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Abstract

Children raised in neighborhoods with low socio-economic status (SES) are at risk for low academic achievement. Identifying factors that help children from disadvantaged neighborhoods thrive is critical for reducing inequalities. We investigated whether children's prosocial behavior buffers concurrent and subsequent academic risk in disadvantaged neighborhoods in Bradford, UK. Diverse children (N = 1,175) were followed until age seven, with measurements taken at four times. We used governmental indices of neighborhood-level SES, teacher observations of prosocial behaviors, and direct assessments of academic achievement. Neighborhood SES was positively associated with academic achievement among children with low levels of prosocial behavior, but not among children with high levels of prosocial behavior. Prosocial behavior may mitigate academic risk across early childhood.

Young Children's Prosocial Behavior Protects Against Academic Risk in Neighborhoods with Low Socio-Economic Status

Children raised in neighborhoods with low socio-economic status (SES) face heightened risk for experiencing environmental adversity and exhibiting developmental difficulties and low academic achievement (Leventhal & Brooks-Gunn, 2000; Minh, Muhajarine, Janus, Brownell, & Guhn, 2017). Identifying factors during early childhood that protect against academic risk in contexts of adversity is crucial for informing interventions to reduce educational disparities between children (Caspi et al., 2017; Masten & Barnes, 2018; Reardon, 2019). Children's prosocial behavior—i.e., the propensity to act kindly or generously towards peers and other people—has been directly associated with positive emotional, social, and academic adjustment (Carlo, Crockett, Randall, & Roesch, 2007; Carlo, White, Streit, Knight, & Zeiders, 2018; Clark & Ladd, 2000; Flouri & Sarmadi, 2016). In addition, children's prosocial behavior has been shown to protect against (i.e., moderate) risk for emotional problems in low SES neighborhoods (Flouri & Sarmadi, 2016). However, it is currently unknown whether prosocial behavior may similarly promote *academic* resilience. In the present study, we draw on a large, longitudinal, diverse sample of young children living in the UK to investigate whether prosocial behavior serves as a protective factor against academic risks in low SES neighborhoods. We use an official governmental measure of neighborhood SES based on income, employment, health, education, crime, and living environment. Further, we examined individual differences in these associations by children's gender and ethnicity.

Low Neighborhood SES is Associated with Children's Developmental Risk

Since the advent of socio-ecological theory, developmental psychologists have increasingly recognized that children are influenced by intersecting circles of individual and environmental

factors (Bronfenbrenner, 1979; Bronfenbrenner & Morris, 2006), including features of the neighborhood in which they are raised (Leventhal & Brooks-Gunn, 2000). There is significant variability in neighborhood SES, and this variability shapes the lived experiences of the neighborhood's child residents. Specifically, children raised in low SES neighborhoods often face many challenges—including social, physical, and psychological stress; exposure to crime; lower quality childcare and schools; and limited access to other educational services and resources (Ellen, Mijanovich, & Dillman, 2001; Reynolds, Ou, Mondi, & Giovanelli, 2019; Sharkey & Sampson, 2015). In turn, these neighborhood-level risks are associated with increased behavioral and emotional difficulties, and lower academic performance and attainment, both concurrently and over time (Dearing et al., 2006; Jeon et al., 2014; Kohen et al., 2008; Sharkey et al., 2012; Wight et al., 2006). For example, exposure to community violence is often more frequent in low SES neighborhoods, and can interfere with children's cognitive functioning and academic performance (Sharkey & Sampson, 2015). Similarly, exposure to air, water, and noise pollution; under-resourced schools; and fewer educational enrichment opportunities are more common in low SES neighborhoods and detract from children's ability to demonstrate their full academic potential (Sharkey & Faber, 2014).

Importantly, the effects of neighborhood SES are not uniform across children. Some children who grow up in disadvantaged neighborhoods appear to be more at-risk than others, and there is significant heterogeneity in children's adaptation and outcomes (Luthar et al., 2000; Masten & Barnes, 2018; Minh et al., 2017). Consequently, developmental science has sought to understand how, where, and for whom, neighborhood characteristics matter the most (Minh et al., 2017). In particular, identifying factors that represent resilience or can *protect* children against academic risk in contexts of adversity has emerged as a top research priority (Masten, 2018). Such research

can enable policymakers to reduce achievement gaps along socio-economic lines when children are young (Caspi et al., 2017; Masten & Barnes, 2018; Reardon, 2019), thereby diminishing inequalities that could otherwise persist across the lifespan (Caspi et al., 2017; Moffitt, 2018; van Raalte et al., 2012) and even across generations (Mustillo, Wilson, & Lynch, 2004; Ryabov, 2020).

Socio-Emotional Competencies as Protective Factors in Contexts of Adversity

To protect against the risks associated with early adversity, researchers have highlighted the importance of positive social-emotional skills, which enable children to recognize and regulate their emotions and behavior, set and achieve positive goals, and form and maintain positive, reciprocal relationships (Domitrovich et al., 2017; Durlak et al., 2011; Masten, 2018). For example, randomized trials broadly designed to promote socio-emotional skills across domains decreased disruptive behavior and stress more among children from lower family SES, compared to those from higher family SES (Larose et al., 2019; Wilson & Lipsey, 2007). This work suggests that socio-emotional skills—broadly and encompassing multiple domains—are particularly protective among disadvantaged youth.

Research on the protective role of socio-emotional skills has been limited in two key ways. First, research has primarily measured adversity at the family level—using measures of family income and maternal education—which obscures the importance of *neighborhood-level* adversity (Domitrovich et al., 2017; Durlak et al., 2011). To extend this work, it is important to understand whether socio-emotional skills protect against academic risks associated with low neighborhood SES—i.e., the larger socio-ecological context—because, as they age, children spend increasing time outside the home and family, engaging with peers and resources in their neighborhood (Leventhal & Brooks-Gunn, 2000; Minh et al., 2017).

A second limitation of prior research is that it has primarily focused on broad measures of socio-emotional skills which encompass multiple domains of children's ability to regulate emotions and behaviors, communicate, pursue goals, and build relationships with others. While this approach provides a rich picture of children's overall functioning, it obscures the possibility of pinpointing which specific behaviors are most relevant (Domitrovich et al., 2017; Durlak et al., 2011). Identifying specific child behaviors that protect against neighborhood-level risk may inform the design of more targeted behavioral interventions to promote children's positive adaptation and reduce inequalities. For example, a classroom-based intervention that focused specifically on encouraging elementary students to help each other reduced disruptive behaviors and increased positive peer relationships (Layous, Nelson, Oberle, Schonert-Reichl, & Lyubomirsky, 2012; Schonert-Reichl, Smith, Zaidman-Zait, & Hertzman, 2012). Moreover, this approach (i.e., researching specific components of socio-emotional skills) may highlight avenues for promoting positive protective behaviors outside of—or in addition to—formal interventions. For example, if we know which specific child behaviors protect against neighborhood-level risk, communities can begin to scaffold opportunities for children to practice those behaviors in daily life.

Prosocial Behavior May Mitigate Effects of Neighborhood Adversity

One specific subset of socioemotional skills that has garnered a great deal of interest across childhood is prosocial behavior. Prosocial behavior is positively correlated with a range of other positive socio-emotional skills (e.g., interpersonal communication, emotion regulation), but represents more specifically the propensity to provide instrumental assistance and emotional support to others (Eisenberg et al., 2016). Children's capacity to engage prosocially with peers (i.e., help peers) is believed to foster positive behavioral and academic growth (Durlak et al., 2011; Eisenberg et al., 2016; Elias & Haynes, 2008). For example, elementary and middle school

children who displayed high levels of prosocial behavior—such as sharing and cooperating—achieved higher academic grades when measured at the same time point (Wentzel, 1991, 2014; Wentzel, Filisetti, & Looney, 2007) later in the same year (Malecki & Elliot, 2002), and 5 to 7 years later (Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo, 2000; Carlo et al., 2018). Similarly, one study in Australia suggested that kindergartners who displayed high levels of prosocial behavior demonstrated higher performance on literacy and numeracy tests in kindergarten and in third grade (Collie, Martin, Roberts, & Nassar, 2018). It is important to replicate and extend this finding to other settings to understand how prosocial behavior relates to academic achievement when children are young and entering formal education for the first time, thus establishing patterns of behavior that shape their educational trajectory (Jensen, Berens, & Nelson, 2017).

In addition to directly relating to positive child outcomes, prosocial behaviors may mitigate (i.e., moderate) the negative effects of environmental adversity. It has been hypothesized that when children help others, they foster positive relationships and emotions that can buffer them from the negative effects of contextual stressors and resource limitations (Eisenberg et al., 2016), such as those encountered in low SES neighborhoods (Fedor, Bender, & Carlson, 2010). For example, children ages 3-to-7 from poorer neighborhoods and schools who also demonstrated more prosocial behaviors—as reported by parents—developed fewer emotional and behavioral problems compared to their less prosocial peers (Flouri & Sarmadi, 2016). However, we do not yet know whether prosocial behavior similarly mitigates neighborhood-level academic risks. It is particularly important to investigate whether prosocial behavior is a protective factor during early childhood, when children have increasing opportunities to both engage with peers and demonstrate academic competence independently in the school setting (Jensen et al., 2017).

Current Study

The present study had two primary goals. First, we aimed to replicate and extend previous work by investigating whether prosocial behavior predicts academic achievement at multiple time points early childhood. Consistent with existing evidence from middle childhood (Caprara et al., 2000; Carlo et al., 2018; Eisenberg et al., 2016; Wentzel, 1991), we hypothesized that prosocial behavior would be positively associated with academic achievement across early childhood. Second, we investigated whether prosocial behavior serves as a protective factor against academic risks associated with neighborhood adversity. We hypothesized that prosocial behavior would protect against academic risks among young children from low SES neighborhoods, such that neighborhood SES would be positively related to academic achievement only among children who demonstrate relatively fewer prosocial behaviors.

In secondary exploratory analysis, we tested whether these associations differed by individual differences in children's gender and ethnicity. We did not have a hypothesis for the direction of the gender and ethnicity moderations. Past research is equivocal; some evidence suggests that gender and ethnicity moderate associations between prosocial behavior and child experiences while other evidence suggests that prosocial behavior operates similarly across groups of children (See Eisenberg et al., 2015, for a review).

To test these hypotheses and conduct exploratory analyses, we drew on a large and diverse sample of children living in Bradford, UK. We employed a governmental index of neighborhood SES, a standardized teacher-led assessment of children's prosocial behaviors, and standardized teacher-observations and direct assessments of three academic outcomes measured across three different time points from ages 4 to 7. This robust, multi-method approach minimized potential method bias. Further, our longitudinal design enabled us to examine

outcomes across early childhood. To increase robustness of our findings, we conducted additional sensitivity analyses controlling for measures of general peer relationship quality and emotional and behavioral skills. In this way, we aim to shed light on whether prosocial behavior can mitigate the early academic risks of growing up in low SES neighborhoods.

Methods

Sample

Our analytic sample was drawn from Born in Bradford (BiB), a longitudinal multi-ethnic birth cohort study conducted in Bradford, a city in northern England (Wright et al., 2012). The city of Bradford has high levels of socio-economic deprivation and ethnic diversity compared to other cities in England. Specifically, Bradford has the 5th lowest income and 6th lowest employment rate in England (City of Bradford Metropolitan District Council, 2019). Bradford also has the largest proportion of families of Pakistani Ethnic origin (20.3%) in England (Council Bradford Metropolitan District, 2020). The BiB cohort is broadly characteristic of the city's population (more details below).

The BiB study was designed to assess child and adult health (Wright et al., 2012). Women were recruited in community clinics during pregnancy (26 to 28 weeks' gestation). The full study recruited 12,453 women and 3,353 of their partners across 13,776 pregnancies and 13,858 children from 2007 to 2010. When children were ages 4 to 5 years, mothers provided their home address and this was linked to government indices of neighborhood adversity. At the same time point, a subset of children participated in the Starting School Project (Shire et al., 2020), which was nested within the larger BiB study, and designed to collect additional educational data for a subset of the BiB children. The Starting School project enrolled 4- to 5-year-old children in schools where there were ≥ 10 children from the BiB cohort in their class

that academic year. Schools that met this criterion collaborated; all BiB children in these schools were eligible to participate and parents were sent an opt-out waiver of consent. More detailed information on the Starting School project is available elsewhere (Shire et al., 2020). As a part of the Starting School project, teachers (N = 180; 67% White in our sample) completed a standardized assessment of their observation of children's prosocial behaviors for children in their classrooms. School administrative educational records yielded three academic outcomes. The first was a structured teacher-observational assessment of children's early learning goals at age 4 to 5 years (at the end of the first year of schooling). The second two were standardized direct assessments of phonics skills at age 5 to 6 (at the end of the second year) and academic performance at age 6 to 7 (at the end of the third year). The Starting School educational data was collected in classrooms, and so has a structure of children nested within classrooms (Shire et al., 2020; more details below).

The full BiB cohort was roughly 50% South Asian, and 50% White or other ethnicities (Wright et al., 2012). Our analytic sample was restricted to children for whom both of our independent variables were available (i.e., prosocial behavior and neighborhood SES; N = 1,175) and was 50% Female, 35% White, 51% South Asian and 9% other ethnicities (5% missing ethnicity information). Compared to the full BiB cohort, participants in our analytic sample on average had lower levels of early learning goals ($t(10482) = 5.87$, $p < .001$) and family SES ($t(19249) = -29.68$, $p < .001$), but did not differ across other study variables (ps >.15).

Consistent with the Bradford area, neighborhoods in our sample were relatively segregated, ranging from 66% South Asian and 26% White in the poorest neighborhoods (8% Other Ethnicity), to 11% South Asian and 89% White in the second to wealthiest neighborhood (the wealthiest neighborhoods were 13% South Asian and 87% White). See Supplementary

Materials Table S1 for more detailed information on diversity within and across neighborhoods in our sample. Classroom diversity in our sample varied widely, ranging from 0% South Asian participants to 100% South Asian participants (Mean % = 60% South Asian, SD = 42%, Range = 1% - 100%).

Measures

Neighborhood SES. Mothers provided their addresses via questionnaire when children were 4 to 5 years old. To index *neighborhood SES,* these addresses were linked to a neighborhood-level socio-economic Index of Multiple Deprivation (McLennan et al., 2019). This is an official government measure of neighborhood affluence in England based on income, employment, health and disability, education, barriers to housing and services, crime, and living environment. We used the rankings within Bradford (instead of rankings across the whole country) in order to capture the full variation among Bradford neighborhoods. Specifically, there were 310 small "neighborhoods" in Bradford, each with a population of ~1,500 (no less than 1,000). These 310 neighborhoods were then rank-ordered by their Deprivation score—according to the government calculations—and summarized into deciles. In other words, the 31 neighborhoods with the lowest deprivation rankings were categorized into the 1st decile, which represents the 10% of neighborhoods in Bradford with the highest SES compared to other locations in the city; the next 31 neighborhoods in these rankings were categorized into the 2nd decile; and so on. For the governmental index, ten indicates relatively more deprived neighborhoods; however, we reverse coded this so that higher levels of our measure *neighborhood SES* reflect greater wealth and less adversity, and lower levels indicate greater poverty and more adversity.

Prosocial behavior. To index children's *prosocial behavior*, we used the Strengths and Difficulties Questionnaire (SDQ; Goodman et al., 1998; Stone et al., 2015), a brief behavioral screening questionnaire that assesses psychological attributes including prosocial behavior, peer relationships, emotional symptoms, conduct problems, and hyperactivity. The child's class teacher completed this measure when the child was age 4 to 5 years. We focused on the prosocial subscale of the SDQ, which includes five items: "This child is considerate of other people's feelings," "This child is helpful if someone is hurt," "This child is kind to younger children," "This child often volunteers to help others," and "This child shares readily with other children." The teacher responded to each item as "0 = Not true," "1 = Somewhat true," or " 2 = Certainly true." The prosocial composite was the sum of these five items, ranging from 0 - 10; Cronbach's α = .85; ICC by teacher = .13.

Academic outcomes. We captured children's outcomes with three measures, which we conceptualized as developmentally appropriate measures of academic functioning at three different time points (see Supplementary Materials for a latent factor analysis). This approach enabled us to examine how associations changed across early childhood. To index *early learning goals*, we used children's scores on the Early Years Foundation Stage Profile, a teacher-led observational assessment that includes six broad areas of learning (e.g., physical development; personal, social, and emotional development) and assesses progress relative to the average child at the end of their first year of schooling (Whitaker, 2014) at age 4 to 5; teacher ICC = .10.

To index children's *phonics skills*, we used a teacher-led assessment of children's phonics abilities (Walker, Sainsbury, Worth, Bamforth, & Betts, 2015). Phonics is the ability to correlate sounds with letters or groups of letters in an alphabetic writing system, and has been shown to be an important component of children's later reading ability (Torgerson, Brooks,

Gascoine, & Higgins, 2019). This measure assesses children's phonics abilities relative to the average child at the end of their second year of schooling at age 5 to 6. Specifically, teachers showed each child a paper with lists of 40 different imaginary words that represented "imaginary creatures" (e.g., ot, vap, osk). Children were asked to sound out, or read the words that they saw on the page. They were allowed as long as necessary to sound out each word. Once children had responded, teachers marked each item as correct or incorrect. Phonics scores were the sum of all items, ranging from 0 – 40; teacher ICC = .04.

To index children's *academic performance*, we used children's scores on the Key Stage 1, a standardized school-based direct assessment/exam that includes math, reading, and science subscales (National Curriculum Assessments, 2016) measured at age 6 to 7. Early achievement at age seven has been shown to have enduring effects on individuals' downstream educational attainment, socio-economic status, and well-being (Ritchie & Bates, 2013). For all three academic outcomes, we standardized each subscale (when applicable) and calculated a mean, with higher scores indicating relatively higher performance; teacher ICC = .01.

Covariates. We controlled for child gender, ethnicity, and a composite measure of family SES, as assessed by maternal reports during pregnancy of maternal education, cohabitation status, employment, governmental benefits (based on income), and perceived financial difficulty as described further in Armstrong-Carter et al., (2020). All measures were coded at the individual participant level.

Statistical analysis

Missing data was low, with 0.17% of children missing data for early learning goals, 3.80% for phonics skills, and 3.97% for academic performance. There was no missing data for other study variables (largely because we restricted our sample to participants who had complete

data for the independent variables). We standardized all continuous variables. We used multiple regression models to examine whether children's prosocial behavior and neighborhood SES were directly and interactively associated with academic achievement outcomes (early learning goals, phonics skills, and academic performance), after controlling for child gender, ethnicity, and family SES. Given that each of the 180 teachers reported on an average of 6.6 students and the educational data was collected in classrooms and therefor was nested (Shire et al., 2020), we included teacher fixed-effects to account for this clustering of students nested within teachers (i.e., classrooms).

Model 1 examined how neighborhood SES and prosocial behavior were directly and uniquely associated with academic achievement outcomes. Model 2 additionally examined how an interaction between neighborhood SES and prosocial behavior was associated with academic achievement outcomes. Specifically, we created an interaction term by multiplying standardized values of neighborhood SES and prosocial behavior together. Significant interactions were further probed using the simple slopes technique (Aiken & West, 1991) by testing the associations between neighborhood SES and academic achievement outcomes for children with high (1 *SD* above the mean) and low (1 *SD* below the mean) levels of prosocial behavior. Analyses were conducted in Stata Version 13.1 (StataCorp, 2013). Secondary models, described below, tested for robustness and probed exploratory hypotheses using additional variables.

Ethical approvals & data sharing

The research project used only existing, de-identified data and the sponsoring institution's IRB board determined that this project did not meet the definition of human subject research. The [BLINDED] Ethics Committee provided ethical approval for the Born in Bradford study, with parents providing written consent for themselves and on behalf of their children

before data collection. Researchers retrieved the sensitive educational records through a managed-access process approved by the BiB Executive Board.

Results

Table 1 displays descriptive statistics for key study variables for the full sample and separately by gender and ethnicity. Table 2 displays bivariate correlations among all study variables. On average, children from higher SES neighborhoods showed higher levels of early learning goals (r = .20, p < .001), phonics skills (r = .07, p < .05), and academic performance (r = .09, p < .01). Similarly, children who demonstrated more prosocial behavior had higher levels of early learning goals (r = .45, p < .001), phonics skills (r = .32, p < .001), and academic performance (r = .40, p < .001).

Children from higher SES neighborhoods were more likely to be White compared to South Asian (r = -.31, p < .001), and boys compared to girls (r = -.09, p < .01). Prosocial behavior was more common among girls (r = .22, p < .001), which is consistent with prior work (Rose & Asher, 2017). Prosocial behavior was not associated with ethnicity (see Eisenberg et al., 2016, p. 624 for a discussion of mixed prior results) or neighborhood SES (consistent with prior research among 4- to 5-year-old children in Australia; Edwards & Bromfield, 2009).

[PLEASE INSERT TABLES 1 & 2 APPROXIMATELY HERE]

Table 3 displays standardized regression results. Model 1 demonstrated that neighborhood SES was positively and significantly associated with early learning goals (β = 0.08, SE = 0.03, p <.05), phonics skills (β = 0.09, SE = 0.04, p <.05), and academic performance (β = 0.09, SE = 0.04 p <.05) after controlling for gender, ethnicity, and family SES. Similarly, prosocial behavior was positively and significantly associated with early learning goals (β = 0.50, SE = 0.03, p <.001), phonics skills (β = 0.33, SE = 0.03, p <.001), and academic

performance (β = 0.42, *SE* = 0.04 p <.001) after controlling for gender, ethnicity, family SES, and neighborhood SES.

[PLEASE INSERT TABLE 3 APPROXIMATELY HERE]

Model 2 demonstrated that the interaction between neighborhood SES and prosocial behavior was marginally associated with early learning goals (β = -0.05, *SE* = 0.02, p = .053), and significantly associated with phonics skills (β = -0.06, *SE* = 0.03, p <.05) and academic performance (β = -0.08, *SE* = 0.03, p <.01). Figures 1, 2, and 3 display a consistent pattern of interactions. Neighborhood SES was positively associated with academic achievement for children with lower levels of prosocial behavior (β = 0.14 - 0.18, ps < .001). In contrast, neighborhood SES was not associated with academic achievement for children with higher levels of prosocial behavior (β = 0.00 - 0.04, ps = .370 - .949).

[PLEASE INSERT FIGURES 1, 2 & 3 APPROXIMATELY HERE]

Sensitivity & Exploratory Analyses

In secondary models we tested the robustness of our findings. Full results are displayed in Supplementary Materials and summarized briefly here. First, we controlled for children's peer relationships, emotional challenges, and behavioral conduct challenges, as assessed by the corresponding subscales of the SDQ. The interaction between neighborhood SES and prosocial behavior was marginal for early learning goals (p = .07) but remained a significant predictor of phonics skills (p <.05) and academic performance (p <.01). To probe consistency of our findings across child demographics, we also tested whether the observed significant interactive effects varied by children's gender and ethnicity. To do this, we first tested whether three-way interactions between neighborhood SES, prosocial behavior, and each demographic variable (i.e., child gender and ethnicity) were associated with each academic achievement outcome. These

three-way interactions were not significant (*p*s >.10), suggesting that our observed pattern of results was consistent across gender and ethnicity.

Discussion

Children born into neighborhood adversity are at risk for lower academic achievement during early schooling and across the lifespan (Caspi et al., 2017; Ritchie & Bates, 2013; van Raalte et al., 2012). Conversely, neighborhood advantage causally and positively impacts long-term educational outcomes (Chetty, Hendren, & Katz, 2016). Identifying factors that protect children against academic risk has long been a top priority (Masten, 2018; Merz et al., 2019), because such research can enable policymakers to reduce achievement gaps along socio-economic lines when children are young (Caspi et al., 2017; Reardon, 2019). In response, we sought to understand if young children's prosocial behavior serves as a protective factor against academic risk in contexts of neighborhood disadvantage. In a large, diverse longitudinal sample of children followed from before birth until age seven, we investigated whether associations between neighborhood SES and academic achievement (measured at three time points across early childhood) varied by the level of children's prosocial behaviors (measured at age 4 to 5). Our research approach employed a governmental index of neighborhood adversity, standardized teacher assessments of prosocial behaviors and early learning goals, and direct assessment of phonics skills and academic performance. We found a consistent pattern of results across all measured outcomes that were relatively robust across alternative specifications considered in sensitivity analyses. Low neighborhood SES was associated with concurrent and subsequent academic risk (i.e., lower performance) only among children who displayed low levels of prosocial behavior, but not among children who displayed high levels of prosocial behavior.

These results suggest that prosocial behavior may be a protective factor for the academic achievement of children faced with limited contextual resources and educational opportunities.

Prosocial Behavior Positively Predicts Academic Performance Across Early Childhood

Our first set of models demonstrated that neighborhood SES was positively associated with teacher observations and direct assessments of academic performance across early childhood, consistent with prior work (Flouri & Sarmadi, 2016; Minh et al., 2017; Oberle, 2013). Moreover, children's prosocial behavior was positively associated with children's early learning goals, phonics skills, and academic test performance, over and above neighborhood and family SES. Prosocial behavior has already been positively linked to academic achievement during middle childhood (Caprara et al., 2000; Carlo et al., 2018; Malecki & Elliot, 2002; Wentzel, 1991). Replicating one prior study among Australian kindergartners (Collie et al., 2018), we extend this research to early childhood, when children are entering formal education for the first time. However, these direct associations were qualified by significant interactions, our main set of findings.

Prosocial Behavior Buffers Academic Risk in Neighborhood Adversity

Our second model revealed that neighborhood SES predicted greater academic achievement (by all three measured outcomes) only among children who displayed *low* levels of prosocial behavior. Specifically, children who helped their peers relatively less displayed lower levels of academic achievement if they came from poorer neighborhoods, but higher levels of academic achievement if they came from relatively wealthier neighborhoods. In contrast, children who tended to help their peers more did not differ in levels of academic achievement across the spectrum of neighborhood SES. These results suggest that among diverse children living in

neighborhoods with low SES, prosocial behavior may be a key protective factor — or promote resilience — for achieving early academic success.

Several possible mechanisms may underlie this pattern of results. One possibility is that when helping others, children gain opportunities for cognitive stimulation via practicing perspective-taking, communicating, self-regulation, or other forms of on-task engagement (Luo, 2018), which in turn protect against the adverse effects of contextual risk on academic achievement. As such, prosocial behaviors may facilitate access to opportunities for learning beyond the resources available in their immediate neighborhood environment.

A second possible explanation is that when young children help others, they foster positive relationships and emotions that can buffer them from contextual stress (Brody, Lei, Chen, & Miller, 2014; Eisenberg et al., 2016; Odgers et al., 2009). Specifically, children who often help their peers may have other supports in the home or at school—not captured by neighborhood SES—that in turn promote social and emotional well-being, and enable them to effectively cope with neighborhood stressors. These supports likely come from teachers or parents rather than peers, because sensitivity analysis controlling for general peer-relationship quality did not change our observed pattern of results. For example, responsive family relationships, opportunities for social and cognitive stimulation, and positive interactions with siblings all promote prosocial behavior (Eisenberg et al., 2015). Similarly, children who help others more may be more engaged in the classroom setting, and/or experience positive relationships with teachers who in turn help them to achieve academic success and resilience, despite neighborhood disadvantage (Carlo et al., 2018; Gryczkowski, Jordan, & Mercer, 2017; Padilla-Walker, Nielson, & Day, 2016). In addition, children who are perceived as more helpful are liked more by their teachers, and may receive greater attention and investments in their education compared to their peers who tend to help less

(Catherine, Schonert-Reichl, Hertzman, & Oberlander, 2012; Gregory & Fergus, 2017). For example, prior research has shown that 10-year-old children from low SES neighborhoods scored lower on standardized academic tests compared to children from high SES neighborhoods, but only if they did *not* experience supportive relationships with peers and teachers (Oberle, 2013).

We found that prosocial behavior was protective across demographic groups—for boys and girls, and for White and South Asian youth. Although we did not have a strong hypothesis for this exploratory analysis—as prior research on demographic differences in children's prosocial behavior has been mixed (Eisenberg et al., 2015)—these results could be considered surprising. Historically and currently, South Asians are a discriminated ethnic minority in the U.K. This is also reflected in our finding that South Asian families were more likely to live in lower SES neighborhoods compared to White families. Thus, one might expect that prosocial behavior would be an even more potent protective factor for an ethnically discriminated group, compared to an ethnically non-discriminated group. For example, one of the proposed potential mechanisms is the advantage of a positive student-teacher relationship—which may be more common among children who are perceived as more prosocial—and could be more protective for children who face discrimination. Although prosocial behavior appears to be similarly protective across gender and ethnicity in our study, future research should continue to investigate how protective factors in neighborhood adversity vary across groups of children.

Implications

Our results should not be interpreted as a "pull yourself up by the bootstraps" view of resilience (Masten & Barnes, 2018). To achieve academic success in the face of adversity, it should not be only the child's responsibility to simply change their behaviors. In contrast, schools and neighborhoods should structure children's opportunities for helping others and developing

prosocial competencies and habits (Eccles & Roeser, 2011; Jennings & Greenberg, 2009; Fuligni, 2020). As such, policy makers, educators, and family caregivers are crucial for nurturing resilience in children (Masten & Barnes, 2018). Teachers and other adults should model, teach and foster the development of students' helping behaviors in formal and informal learning environments.

Consistent with this adaptive systems perspective of resilience (Masten & Barnes, 2018) and a body of research demonstrating the effectiveness of socio-emotional learning programs (Domitrovitch et al., 2017), our results highlight prosocial behaviors as one specific factor that may promote children's positive academic functioning and resilience in contexts of environmental risk. Classroom-based social and emotional learning programs have been shown to improve children's academic achievement in low SES contexts (Durlak et al., 2011; Gregory & Fergus, 2017; Taylor, Oberle, Durlak, & Weissberg, 2017). Such programs, for example those run by the Collaborative for Academic, Social, and Emotional Learning — a nonprofit — also reduce behavior problems and promote positive social-emotional outcomes using and socio-emotional framework (Weissberg, 2019). Our results extend this work by suggesting that opportunities specifically for children to *help each other*—perhaps in community settings beyond structured socio-emotional learning curriculum—may be beneficial. In particular, children in low-income communities may benefit from more opportunities to practice contributing to the lives of other people around them, for example by helping peers or teachers in the classroom, participating in group projects or socially-minded activities, or helping family or adults with daily tasks (Fuligni, 2020). Moreover, since prosocial behavior buffered the effects of social and economic disadvantage measured across neighborhoods, interventions targeting children on the *neighborhood level* (in addition to the individual or classroom level as highlighted in prior research; Layous et al., 2014; Schonert-Reichert et al., 2012) that encourage children's helping

behaviors may be beneficial. Finally, in line with the socio-emotional literature (Domitrovitch et al., 2017), increasing children's opportunities to help others may help to promote academic adjustment as young as age 4.

Limitations & Future Directions

We acknowledge limitations and highlight future directions for study. We were unable to measure children's relationships with parents and teachers, specific experiences when helping peers, and other variables that may have partially buffered risk and confounded observed associations. We attempted to address this by controlling for child gender, ethnicity, and family SES — as well as general measures of behavioral and emotional functioning, and peer relationship quality in sensitivity analyses — but we were unable to fully capture children's experiences and relationships across settings. As such, the precise mechanisms remain unclear from our study. In addition, although we used three different developmentally appropriate academic measures across early childhood which were highly correlated and supported by a latent factor analysis, it is possible that these measures partially reflect distinct academic domains. Future research should further explore whether prosocial behavior and neighborhood SES relate differently to different domains of academic functioning. Future research should also investigate the interplay between prosocial behavior, neighborhood SES, and young children's specific cognitive skills (e.g., executive functions and working memory) that promote academic success (e.g., Hackman et al., 2014).

Although sensitivity analyses were aimed to reduce confounds, the findings are observational in nature and do not indicate causal pathways. Future research could address this by evaluating targeted interventions designed to increase children's helping behaviors. Future research could also randomly assign children to help their peers (or not), and examine the causal

impact on academic performance and attainment. Finally, sociocultural elements that are unique to Bradford may limit the generalizability of the findings to other settings—in particular, the high levels of poverty overall across the city, compared to other cities in the UK (Wright et al., 2012). Our study was also based on a subsample of participants from the full BiB study. Although our analytical sample was similar to the full BiB cohort across most study variables, it may differ by other unobserved variables.

The current study examined children's propensity to help their peers as a specific aspect of behavior that might promote academic resilience in contexts of neighborhood adversity. A handful of prior studies have shown that prosocial behavior is positively associated with academic achievement during middle childhood, and can be protective against early psychopathology, but these have not shed light on the how prosocial behavior and neighborhood contexts interactively relate to academic achievement during early childhood. We extend prior work by demonstrating that prosocial behavior promotes academic resilience across ages 4 to 7 among children living in disadvantaged neighborhoods in Bradford, UK, a city with high levels of adversity. Our results suggest that children growing up in neighborhood disadvantage do not exhibit lower levels of academic performance if they tend to help their peers and others relatively more often. This work highlights the complex interplay between local microcosms and individual differences in young children's social behaviors for foundational educational progress.

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