

Rebecca C. Fauth, [Lucinda Platt](#), Samantha Parsons
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The development of behavior problems among disabled and non-disabled children in England



Rebecca C. Fauth^{a,*}, Lucinda Platt^b, Samantha Parsons^c

^a Tufts Interdisciplinary Evaluation Research, Eliot-Pearson Department of Child Study and Human Development, Tufts University, USA

^b Department of Social Policy, London School of Economics and Political Science, United Kingdom

^c Centre for Longitudinal Studies, UCL Institute of Education, United Kingdom

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ABSTRACT

This study identifies the incidence and development of disabled children's problem behaviors (i.e., conduct, peer, hyperactivity, and emotional problems) during the early years. Using the Millennium Cohort Study, a nationally representative UK study, and a measure of disability anchored in the UK legal definition, we estimate growth curve models tracking behavior problems from ages 3 to 7. We examine whether disabled girls' and boys' behavior differs from their non-disabled peers, and whether it converges with or diverges from them over time. We investigate whether parenting and the home environment moderate associations between disability and behavior. We show that disabled children exhibit more behavior problems than non-disabled children at age 3, and their trajectories from ages 3 to 7 do not converge. Rather, disabled children, particularly boys, show increasing gaps in peer problems, hyperactivity, and emotional problems over time. We find little evidence that parenting moderates these associations.

1. Introduction

The emergence of problem behavior during the early years may set children upon unfavorable developmental trajectories. This is particularly true in the case of early externalizing behavior problems (i.e., hyperactivity, aggression), which may lead to continued problems and poor academic achievement (see e.g., Campbell, Shaw, & Gilliom, 2000; Hinshaw, 1992). Boys and girls tend to exhibit problem behavior differently, with higher rates of externalizing problems documented for boys and, to some extent, more internalizing problems (withdrawal, depression) for girls (see, e.g., Baillargeon et al., 2007; Campbell, 1995; Keenan & Shaw, 1997; Midouhas, Kuang, & Flouri, 2014). Past research has shown that disabled children are more likely than their non-disabled peers to present behavior problems, including social and peer problems, conduct problems and oppositional behaviors, attention difficulties and hyperactivity, and internalizing problems, and that their problems are more likely to be within the clinical range relative to their peers (Alloway, Gathercole, Kirkwood, & Elliott, 2009; Baker et al., 2003; Eisenhower, Baker, & Blacher, 2005; Emerson & Einfeld, 2010; Landa, Gross, Stuart, & Faherty, 2013).

Yet, we know little about the extent to which associations between disability and behavior are linked to children's developmental stage and whether they attenuate or intensify around the time of school entry. We

know from decades of research the critical nature of the early years, in which both genes and the environment—and the interplay between the two—set into motion the development of brain structures that affect children for the rest of their lives (Shonkoff & Phillips, 2000). More proximally, children's development up to age 3 provides the building blocks for the increasingly complex social behaviors, emotional maturity, problem solving ability, and early literacy and numeracy skills that are critical leading up to school entry. For some children, early behavioral problems are temporary, resolved over the normal course of development, while for others they persist or even intensify in the early school years. School entry represents an expansion in children's developmental ecology from the primacy of parents and the home environment to incorporate the school context and peers. Whether disabled children's behavioral development tracks that of their non-disabled peers over the first few years following this transition to school is an important empirical endeavor, a better understanding of which will help to inform the timing of interventions for disabled children. A description of disabled children's early behavioral trajectories across four important domains of behavioral development is the first contribution of this paper.

Our current understanding of the association between disability and behavior is limited by the focus on particular impairments or conditions and reliance on small-scale, localized studies, both of which hamper

* Corresponding author at: Tufts University, 574 Boston Avenue, Medford, MA 02155, USA.
E-mail address: rebecca.fauth@tufts.edu (R.C. Fauth).

generalizability. Many common proxies for disability in UK-based studies, such as identification with special educational needs (SEN), may confound the measurement of disability with the measurement of problem behaviors (Keil, Miller, & Cobb, 2006; Keslair & McNally, 2009; Powell, 2003). Here, instead, we exploit an overarching measure of disability anchored in the UK legal definition, itself informed by the social model of disability, which distinguishes the impairments themselves from the societal conditions under which they become disabling (Oliver, 1990). Our measure, which takes account of the contextualized nature of limitations or impairments, was developed from the data in consultation with the leading UK child disability experts and validated against known correlates of disability. This measure defines disability as both longstanding *and* limiting daily activities (longstanding limiting illness; LSLI), in line with guidance on the legal definition. It incorporates long-term health conditions, mental health problems, and sensory impairments, among others, enabling us to capture a wide range of disabling conditions experienced by a nationally representative sample of young children in England. Use of this measure improves our understanding of the associations between disability, rather than specific impairments or conditions that may or may not be limiting, and behavior, the paper's second contribution.

Given the importance of the family and home environment for young children's behavioral development, supportive and enriching experiences in the home could help mitigate the development of behavior problems for young disabled children. On the other hand, given increased levels of parenting stress associated with parenting a young disabled child (Baker et al., 2003; Hastings, 2002; Neece, Green, & Baker, 2012), it may be that less favorable family climates exacerbate differences in behavior problems between disabled and non-disabled children. To our knowledge, despite the wealth of research attesting to the importance of home environment on children's development, and the ways in which it can mitigate socio-economic disadvantage (see e.g., Siraj-Blatchford, 2010), research has not examined whether family environments promote greater convergence or divergence of behavioral trajectories between disabled and non-disabled children over time. The paper's third contribution is to investigate the moderating role of parental warmth and harshness and the home learning environment on disabled children's behavioral trajectories; notably to better understand which aspects of parenting and the home environment attenuate or exacerbate which problem behaviors.

Using longitudinal data from the UK Millennium Cohort Study (MCS), a large, nationally representative sample of children born in 2000–2001, we examine four problem behaviors: conduct problems, hyperactivity, peer problems, and emotional symptoms. These distinct types of problem behavior have been shown to be important for children's development, and they may present differently over time for disabled and non-disabled children. We address the question of whether young disabled children growing up in England experience more behavioral problems, and in which domains, than their non-disabled counterparts at age 3, and if any initial gap in behavior widens between the ages of 3 and 7. Finally, we examine whether differences in behavioral trajectories are contingent on three aspects of parenting and the home environment.

1.1. Behavioral problems and disabled children

A large body of research attests to specific trajectories associated with the four types of childhood behavior problems (i.e., conduct problems, hyperactivity, peer problems, emotional symptoms), with the preschool and initial school years considered the time when most children learn to control early problematic behavior, particularly externalizing behaviors (Bongers, Koot, van der Ende, & Verhulst, 2003; Broidy et al., 2003; Campbell et al., 2000; Fanti & Henrich, 2010; Tremblay et al., 2004). While conduct, hyperactivity, and peer problems typically decline over this time (Flouri, Midouhas, & Joshi, 2014; Midouhas et al., 2014), emotional symptoms tend to be stable or

increase (Bongers et al., 2003; Leve, Kim, & Pears, 2005; Midouhas et al., 2014). The exception to this general pattern is a small subset of children, comprising more boys than girls, who display high levels of physical aggression that persist (Broidy et al., 2003; Campbell et al., 2000; Tremblay et al., 2004). These studies do not, however, distinguish between disabled and non-disabled children. Studies that have explored the relationship between disability and behavior in the early years have shown that, relative to non-disabled children, disabled children experience more total behavioral problems, more serious and clinically significant problems, and more persistent problem behavior (Alloway et al., 2009; Baker et al., 2003; Eisenhower et al., 2005; Emerson & Einfeld, 2010; Guralnick, Hammond, Connor, & Neville, 2006; Landa et al., 2013; Midouhas, Yogaratnam, Flouri, & Charman, 2013), suggesting that general declines reported for conduct, hyperactivity, and peer problems in the early school years may occur later or not at all for disabled children. Further, a recent study found that disabled children were particularly susceptible to increases in internalizing symptoms (Hauser-Cram & Woodman, 2016). These findings are largely based on small, non-representative cross-sectional samples and tended to focus on one particular type of impairment and more global problem behavior (rather than specific types). While researchers have used the MCS, the data source used here, to explore links between disability and children's behavior (see e.g., Emerson & Einfeld, 2010; Midouhas et al., 2013), it has not previously been used to classify young children according to criteria aligned with the UK legal definition of disability, nor have disabled children's early behavioral trajectories been examined, focusing on the time leading up to and following school entry. Exploring four behavioral trajectories across a representative sample of children from England allows us to assess how disabled and non-disabled children may differentially respond to school entry.

A potentially important element in understanding the behavioral trajectories of young disabled children is the role of parenting and the home environment. A large body of research has demonstrated that parenting characterized by high levels of warmth, cognitive stimulation and clear limit-setting is associated with favorable emotional and behavioral outcomes for children, with the opposite findings for parenting characterized by harsh, arbitrary discipline or emotional detachment (Baumrind, 1966; Belsky, 1999; Berlin & Cassidy, 2000; McLoyd, 1998). Parents can also provide materials and experiences within the home environment, such as reading and other learning activities that promote children's early behavioral development (de la Rochebrochard, 2012; Hall et al., 2013; Kelly, Sacker, Del Bono, Francesconi, & Marmot, 2011; Kiernan & Huerta, 2008).

Yet, parenting a disabled child may yield less than optimal parenting behaviors. Parents of disabled children exhibit higher levels of stress, more coping difficulties, and more conflict than other parents, which may lead to increased child behavior problems over time (Baker et al., 2003; Eisenhower et al., 2005; Herring et al., 2006; Neece et al., 2012; Totsika, Hastings, Vagenas, & Emerson, 2014), although these studies did not differentiate between type of problem behavior. Parents' ability to parent positively depends, in part, on whether they can recognize and interpret their children's behavior and emotional states, which may be difficult with disabled children (Howe, 2006). Some parents successfully adapt to having a disabled child and are able accommodate their special needs, while others face continued challenges to their competence and confidence as parents, becoming stuck in negative interaction patterns (Bailey et al., 2006; Sanders, Mazzucchelli, & Studman, 2004). Unfavorable parenting behaviors, such as unresponsiveness, harsh discipline and negative control exacerbate both externalizing and internalizing behavior problems for disabled children (Campbell et al., 2000; Gilliom & Shaw, 2004), while positive parenting behaviors may buffer them from the development of future problems (Ellingsen, Baker, Blacher, & Crnic, 2014; Hauser-Cram & Woodman, 2016). One UK study found that parent-child relationship quality was a stronger predictor of young disabled children's global behavior problems at age 5 than was discipline or assessments of

the family environment (Totsika et al., 2014). The present study aims to expand on the extant research to examine whether different aspects of parenting may have distinct influences on particular behavior problems from ages 3 to 7. A better understanding of these nuances could help inform the timing and content of interventions to support families with disabled children (Bailey et al., 2006).

1.2. The current study

The present study explores the development of disabled and non-disabled children's internalizing and externalizing behavioral problems over the early years and entry into school, a time of rapid growth and development when children's developmental ecologies expand well beyond their home environments. Using data from a large-scale, nationally representative sample of children living in England, we are able to include a range of relevant child and family background characteristics. The study capitalizes on the longitudinal nature of the dataset, which is critical for understanding whether any early differences in behavioral problems between disabled and non-disabled children are stable, decrease or increase over time.

The paper addresses the following questions: (a) Are there differences in rates of behavior problems, specifically conduct, hyperactivity, peer, and emotional problems, between disabled and non-disabled children at age 3? (b) Are observed patterns of development of behavioral problems moderated by child sex? (c) Do gaps in behavior between disabled and non-disabled boys and girls converge (decrease), diverge (increase), or stay constant from age 3 to age 7? (d) Are the observed patterns of behavioral development robust to the inclusion of family characteristics and parenting behaviors? and (e) Does growing up in positive and stimulating early home environments moderate any divergence in trajectories between disabled and non-disabled boys and girls?

Our measure of disability, longstanding limiting illness (LSLI), aligns most closely with UK disability legislation namely the Disability Discrimination Act, 1995, which was subsequently incorporated in the Equalities Act, 2010. While it does not precisely reflect the terminology of the legislation or the guidance on interpretation of “longstanding,” it provides an approximation that matches the key elements of the law. By contrast with the medical model, which has dominated most extant research, our definition has its roots in the social model of disability (Oliver, 1990), which regards disability as the ways in which societal organization limits those with an impairment, rather than viewing the impairment itself as inherently limiting. Adhering to the social model enables us to perceive behavioral “problems” as manifestations of how social norms limit disabled children, thus linking LSLI to behavioral problems and their development over time.

From the existing literature, we develop the following hypotheses. First, we expect that disabled children will exhibit higher initial levels of conduct problems, hyperactivity, peer problems, and emotional symptoms at age 3 than their non-disabled peers. While we expect that externalizing problems (conduct problems, hyperactivity) will decrease over time for all children, we expect that differences between disabled and non-disabled children, particularly boys, will become more pronounced from around the time of school entry (around 4.5 years in England). Given the ways in which children respond to difference and the fact that schools may enhance the potentially disabling environment for children (Baker & Donnelly, 2001; Chatzitheochari, Parsons, & Platt, 2016; Connors & Stalker, 2006), we expect disabled boys and girls to exhibit increased peer problems over time relative to their non-disabled peers. Our hypotheses concerning emotional symptoms are more tentative, but in line with previous research, we expect stability or small increases in emotional symptoms over the early years, and that they may increase most for disabled girls. Given the importance of family environment for disabled children (Baker & Donnelly, 2001) and the stresses for parents in families of disabled children (Dowling & Dolan, 2001), we expect that warm parenting and enriching

home environments will lead to more convergence over time in disabled children's behavioral trajectories, particularly for conduct problems, hyperactivity, and emotional symptoms. Harsh parenting will likely only moderate the association between disability and externalizing symptoms (i.e., conduct problems, hyperactivity).

2. Methods

2.1. Data

We use data from the longitudinal Millennium Cohort Study (MCS). This large-scale, multidisciplinary, nationally representative study follows approximately 19,000 babies born to families living in the UK between September 2000 and January 2002 (Plewis, 2007). The sample population was drawn from all live births in the UK over this period, which were registered for universal child benefit. Participants were selected from a random sample of electoral wards, disproportionately stratified to ensure adequate representation of all four UK countries, deprived areas, and areas with high concentrations of Black and Asian families. Probability weights available for both whole UK and separate country analysis ensure that oversampled groups are represented according to population proportions.

Families have been surveyed when children were aged 9 months (wave 1), and 3, 5, 7, 11, and 14 years (wave 2–6). At each survey, the child's main caregiver (primarily mothers) and their partner (primarily fathers) were interviewed and carried out self-completion questionnaires. Physical measurements and cognitive assessments of children have taken place since age 3. We use data from the main caregivers' interviews at the first four waves of data collection, and children's cognitive assessments at age 3 (Centre for Longitudinal Studies, Institute of Education, University College London, 2012a, 2012b, 2012c, 2012d). Sample attrition occurred over the course of the study: 72% of the original sample was surveyed at age 7. We employed the relevant survey weights for analysis of separate UK countries (see below) at the fourth survey (age 7). These weights incorporated adjustment for initial non-response at wave 1 and for differential non-response over time. While weights do not fully resolve the potential bias introduced by differential attrition, comparison of the initial wave characteristics of the analytic sample with those of the original respondents revealed that, while the analytic sample tended to be more advantaged, the differences were not sufficient to imply substantial bias in estimates of relationships between variables in multivariate analysis controlling for these characteristics (see Appendix A; Wooldridge, 2007). Moreover, our approach is consistent with extant research on behavioral development using the same study (e.g., Fitzsimons, Goodman, Kelly, & Smith, 2017; Flouri et al., 2014; Midouhas et al., 2014), and thus facilitates direct comparison.

2.2. Analytic sample and exclusions

We restricted our sample to the approximately 60% of MCS families living in England, since education and public health systems vary across the countries of the UK. We further restricted our sample to those families who both took part in the first four waves of data collection, including completion of the main caregiver interview and self-completion questionnaire. At wave 1 when children were 9 months, 11,533 families lived in England. Of these, 7387 (63%) took part in the first four waves of data collection, and around 6300 completed main caregiver interviews and had non-missing data on other key variables. Due to small variations in missing data on behavior, we have sample sizes ranging from 6277 to 6313 for the behavioral outcomes of interest. In terms of inclusion, we found that families with disabled children were as likely to have been continuously involved in MCS as families with non-disabled children (analysis available on request).

2.3. Dependent variables

Our dependent variables are the four “problem” subsets of the parent-reported Strengths and Difficulties Questionnaire (SDQ). The SDQ is a brief behavioral screening tool for 3- to 17-year-olds that has been widely validated cross-nationally and cross-culturally for use in non-clinical settings (Goodman, 1997; Goodman, Meltzer, & Bailey, 1998). The full scale is provided in Appendix B. Parents indicated how true each of 25 attributes (both positive and negative) were of their child over the 6 months preceding the age 3, 5, and 7 interviews (waves 2–4), ranging from “not true” (0) to “certainly true” (2). Four problem scales (each comprising five items)—conduct problems (e.g., “often has temper tantrums or hot tempers”; Cronbach's $\alpha = 0.56$ – 0.68), peer relationship problems (e.g., “picked on or bullied by other children”; Cronbach's $\alpha = 0.47$ – 0.58), hyperactivity/inattention (e.g., “constantly fidgeting or squirming”; Cronbach's $\alpha = 0.71$ – 0.78), and emotional symptoms (e.g., “has many worries, often seems worried”; Cronbach's $\alpha = 0.54$ – 0.66)—were created by summing item scores (positive attributes were reverse coded), with a higher score representing more problems. While some of the alphas appear low for problem scales at certain ages, the subscales are well validated and extensively implemented, including in studies using the same data (Midouhas et al., 2013). More recently, and Flouri and colleagues (Flouri, Midouhas, & Narayanan, 2016) investigated the scales using structural equation modeling and concluded that the individual items loaded well on their latent constructs. Following standard practice (see e.g., Midouhas et al., 2014), we model the scores as continuous outcomes.

2.4. Explanatory variables

2.4.1. Disability

Disability was measured based on children's exposure to a long-standing limiting illness (LSLI) at 3, 5, or 7 years determined by two successive questions asking parents if: (a) the child had a longstanding illness, and (b) whether that illness limited daily activities. We conducted detailed exploratory analysis, including known correlates of disability, such as parental education, income, and employment status and developed our measure in discussion with the Council for Disabled Children, who provided insight into the meaning of changes in LSLI status across waves. We also conducted sensitivity analyses using special educational needs (SEN) and developmental delay (at 9 months) as alternative measures of disability. On this basis, we developed an indicator variable identifying children as disabled if they had an LSLI at one or more occasions between ages 3 and 7. LSLI included long-term health conditions, such as type 1 diabetes or asthma; mental health problems; and impairments, such as partial sight. Using this definition, 10% of the sample was disabled. Among disabled children, asthma was the most common condition (35%), followed by ear disorders (13%) and dermatitis or eczema (12%). Note that in line with the social model of disability, it is not the condition that defines whether or not the child is disabled, but whether it is experienced as limiting their activities. In additional robustness analysis, we re-estimated the models excluding 101 children with specific conditions that might overlap with our outcome measures (ICD10 codes: F80-F89 = disorders of psychological development; F90-F98 = behavioral problems). Our findings were robust to this narrower specification (results available on request), so we retained the analytic sample previously described. We additionally estimated our models using a time varying measure of LSLI at ages 3, 5, and 7 as a sensitivity analysis. Results were consistent with the findings reported here (available on request).

A range of child, family and parent-child relationship variables that have been found to be significantly associated with child behavior and/or disability in previous research were included in all analytic models.

2.4.2. Child characteristics

Child age was measured in fractions of years centered at age 3.

Centering enabled us to establish initial differences in behavior problems between disabled and non-disabled children. We also computed a quadratic age term to measure non-linearity in the development of behavior problems over time.

Child's sex was included in all models. Through estimating an interaction term with LSLI we aimed to isolate any differences in behavior problem trajectories between (disabled) boys and girls, and to investigate the extent to which child sex moderated the relationship between behavioral difficulties and disability in these early school years. Where the interaction between disability and child sex was not statistically significant (i.e., for conduct problems), we did not include it in the final specifications.

The British Ability Scale Naming Vocabulary scale (Elliott, 1996), a widely used assessment of young children's expressive verbal ability, administered at age 3 (wave 2), and therefore prior to any school influences on cognitive development, was used as a control for children's cognitive ability. The child is shown a series of pictures (e.g., shoe, chair, scissors) and asked to identify the objects. Children are shown up to 36 pictures, depending on their performance. Ability scores created using item response theory ranged from 10 to 141 (Connelly, 2013; Rasch, 1960).

2.4.3. Family background characteristics

Low income (poverty) was measured as family household income < 60% of adjusted median household income, in line with the UK definition of relative poverty. As well as a time varying measure when children were 3, 5, and 7 years of age (waves 2–4), low income status at wave 1 was also controlled to capture the different circumstances disabled children are born into.

Maternal work status was captured as a binary time varying variable (1 = in work), to capture the role of work independently of family income, and to allow for the fact that mother's work status might respond to child disability over time. Mothers' initial work status at wave 1 was also controlled.

Family structure and cohabiting father's (mother's partner's) work status was captured in a single time varying variable with three values: father not present (single parent family), father present and not in work, and father present and in work. As well as the time varying measure, we controlled for wave 1 father's work and family structure to capture antecedent influences.

Parental education was based on the highest qualification held by a parent living in the household at wave 1. Qualifications were grouped according to the national qualification framework levels (<https://www.gov.uk/what-different-qualification-levels-mean/overview>), and were rated on a 5-point scale, ranging from no qualifications (0) to NVQ4 or 5 (4), which equates to a Bachelor's degree or higher.

To control for maternal mental health, we used a reduced form of the Malaise Inventory (Rutter, Tizard, & Whitmore, 1970). At wave 1, mothers considered nine indicators of depression/anxiety (e.g., Are you easily upset or irritated?; Do you feel tired most of the time?), and indicated for each whether they “generally” felt these symptoms. Items were summed, with higher scores indicating increased probability of depression or anxiety (range = 0–9; Cronbach's $\alpha = 0.73$). While this was our preferred measure of maternal mental health and, since it was measured at wave 1 when children were 9 months, captured antecedent influences on child behavior and its evolution, in a sensitivity analysis we estimated an alternative measure of time varying (ages 3, 5, and 7) responses to the Kessler scale (Kessler et al., 2003). Since we did not identify any substantive differences to our results using this alternative measure, and rates of non-response to the Kessler scale were higher than for other measures, we retained the Malaise Inventory at wave 1 in our final analysis.

Research has documented both favorable (Hall et al., 2013) and unfavorable (Stein, Malmberg, Leach, Barnes, & Sylva, 2013) associations between early child care usage and young children's behavior problems. Child care in formal settings or by non-family members may

reduce the direct influence of home context or mother's work status. We control for use of center-based child care (nursery) and, for comparison, non-kin family-based child care (childminder) at age 9 months, relative to using neither of these external child care settings.

2.4.4. Parenting

When children were 3 years old (wave 2), parents reported on how frequently they engaged their child in six educational activities: going to the library (“not at all” to “once a week”), and reading, painting and drawing, being taught letters, being taught numbers, and singing, reading poems, or rhyming (“not at all” to “everyday”). Items were summed to create a home learning environment scale ($M = 25.8$, $SD = 7.39$, range = 0 to 42). This scale has been widely used (e.g., Chatzitheochari et al., 2016; Kiernan & Huerta, 2008; Parsons, Schoon, & Vignoles, 2014) and has shown strong links to children's cognitive and behavioral outcomes (de la Rochebrochard, 2012; Hall et al., 2013; Siraj-Blatchford, 2010).

To capture parent-child closeness, parents' self-evaluation of how close they were to their child (“not at all” to “extremely”) at age 5 (wave 3) was used. As 69% of parents reported being “extremely” close to their children, we constructed a binary variable contrasting “extremely close” with all other responses.

Harsh discipline in the home was captured at age 5 (wave 3), using seven items from Murray Straus's Conflict Tactics Scale (Straus & Hamby, 1997). The scale sums the number of discipline measures used by the parent (e.g., ignore, smack, shout at, send to bedroom/naughty chair, take away treats, bribe) together with how frequently they are used (1 = “never” to 5 = “daily”). The total score ranged from 7 to 34 ($M = 17.78$, $SD = 4.01$; Cronbach's $\alpha = 0.71$; Johnson, Atkinson, & Rosenberg, 2015).

Descriptive statistics for all measures, broken down by whether or not children had an LSLI, are given in Table 1.

2.5. Analytic strategy

We estimated linear mixed models of children's behavior (Rabe-Hesketh & Skrondal, 2012; Singer & Willett, 2003). This analytic technique capitalizes on the repeated measures of behavioral outcomes measured at three time points, when children were approximately 3, 5, and 7 years. We examined whether disabled and non-disabled boys and girls start with similar or different behavior scores at age 3, and whether disability status is associated with converging or diverging trajectories over the early years, while controlling for potentially confounding family and child characteristics. We estimate their associations at baseline (age 3). We also explored whether parenting and the home learning environment moderated associations between disability and children's behavior problems at baseline and over the early years.

Level 1 represents within-child change in behavior problems from 3 to 7 years, and Level 2 the between-child variation in the expected mean of children's behavior problems at age 3 (random intercept, β_{00}) and linear change from 3 to 7 years (random slope, β_{10}). We included a fixed quadratic on age to account for the curved shape of children's average trajectories (β_{20}). We examined whether average age 3 behavior problems (β_{01}) and change over time in behavior problems (β_{11}) varied according to disability status, as well as whether these relationships were moderated by child sex (β_{03} , β_{13}).

The basic model can be written as follows:

$$\begin{aligned} SDQ_{ij} = & (\beta_{00} + \beta_{10}AGE_{ij} + \beta_{20}AGE_{ij}^2 + \beta_{01}disability\ status_i \\ & + \beta_{11}disability\ status_i \times AGE_{ij} + \beta_{02}child\ sex_i \\ & + \beta_{12}child\ sex_i \times AGE_{ij} + \beta_{03}disability\ status_i \times child\ sex_i \\ & + \beta_{13}disability\ status_i \times child\ sex_i \times AGE_{ij}) \\ & + (u_{0i} + u_{1i}AGE_{ij} + e_{ij}) \end{aligned}$$

The components in the first set of parentheses represent the fixed effects, and the components in the second set represent the random intercept and linear slope for each child, reflecting between-child variation in problem behaviors (u_{0i}), their development over time (u_{1i}), and the error term (e_{ij}). The quadratic slope was fixed in all models.

We estimated the growth curve models separately for each of the four problems in a series of nested models. In model 1, we estimated an unconditional model with age, age squared and the random intercept and slope. In model 2, we estimated a model with disability and sex as predictors, as well as two- and three-way interactions between age, sex, and disability, retaining only statistically significant interactions for the final model 2 specification. In model 3, we incorporated the full set of family and parenting characteristics (i.e., time varying family poverty, maternal work status, and family structure; wave 1 family poverty, maternal work status, family structure, child care usage, and maternal mental health; wave 2 child cognitive ability and home learning environment; and wave 3 harsh discipline and parental closeness) as covariates in addition to the final model 2 specification. Inclusion of the time varying covariates enabled us to examine the average difference in change over time in behavior problems according to families' poverty status, maternal work status, and family structure, respectively. The time invariant covariates enable us to examine the influence of these factors at baseline (age 3). Finally, in model 4, we included two- and three-way interactions between each of the key parenting variables (i.e., home learning environment, harsh discipline, and parental closeness), disability, and age to identify any moderation effect of parenting. The series of models is illustrated schematically in Table 2, alongside the related research questions.

The models were estimated using the mixed procedure in Stata 13.1 (Rabe-Hesketh & Skrondal, 2012).

We present the results from the unconditional model 1 in Table 3; and in Table 4 we present the initial disability model (model 2) and the full model (model 3) for each behavioral outcome. As none of the interactions between disability and parenting were statistically significant for any of the outcomes, model 3 is the final model. To illustrate the key results and demonstrate the magnitude of the differences, we plot the four behavioral outcomes by disability and sex, using model 3 estimates (Figs. 1–4).

3. Results

3.1. Overall development of behavioral problems

Table 3 presents model 1. It shows that, in line with previous results, conduct, hyperactive, and peer problem behaviors tended to decrease over time from around age 3, with a slight increase from around age 6, as illustrated by the positive value for age squared. Emotional problems increased over time and at greater rate as the child aged (inflection point at age 3.5). The random effects parameters reveal that there was substantial idiosyncratic variation in behavior problems between children at age 3 and over time.

3.2. Unconditional behavior trajectories for disabled girls and boys

Table 4 illustrates the role of disability in shaping behavioral trajectories. It presents the results from the models including age, disability, and child sex, and their interactions (model 2), and the final specification, which includes all the controls and parenting measures (model 3). We see from model 2 that disability tended to be positively associated with problem behavior at age 3: a substantial difference amounting to between a third and four-fifths of a point for boys on the behavioral outcome scale (typically double or more than double the gap between girls and boys). Prior to school entry, disabled children demonstrated more challenging behavior than their non-disabled peers. Child sex was a significant predictor of behavior problems at age 3, as well as their trajectories from age 3 to age 7. When we look at changes

Table 1
Family and child characteristics by disability status at age 3 survey (wave 2).

	LSLI (n = 627)	No LSLI (n = 5744)	Total (N = 6731)	p-Value LSLI v. No LSLI
SDQ scores				
M (SE) conduct score	3.27 (0.10)	2.77 (0.04)	2.82 (0.04)	p < 0.000
M (SE) hyperactivity score	4.53 (0.11)	3.84 (0.04)	3.91 (0.04)	p < 0.000
M (SE) peer score	1.98 (0.08)	1.45 (0.02)	1.50 (0.02)	p < 0.000
M (SE) emotional score	1.64 (0.06)	1.27 (0.02)	1.31 (0.02)	p < 0.000
Child characteristics				
Child sex				p < 0.001
Boy	57.5%	49.7%	50.5%	
Girl	42.5%	50.3%	49.5%	
M (SE) age	3.14 (0.01)	3.11 (0.00)	3.12 (0.00)	p < 0.10
M (SE) BAS naming vocabulary score	70.85 (0.86)	74.84 (0.35)	74.4 (0.34)	p < 0.000
Family characteristics				
Parental education ^a				p < 0.001
Degree or higher	40.4%	46.9%	45.4%	
NVQ3 (A levels)	13.9%	16.6%	16.3%	
NVQ2 (O levels)	28.7%	25.3%	25.7%	
NVQ1 (level 1/CSE)	6.5%	5.6%	5.7%	
No qualifications	10.5%	6.6%	7.0%	
Mother's work status				p < 0.01
Mother in work	47.8%	55.4%	54.6%	
Mother not in work	52.2%	44.6%	45.4%	
Father work & family structure				p < 0.000
Lone parent family (no father present)	21.6%	14.8%	15.5%	
Father present & not in work	7.5%	5.8%	6.0%	
Father present & in work	70.9%	79.3%	78.5%	
Family poverty status				p < 0.000
Family not in poverty	63.9%	74.4%	73.4%	
Family in poverty	36.1%	25.6%	26.6%	
Child care ^a				p < 0.50
No non-kin child care	84.4%	81.5%	81.8%	
Nursery (center-based care)	8.8%	11.0%	10.8%	
Childminder (family-based, paid, non-kin care)	6.8%	7.5%	7.4%	
Parental and parenting measures				
M (SE) mother poor mental health ^a	2.04 (0.08)	1.55 (0.03)	1.60 (0.03)	p < 0.000
M (SE) harsh discipline ^b	18.27 (0.17)	17.84 (0.17)	17.88 (0.06)	p < 0.05
M (SE) home learning environment	26.35 (0.41)	26.05 (0.18)	26.08 (0.18)	p < 0.50
Closeness to child ^b				p < 0.30
Not extremely close	27.5%	30.5%	30.2%	
Extremely close	72.5%	69.5%	69.8%	

Note. Values are group percentages except where indicated as mean and standard error in parentheses. All statistics are adjusted to take account of sample design and attrition. Values presented are from the age 3 survey (wave 2), the initial time point for this study, unless otherwise indicated: ^ameasured age 9 months survey only (wave 1); ^bmeasured at age 5 survey only (wave 3). Significance testing for differences between LSLI and no LSLI categories were evaluated by *t*-tests for continuous measures and χ^2 tests for categorical measures.

Table 2
Estimation strategy.

Model	Variables	Research question (s)
1	Age (centered at 3), age squared	Unconditional model
2	1 + child sex + disability + disability * age + child sex * disability + child sex * age + child sex * disability * age	a-c
3	2 + control variables + parenting measures	d
4	3 + parenting * age + disability * parenting + parenting * disability * age	e

Note. Two- and three-way interactions with child sex only retained if the interactions were statistically significant at *p* < 0.05 or less.

in problem behavior over time by disability, we see that there was an increasing gap over time between disabled and non-disabled children for peer problems, hyperactivity (*p* < 0.10), and emotional symptoms. For conduct problems, the gap was constant.

3.3. Conditional behavior trajectories for disabled girls and boys

Model 3 in Table 4 shows that the relationships between disability and behavioral problems were largely robust to the inclusion of the full

Table 3
Base model of development of behavior problems (model 1).

	Conduct	Hyperactivity	Peer	Emotional
Fixed effects parameters				
Age	- 1.79** (0.05)	- 0.94** (0.06)	- 0.70** (0.04)	- 0.14** (0.05)
Age ²	0.14** (0.00)	0.08** (0.01)	0.06** (0.00)	0.02** (0.00)
Constant	1.22** (0.07)	2.71** (0.10)	0.48** (0.06)	0.80** (0.05)
Random effects parameters				
Intercept variance	2.76 (0.09)	3.50 (0.97)	1.24 (0.05)	0.79 (0.06)
Variance of slope (age)	0.90 (0.01)	0.12 (0.01)	0.07 (0.01)	0.05 (0.01)
Intercept slope covariance	- 0.37 (0.02)	- 0.14 (0.02)	- 0.13 (0.01)	0.02 (0.01)
Residual variance	1.06 (0.03)	1.86 (0.05)	1.00 (0.03)	1.21 (0.04)
N (child-wave observations)	18,939	18,832	18,863	18,899

Note. Standard errors in parentheses. To account for survey design, the model adjusted for clustering and included controls for survey stratum and non-response weights. *N*s are unweighted.

** *p* < 0.01.

Table 4
Associations between disability and behavioral problems: estimates from growth curve models (coefficient [SE]).

	Conduct		Hyperactivity		Peer		Emotional	
	Model 2	Model 3						
Age	-1.79** (0.05)	-1.79** (0.05)	-0.91** (0.06)	-0.91** (0.06)	-0.71** (0.04)	-0.71** (0.04)	-0.17** (0.05)	-0.16** (0.05)
Age ²	0.14** (0.00)	0.14** (0.00)	0.08** (0.01)	0.08** (0.01)	0.06** (0.00)	0.06** (0.00)	0.02** (0.00)	0.02** (0.00)
LSLI	0.47** (0.10)	0.29** (0.09)	0.88** (0.14)	0.64** (0.12)	0.58** (0.10)	0.47** (0.10)	0.29** (0.08)	0.16* (0.08)
LSLI * age	-0.01 (0.03)	-0.01 (0.03)	0.06+ (0.03)	0.06+ (0.03)	0.14** (0.03)	0.14** (0.03)	0.14** (0.03)	0.14** (0.03)
Girl	-0.29** (0.03)	-0.12** (0.03)	-0.51** (0.07)	-0.28** (0.06)	-0.19** (0.04)	-0.13** (0.04)	-0.02 (0.04)	0.04 (0.04)
Girl * age ^a	-	-	-0.06** (0.02)	-0.06** (0.02)	0.03* (0.01)	0.03* (0.01)	0.04** (0.01)	0.04** (0.01)
LSLI * girl ^a	-	-	-0.43* (0.20)	-0.36* (0.18)	-0.24+ (0.14)	-0.24* (0.13)	0.18 (0.15)	0.16 (0.14)
LSLI * girl * age ^a	-	-	-	-	-0.09* (0.05)	-0.09* (0.05)	-0.10* (0.05)	-0.11* (0.05)
Child cognitive ability		-0.01** (0.00)		-0.02** (0.00)		-0.01** (0.00)		-0.01** (0.00)
Family in poverty (wave 1)		0.21** (0.06)		0.22** (0.09)		0.17** (0.05)		0.13* (0.06)
Family in poverty (time varying)		0.02 (0.04)		0.00 (0.06)		0.06 (0.04)		0.06 (0.04)
Mother in work (time varying)		-0.05+ (0.03)		-0.07+ (0.04)		-0.08** (0.03)		-0.10** (0.03)
Father's work status (reference category = lone parent family; time varying)								
Father not in work		-0.13+ (0.07)		-0.01 (0.10)		-0.10 (0.06)		-0.06 (0.07)
Father in work		-0.18** (0.05)		-0.13** (0.06)		-0.05 (0.05)		-0.01 (0.05)
Child care (reference category = no non-kin childcare)								
Nursery		-0.13** (0.04)		-0.10 (0.08)		-0.29** (0.04)		-0.10* (0.04)
Childminder		-0.12* (0.06)		-0.10 (0.11)		-0.16* (0.06)		-0.05 (0.05)
Mother's poor mental health		0.11** (0.01)		0.12** (0.01)		0.10** (0.01)		0.14** (0.01)
Home learning environment		-0.01** (0.00)		-0.03** (0.00)		-0.00 (0.00)		-0.00 (0.00)
Harsh discipline		0.12** (0.00)		0.14** (0.01)		0.02** (0.01)		0.03** (0.00)
Extremely close to child		-0.29** (0.04)		-0.26** (0.05)		-0.24** (0.03)		-0.14** (0.04)
Constant	1.62** (0.09)	0.59** (0.16)	2.92** (0.11)	2.84** (0.24)	0.55** (0.07)	1.26** (0.15)	0.79** (0.05)	0.99** (0.15)
N (person waves)	18,939	18,939	18,832	18,832	18,863	18,863	18,899	18,899

Note. Standard errors in parentheses. Random effects coefficients not shown. Models control for wave 1 parental work status, family structure, and parental highest qualification. To account for survey design, the models were adjusted for clustering, included controls for survey stratum, and applied wave 4 non-response weights. The Ns presented are unweighted.

^a Two- and three-way interactions with child sex only retained if the interactions were statistically significant at $p < 0.05$.

+ $p < 0.10$.

* $p < 0.05$.

** $p < 0.01$.

set of family and maternal background characteristics. To clarify the pattern of the trajectories for disabled and non-disabled children, and the scale of the gap between disabled and non-disabled girls and boys, Figs. 1–4 illustrate trajectories derived from the full model estimates, with family and maternal background characteristics set to their mean values.

Fig. 1 illustrates the relatively steep decline in conduct problems over time with a slight upswing one and a half to two years after their entry into school: an inflection point at age 6.4. This pattern was tracked by disabled children but at a higher level. Girls faced lower conduct problems than boys across the early years, but the disability gap for both boys and girls was constant. The gap in conduct problems between girls and boys was smaller than that between disabled and non-disabled children, as the figure makes clear.

For hyperactivity, there was a slight decline over time for non-disabled boys that leveled off somewhat before they reached age 6 (the

inflection point was at age 5.7). As Fig. 2 and Table 4 show, non-disabled girls started from a somewhat lower level of problems and faced a steeper decline, resulting in an increasing gap relative to boys. Disabled boys started with a larger gap compared to disabled girls, than did disabled girls relative to non-disabled girls. Disabled girls tracked the steeper decline exhibited by non-disabled girls, but both disabled girls and boys exhibited a slightly growing gap relative to their non-disabled peers over time (see Fig. 2 and the interaction effects in Table 4). The result is that by age 7, disabled boys had substantially higher rates of hyperactivity than either disabled girls or non-disabled boys, even if not as high in absolute terms as they were prior to school entry.

Non-disabled children's peer problems largely declined over time, though there was a slight upswing as they reached age 6 (the inflection point was 5.9 years; see Table 4 and Fig. 3). By contrast, peer problems for disabled children started increasing by the time of school entry, such that the gaps between disabled and non-disabled children were at their

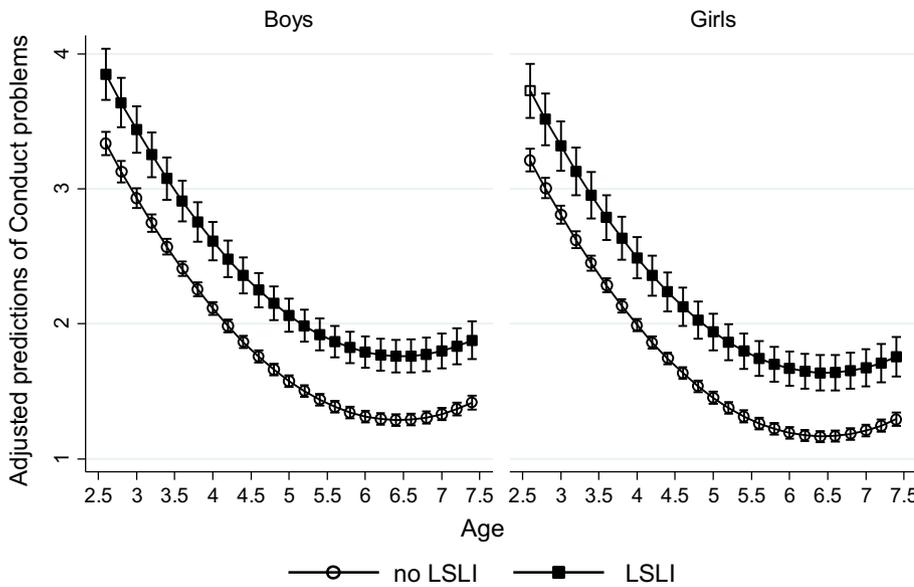


Fig. 1. Predicted conduct problems over ages 2.5–7.5 by sex and disability.
 Note. Estimates from growth curve model (model 3) at mean values of other covariates.

greatest by age 7. The gap between disabled and non-disabled boys was substantially greater than that between disabled and non-disabled girls from the outset, and increased at a faster rate. This left disabled boys experiencing exceptionally high rates of peer problems by age 7.

Emotional problems increased for all children over the school years. Indeed, they had already started increasing prior to school entry (inflection point at 4.3 years). However, they not only started higher, but also increased faster for disabled children (Fig. 4), particularly for disabled boys. Although disabled girls were more at risk of emotional problems than boys at age 3, and experienced a sharper increase over time than non-disabled girls, disabled boys experienced even more of an increase in emotional symptoms so that by age 7 they had the highest levels. This illustrates a pattern of divergence between disabled and non-disabled children that was particularly marked for boys.

3.4. Associations between covariates and behavioral problems at baseline (age 3) and over time

Before we turn to consider the role of parenting practices in shaping behavioral trajectories, we briefly discuss associations between the

individual and family background covariates and behavioral problems at age 3. Overall, the inclusion of the covariates in the full model accounted for only part of the differences in problem behavior between disabled and non-disabled children, even though many were associated with behavior. As expected, maternal poor mental health had a strong positive association with child behavioral difficulties. Socioeconomic characteristics, namely initial poverty status and lone parenthood were associated with greater levels of problems across the domains. Time varying maternal employment was also associated with fewer problem behaviors, net of time varying poverty status, which was itself not significantly associated with problems. Early experience of external child care was associated with fewer behavioral problems at age 3. Finally, children who were more cognitively able at age 3 were less likely to exhibit behavioral problems.

3.5. Parenting and home environment and behavioral problems

We expected that parenting and home learning environment would both be associated with behavioral problems, and that they would also moderate the negative association of disability and specific problem

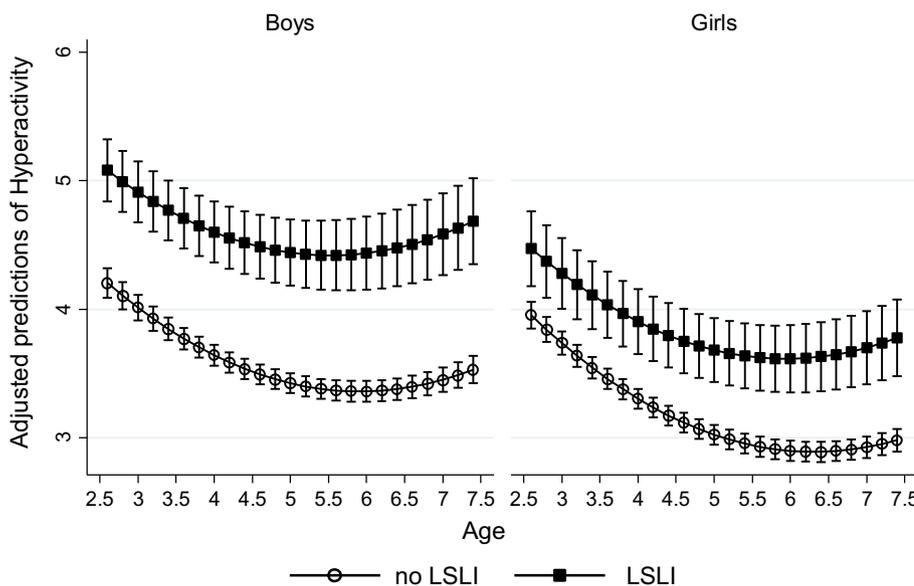
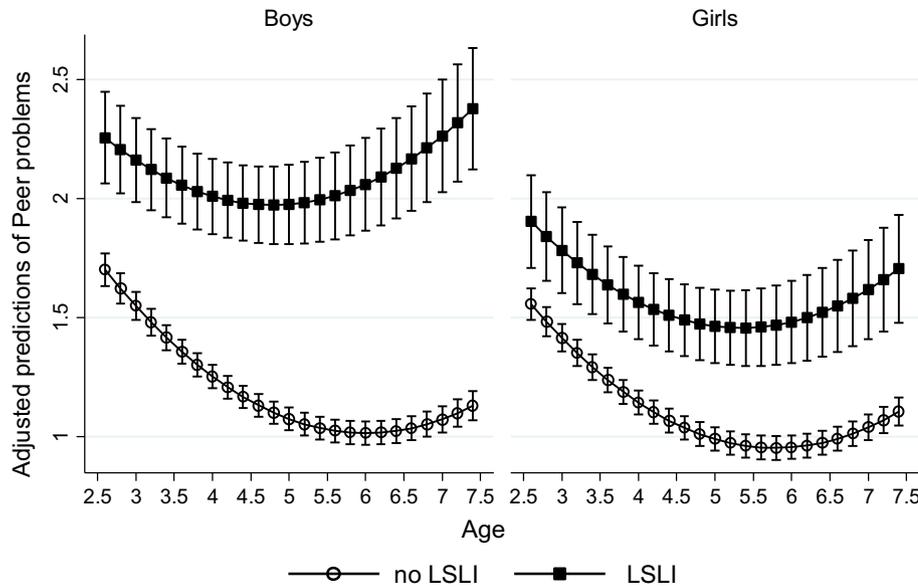


Fig. 2. Predicted hyperactivity problems over ages 2.5–7.5 by sex and disability.
 Note. Estimates from growth curve model (model 3) at mean values of other covariates.

Fig. 3. Predicted peer problems over ages 2.5–7.5 by sex and disability.
Note. Estimates from growth curve model (model 3) at mean values of other covariates.



behaviors. We found that harsh discipline was positively associated with greater levels of all four types of behavioral problems at baseline. Similarly, parental warmth as expressed in their closeness to their child was associated with fewer behavioral problems. Home learning environment was negatively associated with conduct problems and hyperactivity, but not peer or emotional problems. We found no evidence for moderation at age 3 or over time: Estimated interactions between parenting, LSLI, and age were small and did not approach statistical significance.

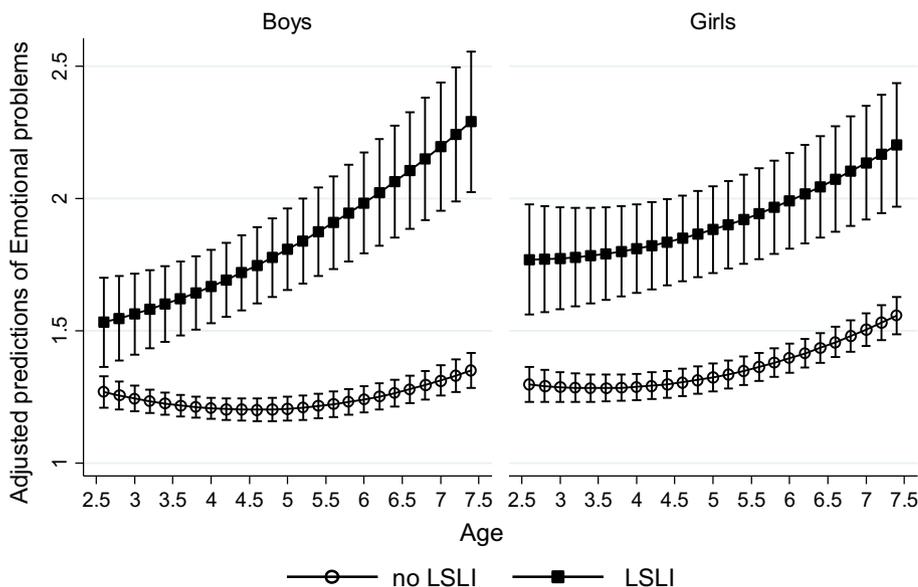
4. Discussion

The early development of problem behaviors can have consequences for children's later outcomes. While most children “grow out” of the problem behaviors that are common in early childhood, others do not, and may show elevated levels over time. Early problem behaviors that do not attenuate give way to later problems, including mental health problems, substance use, and even crime (Caspi, Moffitt, Newman, & Silva, 1996; Fergusson, John Horwood, & Ridder, 2005;

Roza, Hofstra, van der Ende, & Verhulst, 2003). Given that disabled children are at risk of disadvantage in adulthood across a range of domains (Berthoud, 2008; Janus, 2009; Lindstrom, 2011; Loprest & Maag, 2003), it is relevant to ascertain whether these inequities start to develop in the early years and whether their behavioral trajectories in the early school years are the same or different to those of non-disabled children. If disabled children are experiencing higher levels and different trajectories of behavior problems than their peers during this time, it could indicate a critical point for intervention. Our findings provide clear and consistent evidence that in their early preschool years disabled children suffer from more challenging expressions of behavior than their non-disabled peers, and that in the early school years their trajectories diverge rather than converge.

Two points stand out from our findings. First, disabled children (girls and boys) face sharper increases or slower declines in problem behaviors across three out of the four domains compared to non-disabled children: hyperactivity, peer problems, and emotional symptoms. Disabled children demonstrate greater levels of hyperactivity in the early school years, while their peer relationships and emotional health

Fig. 4. Predicted emotional problems over ages 2.5–7.5 by sex and disability.
Note. Estimates from growth curve model (model 3) at mean values of other covariates.



also suffer, perhaps directly linked to their externalizing behaviors. Second, disabled boys are particularly vulnerable to the development of problems over these critical early years, with steadily widening gaps between themselves and their non-disabled peers, as well as with disabled girls, again with the exception of conduct problems. Even in conduct problems where all children exhibited sharp declines over time, disabled children still exhibited higher levels of these potentially serious behavioral problems at the beginning of their school career.

While the higher rates of problems and their increase (or stability) were in line with our expectations for externalizing problems (conduct problems, hyperactivity), our hypotheses were more speculative for internalizing problems (peer problems, emotional symptoms), though we did anticipate that peer relationships would present more of a problem for disabled children as they adjusted to the social environment of school. The size of the effects, the clear escalation for several of the outcomes, and the ways in which disabled boys, in particular, were affected was more surprising. The challenges associated with the expansion of children's developmental ecologies at the time they enter school, where they are in contact with new and potentially demanding or unsympathetic social environments may be exacerbated for disabled children, notably, disabled boys.

Disabled boys exhibited concerning rises in both peer problems and emotional symptoms over time. We anticipated that emotional symptoms would stabilize or increase over time, and perhaps increase most for disabled girls. Less anticipated, however, was the substantial increase for disabled compared with non-disabled children, and for disabled boys even more than disabled girls, perhaps related to the social difficulties they face. Research has found that some disabled children display less competence in social situations than their peers; they interact with peers less frequently and are less well accepted within social circles (Carter & Hughes, 2007). Children often learn social skills through observing and participating in social interactions. If disabled children are not afforded opportunities for social learning, however, they miss out on important developmental inputs that may affect their social competence for years to come. This may be particularly true for boys, since by the time of school entry, boys and girls exhibit different peer group experiences. Boys display denser and more hierarchical social networks with less prosocial behavior and more verbal and physical victimization than girls (Rose & Rudolph, 2006). Just as all boys face greater challenges in adjusting to peers, our findings show how disabled boys are particularly at risk, with disability status contributing to widening the sex gap.

These findings clearly indicate that the early years provide a relevant period for intervention to prevent the escalation and entrenchment of disabled children's behavioral problems that may be consequential for their subsequent development. Disabled boys who are already vulnerable in early socializing environments and developmental settings may benefit, in particular, from practices and contexts that foster easier transitions into school, such as enriched preschool programs that more explicitly focus on developing children's socio-emotional school readiness skills (Bierman et al., 2008; Odom & Wolery, 2003). Social integration activities, such as the formation of structured play groups within inclusive classrooms, and small group prosocial skills training may both facilitate more positive peer interactions for disabled children to ensure they benefit from the natural learning that occurs in day-to-day peer group interactions (Carter & Hughes, 2007; Odom et al., 1999; Ofsted, 2011). Early intervention in supporting young disabled children's emotional resilience and curtailing maladaptive behaviors may be important in preventing the development of more serious mental health problems, and in preventing high levels of school alienation that have been demonstrated for disabled children in their teenage years (McDougall, DeWit, King, Miller, & Killip, 2004).

Our findings point to the ways in which social contexts can “disable” children (Connors & Stalker, 2006), and imply that children's educational plans should incorporate a socio-emotional component.

Successfully transitioning to school requires children to follow the rules and demands of the classroom, consistently navigate increasingly complex peer interactions, and appropriately self-regulate their emotions—actions that have been argued to pose difficulties for disabled children (McIntyre, Blacher, & Baker, 2006). Strong partnerships between families and school personnel could help to ensure behavior management strategies and decisions regarding children's care are consistent (Newman, McEwen, Mackin, & Slowley, 2009; Odom & Wolery, 2003).

We expected that the home environment and parenting might moderate the development of behavioral problems among disabled children. Our findings showed a significant main effect between the home learning environment and children's hyperactive and conduct problems, though it did not moderate the impact of disability. More structured home environments support fewer externalizing problem behaviors, then, but do not seem to protect against peer or emotional problems. While closeness and harsh discipline were implicated in, respectively, lesser and greater levels of all four problem behaviors, we also failed to find any evidence that they moderated the effect of child disability. Nevertheless, given the higher levels of behavior problems among disabled children, the creation of stimulating outlets within the home and the provision of parenting support through early intervention could potentially have payoffs for them. Similarly, since disabled children are more likely to be growing up in poverty, in lone parent families, and with greater levels of maternal ill-health, all of which impact on behavioral problems (even if these do not account for the divergence in behavioral problems between disabled and non-disabled children), economic and maternal mental health support may go some way to preventing disabled children starting out on their differential behavioral pathways in the early years.

Overall, this study demonstrates how disabled children face ongoing difficulties with social relations and ordered social contexts that cannot adequately adapt to or accommodate their impairments (Barkley et al., 2002). The early years during which children learn to regulate their behaviors and adjust to social expectations appear to be differently experienced by disabled children, and particularly by disabled boys. Instead of modifying their behavioral problems, the demands of responding to greater social influences and institutional settings seem to bring emotional costs, and difficulties in behavior and social relations. Home environments may initially shelter children from these external influences, but the early environment alone does not protect against these wider social challenges for disabled children. Our findings on the divergence over the early school years in children's peer and emotional problems, in particular, reflect the ways in which “difference” can be enhanced on primary school entry. One of the routes to these poorer outcomes is the daily separation of disabled children from their peers, illustrating one of the ways in which certain forms of compensatory provision can inadvertently stigmatize disabled children, impacting not only their educational, but also their behavioral development (Webster & Blatchford, 2015). Targeted programs that promote peer inclusion may offer more promising routes for intervention (Holt, 2007).

This implies a better understanding of school effects and the mechanisms driving those effects could be crucial to developing appropriate, “non-disabling” environments. That is, the ability to identify institutional factors, school cultures, and teacher behaviors that are more or less supportive for disabled children and more or less conducive to stabilizing or reducing problem behaviors has the potential to reduce the escalation of these problems. While our data cannot identify positive school cultures nor such institutional practices, future quantitative survey research would benefit from incorporating relevant school-level factors into analyses linking disability to behavioral problems to provide evidence of potential mechanisms and identify contexts for further interrogation. Such further research would facilitate crafting appropriate recommendations for English school systems.

Our study is not without its limitations, including our dependence

on parental (mother's) report of family context, child behavior, child disability, and her own parenting. In particular, relying on mother's report for behavioral problems means we cannot directly link it to their behavior at school. For our measure of closeness we rely on a single item. There was some variation in the reliability of our measures, and internal consistency for peer problems at age 3 was below 0.5, which raises some concerns for the reliability of our results at that age. Our longitudinal analysis was limited to three data collection points across our four-year period of interest, restricting the analytical purchase. Further, our home environment and parenting variables were each available at one wave only, preventing us from exploring whether children's experiences in the home and with their families at particular points in their development affected their behavioral trajectories. Nevertheless, our study represents a contribution to our understanding of young disabled children's behavioral problems. Using a nationally representative sample of children living in England, it provides clear

and consistent evidence that disabled children experience greater behavioral problems in their early years and that these do not dissipate—and, in some cases, increase—over time. Child behavioral difficulties can have far reaching consequences and hence, without appropriate support or intervention, young disabled children may face an accumulation of adverse consequences that serve to compromise their well-being in adolescence and adulthood.

Acknowledgements

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Appendix A

Characteristics at wave 1 of full and analytic samples.

	Full wave 1 sample ($n = 11,533$)	Analytic sample ($n = 6731$)
Mother employed	49.2%	54.6%
Single mother	14.0%	15.5%
Father employed	77.7%	78.5%
Father unemployed	8.3%	6.0%
In poverty	29.6%	25.5%
Child sex (girl)	48.9%	49.5%
Mother's highest qualification		
Degree or higher	43.4%	45.4%
Level 3	15.4%	16.3%
Level 2	25.1%	25.7%
Level 1	7.7%	5.7%
None	8.5%	7.0%

Appendix B

Strengths and Difficulties Questionnaire (SDQ), age 4–17 for coding by parents or teachers.

The table below lists the 25 SDQ items for the five SDQ domains. For all questions, parents are asked to consider the child's behavior over the last six months and state whether the statement is “not true,” “somewhat true,” or “certainly true” of the child.

Behavior domain	Statement
Conduct problems	Often has temper tantrums or hot tempers
	Generally obedient, usually does what adults request (reverse scored)
	Often fights with other children or bullies them
Hyperactivity	Often lies or cheats ^a
	Steals from home, school, or elsewhere ^b
	Restless, overactive, cannot stay still for long
	Constantly fidgeting, or squirming
Peer problems	Easily distracted, concentration wanders
	Thinks things out before acting ^c (reverse coded)
	Sees tasks through to the end, good attention span (reverse coded)
	Rather solitary, tends to play alone
Emotional symptoms	Has at least one good friend (reverse coded)
	Generally liked by other children (reverse coded)
	Picked on or bullied by other children
	Gets on better with adults than with other children
Prosocial scale	Often complains of headaches, stomach-aches, or sickness
	Many worries, often seems worried
	Often unhappy, down-hearted, or tearful
	Nervous or clingy in new situations, easily loses confidence
	Many fears, easily scared
	Considerate of other people's feelings
	Shares readily with other children (treats, toys, pencils, etc.)

Helpful if someone is hurt, upset or feeling ill
Kind to younger children
Often volunteers to help others (parents, teachers, other children)

Note. The prosocial scale is not a problem behavior domain. For the age 2–4 version of the SDQ (used at the MCS age 3 survey) three questions are different, although the scoring remains the same. The following is the wording for these items at age 3: ^aOften argumentative with adults; ^bCan be spiteful to others; ^cCan stop and think things out before acting. See further: <http://www.sdqinfo.com/>

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