable as the predictor.

Results

Bivariate correlations and descriptive statistics

Demographic variables are presented in Table 1. The mean age of children (54.6 % female, 45.4% male) in this sample at the time of the first psychopathology assessment (Time 1) was 4.34 years old (2.00–6.17). The mean age of children at the time of the second psychopathology assessment (Time 2) was 6.61 years old (6.00–8.75). The mean time between Time 1 and Time 2 was 2.26 years (0.17–5.58). Eighty children (38.6%) met the criteria for an anxiety disorder in preschool at Time 1, whereas 127 children (61.4%) did not meet the criteria. Parents of children in the sample identified their children as Black (55.6%), White (39.1%), Asian or Asian-American (1%), Native American (3.9%), or another race (0.5%). Caregiver education was coded as 0 or 1 to indicate the presence or absence of at least one caregiver in the household with a 4-year college education. Similarly, household composition was coded as 0 or 1 to indicate the presence or absence of a two-caregiver household. Most children in this study came from a two-caregiver household (62.8%). Slightly less than half of caregivers in our sample (42.7%) had received a 4-year college education.

Tables 2 and 3 present bivariate correlations and descriptive statistics among cognitive ability, social skills, and total psychopathology symptoms. In this sample, psychopathology symptoms at Time 2 were negatively correlated with cognitive ability and social skills. Cognitive ability was not significantly correlated with social skills ($r = .06$).

Table 1. Cohort description

Demographic variables	Mean (SD) or % (*N*)
Age at first PAPA (Time 1)	4.34 (1.06)
Age at second PAPA (Time 2)	6.61 (.57)
Time between Time 1 and 2	2.25 (1.02)
Preschool anxiety diagnosis (Time 1)	38.6 (80)
Ethnicity-race	
Black	55.6 (115)
White	39.1 (81)
Asian	1.00 (2)
Native American	3.90 (8)
Other	.50 (1)
Sex at Birth	
Male	45.4 (94)
Female	54.6 (113)
Two–caregiver household	62.8 (130)
Caregiver with a 4-year college education	42.7 (88)

Note. PAPA = Preschool Age Psychiatric Assessment.

Hierarchical regression analysis results

Results from Model 1 are presented in Table 4. The first step, with demographic variables, covariates, and preschool anxiety entered, was statistically significant ($F = 3.61$, $p = .001$) with an R^2 of 0.121, indicating that the entered variables accounted for 12.1% of the total variance in psychopathology symptoms at Time 2. In the second step, social skills accounted for an additional 18.2% of the variance ($F = 9.87$, $p < .001$; $R^2 = 0.303$). Finally, in the last step, the interaction between preschool anxiety and social skills was entered; this interaction term accounted for an additional 11.3% of the total variance in psychopathology symptoms at Time 2 ($F = 14.35$, $p < .001$; $R^2 = .416$). In this final step, the interaction between social skills and preschool anxiety was statistically significant ($B = .062$, $p = <.001$). Examination of simple slopes revealed that preschool anxiety was significantly associated with total psychopathology symptoms at Time 2 when social skills were one standard deviation below the mean ($B = 0.252$, $p = .005$). When social skills were one standard deviation above the mean, this association was not significant ($B = 0.109$, $p = 0.199$). Figure 1 plots the simple slopes of these interactions.

Results from Model 2 are presented in Table 5. The first step, with demographic variables, covariates, and preschool anxiety entered, was statistically significant ($F = 3.61$, $p = .001$) with an R^2 of 0.121, indicating that the entered variables accounted for 12.1% of the total variance in psychopathology symptoms at Time 2. In the second step, cognitive ability accounted for an additional 0.5% of the variance ($F = 3.29$, $p = .002$; $R^2 = 0.126$). Finally, in the last step, the interaction between preschool anxiety and cognitive ability was entered; this interaction term accounted for an addition 24.4% of the total variance in psychopathology symptoms at Time 2 ($F = 11.83$, $p < .001$; $R^2 = 0.370$). In this final step, the interaction between cognitive ability and preschool anxiety was statistically significant ($B = .075$, $p = <.001$). Examination of simple slopes revealed that preschool anxiety was significantly associated with total psychopathology symptoms at Time 2 when cognitive ability was one standard deviation above the mean ($B = 0.312$, $p = .001$). When cognitive ability was one standard deviation below the mean, this association was not significant ($B = 0.135$, $p = 0.161$). Figure 2 plots the simple slopes of these interactions.

Sensitivity analyses

When internalizing symptoms, externalizing symptoms, and the total number of disorders at Time 2 were entered as the dependent variable, the findings were identical to the main findings presented (Supplement Tables 2–5; 8–9); thus, only results exploring associations with total psychopathology symptoms at Time 2 are presented. When anxiety symptoms, measured continuously, were used in our model, only main effect associations remained consistent (Supplement Tables 6–7).

Discussion

The purpose of the present study was to examine whether preschool anxiety predicted transdiagnostic risk for psychopathology in early childhood and whether this risk was mitigated by well-known protective factors: social skills and cognitive ability, which promote positive development in adulthood and adolescence. Here, we use a longitudinal design to examine associations between early anxiety, protective factors, and psychopathology across time. Consistent with previous work, we observed that meeting the criteria for an anxiety disorder in preschool longitudinally increased the risk for both internalizing and

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Table 2. Bivariate correlations

	1	2	3	4	5	6	7	8	9	10	11
1. Preschool anxiety	–	−0.121	−.026	.0221**	0.116	−0.116	−0.216**	.013	0.179*	.001	.005
2. Social skills		––	.055	−0.455**	.069	−.017	−.056	−0.153*	.045	0.136	0.127
3. Cognitive ability			––	−0.149*	0.142	−.010	−0.158*	.054	0.379**	0.324**	0.255**
4. Total psychopathology symptoms at Time 2				––	−.010	−.016	.002	−.031	−0.163*	−.086	−0.196**
5. Age at Time 1					––	0.349**	−0.849**	.091	0.287**	0.215**	0.164*
6. Age at Time 2						––	0.198**	.044	.046	−.089	.047
7. Time between visits							––	−.078	−0.255**	−0.256**	−0.138
8. Sex at birth								––	.030	.037	.001
9. Race									––	0.477**	0.460**
10. Parental 4-year degree										––	0.418**
11. Two-caregiver household											––

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

Table 3. Descriptive statistics among variables of interest

	No preschool anxiety M (*SD*) ($N = 80$)	Preschool anxiety M (*SD*) ($N = 127$)	Full sample M (*SD*) ($N = 207$)
1. Social skills	95.08 *(15.96)*	91.24 *(14.22)*	90.20 *(18.70)*
2. Cognitive ability	99.61 *(14.86)*	99.36 *(15.76)*	99.19 *(14.39)*
3. Total psychopathology symptoms	7.04 *(6.26)*	10.31 *(7.03)*	9.04 *(6.70)*

Table 4. Social skills regression model

	Step 1 $R^2 = 0.121$			Step 2 $R^2 = 0.303$, $\Delta R^2 = 0.182$			Step 3 $R^2 = 0.416$, $\Delta R^2 = 0.113$		
	B (*SE*)	***t***	***p***	**B (*SE*)**	***t***	***p***	**B (*SE*)**	***t***	***p***
Age	0.466 *(0.870)*	0.536	0.592	0.416 *(0.782)*	0.533	0.594	0.522 *(.714)*	0.731	0.465
Time between visits	−.007 *(0.514)*	−.013	0.990	−0.234 *(0.464)*	−0.504	0.614	.008 *(.425)*	.019	0.985
Race	−2.52 *(1.32)*	−1.91	.057	−2.69 *(1.20)*	−2.25	**.025**	−2.27 *(1.07)*	−2.13	**.033**
Sex	−0.575 *(.967)*	−0.594	0.552	−1.43 *(0.882)*	−1.62	0.105	−1.31 *(0.804)*	−1.62	0.104
Household	−2.13 *(1.17)*	−1.82	.068	−1.63 *(1.06)*	−1.54	0.124	−1.44 *(0.963)*	−1.49	0.136
Parent ed	0.836 (*1.17*)	0.717	0.473	1.31*(1.05)*	1.25	0.210	0.244 *(0.974)*	0.250	0.802
PA	3.88 *(1.04)*	3.74	**< .001**	2.91 *(.934)*	3.11	**.002**	2.16 *(0.863)*	2.50	**.012**
SS				−.149 *(.023)*	−6.60	**< .001**	−0.133 *(.020)*	−6.50	**< .001**
PA X SS							.062 *(.010)*	5.99	**< .001**

Note. Household = household composition; parent ed = parent education; SS = social skills; PA = preschool anxiety.
The bold values are in the *p* column, signifying their significant value. For example, this value was significant, $p = 0.025$.

externalizing symptoms of psychopathology in middle childhood. In addition, we observed that having high social skills protected against emergent psychopathology for both children with and without anxiety; this association was stronger for children with preschool anxiety. In contrast, higher cognitive ability was associated with fewer psychopathology symptoms for children without preschool anxiety only. Together, these findings demonstrate that preschool anxiety is a risk factor for the development of psychopathology in childhood, and while protective factors are important avenues for intervention in ameliorating the development of psychopathology across early childhood, their impact may differ by this existing vulnerability.

Social skills moderated the association between preschool anxiety and later psychopathology. Specifically, having higher social skills was associated with fewer psychopathology symptoms for both children with and without an anxiety disorder during preschool. Having poorer social skills, however, was more strongly associated with greater psychopathology symptoms in children

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Table 5. Cognitive ability regression model

	Step 1 $R^2 = 0.121$			Step 2 $R^2 = 0.126$, $\Delta R^2 = .005$			Step 3 $R^2 = 0.370$, $\Delta R^2 = 0.244$		
	B (*SE*)	***t***	***p***	**B (*SE*)**	***t***	***p***	**B (*SE*)**	***t***	***p***
Age	0.466 *(0.870)*	0.536	0.592	0.455 *(0.870)*	0.522	0.601	0.502 *(.741)*	0.677	0.498
Time between visits	−.007*(0.514)*	−.013	0.990	−.027 *(0.515)*	−.053	0.958	0.132 *(0.439)*	0.302	0.763
Race	−2.52 *(1.32)*	−1.91	.057	−2.24 *(1.38)*	−1.62	0.107	−1.63 *(1.15)*	−1.42	0.157
Sex	−0.575 *(.967)*	−0.594	0.552	−0.540 *(0.969)*	−0.557	0.578	−0.337 *(.826)*	−0.409	0.683
Household	−2.13 *(1.17)*	−1.82	.068	−2.08 *(1.17)*	−1.78	.075	−1.57 *(.993)*	−1.58	0.114
Parent ed	0.836 *(1.17)*	0.717	0.473	0.977 *(1.18)*	0.830	0.406	−0.329 *(1.01)*	−.325	0.745
PA	3.88 *(1.04)*	3.74	**< .001**	3.79 *(1.05)*	3.62	**< .001**	2.16 *(0.911)*	2.37	**.018**
CA				−.031 *(.037)*	−0.831	0.406	−.055 *(.032)*	−1.70	.088
PA × CA							.075 *(.009)*	8.35	**< .001**

Note. Household = household composition; parent ed = parent education; CA = cognitive ability; PA = preschool anxiety.

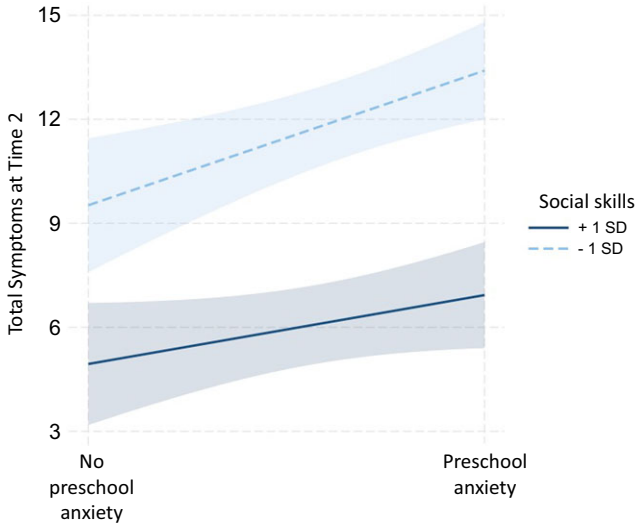

Figure 1. Social skills moderate the association between preschool anxiety diagnosis and childhood psychopathology symptoms.

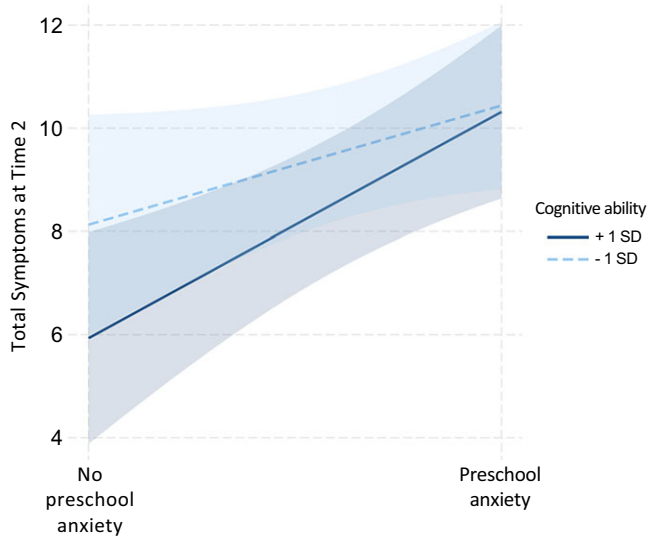

Figure 2. Cognitive ability moderates the association between preschool anxiety diagnosis and childhood psychopathology symptoms.

with an anxiety disorder. These results are consistent with other longitudinal evidence indicating that children who have stronger social skills experience fewer psychopathology symptoms later in life, with previous studies showing these associations lasting into adolescence and adulthood (Bornstein et al., 2010; Burt et al., 2008; Jones et al., 2015). Possessing social skills early in development sets the stage for positive behavioral and emotional functioning. Because positive social behaviors are reinforced by others, employing social skills increases engagement in positive experiences and allows individuals to gain social support from those around them. Children who show difficulty using social skills, contrastingly, may not receive this reinforcement, resulting in fewer positive experiences and increased difficulty forming relationships necessary for psychological well-being. For children with anxiety, a disorder characterized by excessive worry and fear, social skills may be especially helpful, as garnering positive social experiences may counteract anxiety-driven cognitions and worries.

Social skills interventions have been found to be effective in reducing psychopathology among children. A meta-analysis of intervention programs aimed at enhancing the social skills of children and adolescents reported that participants demonstrated significant increases in positive social behaviors and academic achievement, and significant decreases in problem behaviors after receiving social skills training (Durlak et al., 2010). Other randomized control trials (Flook et al., 2014; Schonert-Reichl et al., 2015) show similar improvements. Our study demonstrates that associations between social skills and emergent psychopathology are present as early as 6 years of age and point to the opportunity for early intervention to mitigate the progression of psychopathology even in early childhood. Further, in our study, the protective role of social skills extended across both internalizing and externalizing disorders. While a meta-analysis investigating longitudinal associations between social skills and psychopathology reported stronger evidence for externalizing symptoms versus

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internalizing symptoms (Huber et al., 2019b), our results suggest that in early childhood, social skills are protective across both dimensions of psychopathology and in particular for children with early internalizing symptoms.

Cognitive ability moderated the association between preschool anxiety and total psychopathology symptoms. Higher cognitive ability was associated with fewer psychopathology symptoms at Time 2 among children without preschool anxiety only, a finding reported in older children and adults (Blok et al., 2022). Cognitive ability encompasses multiple domains, including working memory, verbal language, and perceptive reasoning. These skills are needed for self-regulation and goal-directed behavior, processes that are disrupted in many psychological disorders (Strauman, 2017). The relationship observed among children without anxiety is therefore consistent with previous literature finding associations between cognitive deficits and psychopathology (Abramovitch et al., 2021).

Interestingly, and contrary to our hypothesis, having higher cognitive ability was not protective for children with preschool anxiety. While it is theorized that cognitive ability results in greater capacity to employ the skills needed for self-regulation and goal-directed behavior, cognitive ability may not serve this function for children with preschool anxiety. Instead, increased cognitive ability may contribute to or exacerbate anxiety symptoms. Children with increased cognitive ability may be better able to understand complex situations, remember events with greater detail, and form conclusions about these events. For children with anxiety, this greater understanding of their environment might result in more rumination and worry. Among adults with generalized anxiety disorder, for example, worry and rumination over past events have been positively correlated with cognitive ability (Coplan et al., 2012; Penney et al., 2015). Since worry and rumination are cognitive processes, individuals with higher cognitive ability may also have more cognitive resources to engage in maladaptive thinking, increasing the risk for further psychopathology. Future research, however, is needed to identify the mechanisms underlying these associations.

Of note, when we conducted our analyses using a continuous measure of preschool anxiety (i.e., number of anxiety symptoms), we did not find any significant interactions between social skills and cognitive ability. This difference in results points to the importance of diagnostic evaluation at the preschool age. While some symptoms of anxiety are considered a normal part of development and may be exhibited by many children, not all will exhibit the impairment and duration necessary to meet the criteria for an anxiety diagnosis (Muris et al., 2000). Our findings support that identifying those who do meet the criteria for an anxiety disorder in preschool is imperative to understanding how other individual-level factors ameliorate or exacerbate future psychopathology symptoms.

Several limitations should be noted. Social skills and cognition were not tested during the first timepoint in our study, and thus, we are unable to examine how these protective factors changed between preschoolage and age 6. Measuring potential protective factors during the preschool age would allow for a greater understanding of how these skills develop longitudinally and are shaped by emerging psychopathology. Similarly, it may also allow us to examine whether, and how, social skills and cognitive ability contribute to the development of psychopathology. Further, while we chose to focus on preschool anxiety as a moderator of psychopathology outcomes due to its documented impact on families in the first few years of a child's life, future research may consider exploring how other forms of psychopathology moderate the relationship between protective factors and future outcomes.

Conclusion

The present study explored how social skills and cognitive ability interact with preschool anxiety to shape risk for psychopathology. Our findings identify that, while social skills serve as a protective factor for children with preschool anxiety, cognitive ability functions differentially among children with and without preschool anxiety. These results inform our understanding of how important developmental processes, such as developing social skills and strong cognitive abilities, interact with preschool anxiety to shape future psychopathology. Given that early intervention is essential for mitigating risk, fostering the development of potential protective factors as early as the preschool age serves as an important avenue of interventions for young children, particularly among those with preschool anxiety.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S0954579424001652.

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Competing interests. Dr Egger has reported being the cofounder and chief medical and scientific officer of Little Otter Health.

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