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Convergence or divergence? A longitudinal analysis of behaviour problems among disabled and non-disabled children aged 3 to 7 in England

Rebecca Fauth¹, Samantha Parsons² and Lucinda Platt³

Abstract

This study sets out to identify the incidence and development of disabled children's problem behaviours, including conduct, peer, hyperactivity and emotional problems during the early years using the Millennium Cohort Study, a large-scale, nationally representative UK study. We track the behaviour problems from age 3 to 7 to examine the emergence of problems and whether disabled girls' and boys' behaviour converges or diverges from non-disabled children over time. Childhood disability is assessed using three broad measures: developmental delay (DD), long standing limiting illness (LSLI), and special educational needs (SEN) to ascertain the implications of particular constructions of disability. Finally, we examine whether parenting and the home environment moderate any associations between disability and behaviour. Estimating linear growth models, we find that disabled children exhibit more behaviour problems than non-disabled children across disability measures. We find no evidence that trajectories converge for disabled and non-disabled children; rather, children with LSLI and SEN show a greater increase in peer problems, hyperactivity and emotional problems over time. We find little evidence that parenting moderates associations between disability and behaviour. The findings suggest that further in-school support for disabled children may be warranted given persistence in problem behaviour well after school entry.

JEL codes: I3, I24, J13, J14

Keywords: Disabled children, behaviour, Millennium Cohort Study, SDQ, early years, growth curve models

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Introduction

The emergence of problem behaviour during the early years may set children upon unfavourable developmental trajectories. This is particularly true in the case of early externalising behaviour problems (i.e. hyperactivity, aggression), which have been linked to continued behaviour and psychological problems and poor academic achievement (see e.g. Campbell, Shaw and Gilliom 2000; Hinshaw 1992; Jaffee et al. 2002). Past research has shown that disabled children are more likely to present behavioural problems including social and peer problems, conduct problems and oppositional behaviours, attention difficulties and hyperactivity, and internalising problems (e.g. anxious/depressed, withdrawn) and that their problem scores were more likely to be within the clinical range relative to their peers (Alloway et al. 2009; Baker et al. 2003; Eisenhower, Baker and Blacher 2005; Emerson and Einfeld 2010; Landa et al. 2013). We also know that, compared to other children, disabled children are likely to face greater subsequent disadvantage and less favourable outcomes as adults (Burchardt 2004; Janus 2009; Lindstrom 2011).

These findings together suggest that disabled children are at particular risk of developmental challenges, which may compound the barriers they face (Keil, Miller and Cobb 2006), and thus be part of the mechanism by which childhood disability translates into poorer adult outcomes. That is, problematic early behaviour and its impact on disabled children's relationships, learning and subsequent mental health may be a key driver of subsequent disadvantage.

If this is the case, we would expect to see not only greater levels of behaviour problems among disabled children, but also their persistence over time. However, we currently know little about the extent to which the associations between disability and behaviour are linked to children's developmental stage and thus may be 'grown out of' as children enter school and move out of the early years. More explicitly, we lack understanding of the differentiation of normative age-related transient problem behaviours from more serious enduring, or even increasing, problems faced by disabled children. If we are to understand whether and when it is important to intervene to address disabled children's behavioural problems to avoid subsequent detrimental outcomes, it is necessary to explore in depth disabled children's patterns of behaviour over time, in particular whether or not they follow a similar trajectory to those of non-disabled children. This is the first main contribution of this paper.

A further limitation to our current understanding has been the focus on particular impairments or conditions. Findings are also typically based on small-scale, localised studies. Both these factors makes it harder to generalise to disabled children more widely, and to take account of the ways in which social construction of disability is itself linked to the ways in which they present as troubled or with complex behavioural challenges (Keil, Miller and Cobb 2006; Powell 2003b). There are challenges in measuring disability among young children in nationally representative studies (Blackburn, Spencer and Read 2010). Many common proxies for disability in English studies, such as identification with special educational needs (SEN), which has been used extensively for investigating disabled children's educational and cognitive outcomes, may confound the measurement of disability itself with the measurement of problem behaviours (Keil, Miller and Cobb 2006; Keslair and McNally 2009; Marchant and Jones 2010; Powell 2003a). Exploiting multiple measures of disability is therefore likely to provide a more robust understanding of behavioural problems and their associations with child disability. Our second key contribution is therefore utilising three broad measures of disability, measured at different ages, within a nationally representative sample of English children.

Given the significance of parenting in young children's development, it is crucial to investigate the role of parenting and the home environment in young disabled children's lives. Disabled children's behaviour problems may be associated with parenting styles that themselves co-vary with child disability, as well as with the socio-economic disadvantage associated with child disability (Parsons and Platt 2013; Shahtahmasebi et al. 2011). Supportive and enriching experiences in the home may be particularly significant for young disabled children. If this is the case, early parenting support would help mitigate the development of behaviour problems and lessen the likelihood of parents developing negative parenting strategies in reaction to their children's problematic behaviour (see e.g. Dishion et al. 2008). Our third contribution is to investigate the role of parenting and family context in the disabled children's behavioural trajectories.

We bring together research on behaviour problems, on the development of disabled children and on children's early experiences in the home to address the question of whether young disabled children experience diverging or converging behaviour trajectories relative to non-disabled children between the ages of 3 and 7 years old; and whether these are sensitive to the

measure of disability used. We use longitudinal data from the *Millennium Cohort Study* (MCS), a large, nationally representative sample of children growing up in England; and examine four types of social/behavioural outcomes derived from the well-validated Strengths and Difficulties Questionnaire (SDQ) (Goodman 2001), namely conduct problems, peer problems, hyperactivity and emotional problems. We also take account of gender differences in both problem behaviour and disability.

Background

Based on a large body of research examining the development and persistence of behaviour problems in the early years, we know that there are specific trajectories associated with the conduct problems, peer problems, hyperactivity, emotional problems. The preschool and initial school years are the time when most children learn to control early problematic behaviour, particularly in terms of conduct problems (Bongers et al. 2003; Broidy et al. 2003; Campbell, Shaw and Gilliom 2000; Fanti and Henrich 2010; Tremblay et al. 2004). 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, Shaw and Gilliom 2000; Tremblay et al. 2004). Some studies have reported increases in peer problems over time (Bongers et al. 2003), linked to children having more regular contact with peers and more opportunities for socialisation as a result of starting school. Previous studies using the MCS, however, found small declines from 3 to 7 years (Flouri, Midouhas and Joshi 2014). These studies did not identify whether the reported patterns were consistent across disabled and non-disabled children. While some studies have reported increases in children's hyperactivity problems with age (see e.g. Bongers et al. 2003), previous studies using MCS data have found general declines over time (Flouri, Midouhas and Joshi 2014; Midhouhas, Kuang and Flouri 2014). Finally, internalising symptoms, including emotional symptoms, such as anxiety and depression tend to be fairly constant in the early years, particularly for boys (Bongers et al. 2003; Leve, Kim and Pears 2005), although a study using data from the MCS found that children's emotional symptoms increased from 3 to 7 years, with a slight acceleration at age 7 (Midhouhas, Kuang and Flouri 2014).

Studies that have explored the relationship between disability and behaviour in the early years have generally shown that, relative to non-disabled children, disabled children

experience more social/behavioural problems, more serious and clinically significant problems and, if behaviours were examined at multiple timepoints, more persistent problem behaviour (Alloway et al. 2009; Baker et al. 2003; Eisenhower, Baker and Blacher 2005; Emerson and Einfeld 2010; Landa et al. 2013; Midhouhas et al. 2013). These studies, however, are largely based on relatively small, non-representative cross-sectional studies and tend to focus on children with one particular type of disability. Emerson and Einfeld (2010) and Midouhas and colleagues (2013) utilised the MCS, but focused on a specific condition, and Emerson and Einfeld only examined age 3 outcomes.

A potentially important element in understanding the developmental trajectories of young disabled children is the role of parenting and the early home environment. A large body of research has demonstrated that parenting characterised by high levels of warmth, cognitive stimulation and clear limit-setting has been consistently associated with favourable emotional and behavioural outcomes for children, with the opposite findings for parenting characterised by harsh, arbitrary discipline or emotional detachment (Baumrind 1966; Belsky 1999; Berlin and Cassidy 2000; McLoyd 1998; Shonkoff and Phillips 2000). In addition to parenting behaviours, parents can also provide materials and experiences within the home environment, such as reading and other learning activities that promote children's early development, including behavioural outcomes (Cullis and Hansen 2008; Sylva et al. 2008).

These factors not only have a strong influence on social/behavioural outcomes during early years, but they may also vary with child disability. Parents' ability to demonstrate positive parenting behaviours depends, in part, on whether they can recognise and interpret children's behaviour and emotional states. This can be more challenging with disabled children, depending on the nature of their disability (Howe 2006). Further, it has been shown that parents with disabled children have higher levels of stress and more difficulty coping than other parents, and that some of this stress may stem from attendant social/behavioural problems experienced by disabled children (Eisenhower, Baker and Blacher 2005; Hatton et al. 2011; Herring et al. 2006). It has been argued that barriers to services enhance family stress and hence put pressure on the family environment (Dowling and Dolan 2001); and of course, parental stress may further exacerbate children's behaviour (Baker et al. 2003; Pianta and Lothman 1994). Moreover, parents of disabled children may perceive that they do not have the skills, confidence or resources to meet their disabled child's needs within the home environment (DCSF 2010). If parents of disabled children can maintain positive parenting in

the face of their child's challenging behaviour, then the children may benefit (Campbell, Shaw and Gilliom 2000; Gilliom and Shaw 2004). A better understanding of whether favourable parenting behaviours and the provision of stimulating early home environments matter for disabled children's development over the early years will help to inform interventions, in terms of both the timing and possible content of such services.

This paper therefore addresses the following questions:

- a) Are there differences in social/behavioural outcomes for disabled and non-disabled children at age 3?
- b) Accounting for starting levels of social/behavioural problems at age 3, do disabled children experience diverging trajectories of social/behavioural development compared to non-disabled children through the early years (from age 3 to age 7)?
- c) Are the observed patterns of social/behavioural development robust to the inclusion of relevant child and family background factors?
- d) Do the observed patterns of social/behavioural development (both initial scores and change over time) vary by children's sex?
- e) Does growing up in positive and stimulating early home environment moderate the divergence in trajectories between disabled children compared to their non-disabled peers?
- f) Do findings vary depending on the measure of disability used?

Disability is not a clearly defined categorisation. It is socially constructed and can change over time, even when identified as longstanding (Burchardt 2000; Jenkins and Rigg 2004; Oliver 2009). Legal definitions of disability and those used for the provision of services can vary (Lewis et al. 2010), but the fact that children are designated as having needs can be highly relevant for their visibility in social contexts, such as school (Mishna 2003), and for the extent to which they exhibit behaviours that are out of the range of those without disabilities. We therefore selected three measures, both to test the robustness of our findings to different ways of capturing disability and to illuminate different processes that are potentially implied by the different measures. Although each of the measures has strengths and weaknesses in capturing child disability across the early years, and each has slightly different implications in terms of any increased risk of behavioural problems found, taken together they are informative about disabled children's experience.

First we have Developmental Delay (DD), which is a prospective measure, captured when children were 9 months old, which measures whether children have not (yet) reached expected developmental milestones. Given that this measure potentially captures 'delay', we may expect it to result in slower transitions through childhood on a number of fronts, but also some catching up and hence convergence with non-disabled children over time. There is also less likely to be reverse causation between behaviour problems and designation of disability since children's behavioural problems at 3 cannot lead to the identification of delay at 9 months. Children with DD are less likely to live in disadvantaged families and to have lower educational outcomes scores than children defined as disabled by other measures (Parsons and Platt 2013). Nevertheless, their families do tend to become more disadvantaged over time, and they are also more likely to end up designated as SEN than children without DD.

Second, Long-standing Limiting Illness (LSLI) gives us a measure that accords most closely with that enshrined in UK disability legislation (the 1995 Disability Discrimination Act and the Equalities Act 2010). It relates to an impairment or condition which is long term and limits daily activities. The definition has its roots in the social construction of disability (Oliver 1990; Oliver 2009), which regards disability as the ways in which social organisation limits those with an impairment, rather than the impairment itself. The operationalisation of the social model (rather than the medical model which has dominated most extant research) has implications for our understanding of the relationship between disability and behaviour. We can understand 'behavioural' problems as manifestations of the ways in which disability can limit children in the social and emotional sphere and in being able to adapt to social norms. This would link LSLI to behavioural problems and their development over time.

Finally, Special Educational Needs (SEN) is a commonly used and widely researched proxy for child disability (Office for Disability Issues 2011). Those designated as SEN at age 7, and hence as having needs for learning support, may more plausibly end up being so defined as a consequence of behavioural problems, particularly externalising problems that are more disruptive in a classroom context (Keslair and McNally 2009). SEN children may also be those who show increased problems over time or whose problems are revealed by the challenges that confront them in learning once they enter school. If the issue is more behavioural than cognitive, this would help to explain the findings that additional learning support only has a limited impact on educational attainment (Crawford and Vignoles 2010; Keslair, Maurin and McNally 2011). SEN children achieve distinctively lower cognitive

scores than other children, and they are also likely to come from more disadvantaged family backgrounds (Gordon et al. 2000; Parsons and Platt 2013).

Given the existing literature, the disability definitions used, and the four specific problem behaviours addressed, we develop the following hypotheses. We expect that disabled children (DD, LSLI and SEN) will exhibit higher initial levels of **conduct problems** at age 3. Overall, we expect that conduct problems will decrease over the early years; but whereas we expect convergence in scores for children with and without DD, for children with SEN and possibly LSLI, we expect that conduct problems will show less desistance over time. Divergence is likely to occur from around the time of school entry (when children are 4.5 to 5 years of age) and we anticipate that this will be most marked for boys. It is likely that supportive parenting and enriching early home environments will contribute to decreased conduct problems over time for all children, and for disabled children in particular.

Given the ways in which children respond to difference and the fact that schools, in part through the pupils in them, may enhance the potentially disabling environment for children (Baker and Donnelly 2001; Chatzitheochari, Parsons and Platt 2014; Connors and Stalker 2006), we expect children identified as SEN or LSLI to exhibit more **peer problems** at age 3 and show increases over time relative to their non-disabled peers. We expect that differences in peer problems at age 3 between children with early identified DD and children will converge over time. We do not expect peer problems in the early years to be moderated by either child gender or parenting.

Similar to conduct problems, we expect that disabled children (DD, LSLI and SEN) are likely to exhibit more hyperactive problems at age 3 and that **hyperactivity problems** will decrease over time for children with DD. However, we anticipate an increase over time for children identified with SEN and possibly LSLI, keeping in mind that hyperactive behaviours may account, in part, for children being identified as disabled, particularly with SEN. We do not expect that gender or early parenting experiences will moderate these associations.

We expect that disabled children and non-disabled children (DD, LSLI and SEN) will exhibit a similar number of **emotional symptoms** at age 3, but that symptoms will increase over time more for disabled children identified as SEN or LSLI, such that by age 7 children with SEN or LSLI exhibit the greatest number of symptoms relative to other children, particularly for

girls. The trajectories of children with DD will largely mirror those of children without DD. Given the importance of environment for disabled children (Baker and Donnelly 2001) and the stresses for parents in families of disabled children (Dowling and Dolan 2001), we expect that parenting and enriching home environments may be key, and hence attenuate this increase for disabled children.

Methods and data

Data

There is a lack of specialised national studies in the UK that focus both on early childhood and on disability (Blackburn, Spencer and Read 2010). Given our interest in the present study on the early formation and development of behavioural problems among disabled children, we use data from the multi-purpose longitudinal *Millennium Cohort Study* (MCS), a study of approximately 19,000 babies born to families living in the UK between September 2000 and January 2002, who are followed over time (Plewis 2007). Data collection has been carried out at five sweeps when children were 9 months and 3, 5, 7 and 11 years old. In the present study, we use data from the first four sweeps of data collection: from age 9 months in 2001/2 to age 7 in 2007/8. Personal interviews and self-completion questionnaires have been administered to parents, children, teachers and health visitors to collect information on socio-demographic family characteristics; children's cognitive, social, emotional and behavioural development; gender roles; and health and well-being. Importantly for our purposes, as well as the repeated measures of emotional and behavioural development (collected from sweep 2 onwards), MCS includes several measures of disability, as discussed.

Dependent Variables

Our dependent variables are the four 'problem' subsets of the parent-reported Strengths and Difficulties Questionnaire (SDQ). The SDQ is a brief behavioural screening questionnaire for use with 3- to 17-year-olds. It is widely validated cross-nationally and cross-culturally for use in non-clinical settings (Goodman 1997a; Goodman, Meltzer and Bailey 1998), and can be completed by either an adult about the child (when the children are young) or by children themselves (from around 11 years old). All versions of the SDQ include 25 attributes, both positive and negative, comprising five scales (conduct problems, peer relationship problems, hyperactivity/inattention, emotional symptoms and prosocial behaviour) each with five items.

In the MCS, the SDQ was completed by the cohort member's parent when children were 3, 7, 7 and 11 years of age, and by their teacher when they were 7 and 11. In the present study, we use parent-reported behaviour problems at age 3, 5 and 7, focusing on the four scales identifying 'problems' (i.e. excluding prosocial behaviour). Appendix 1 details the individual items in each of the four scales. For each negative attribute, the parent is asked to say whether it is 'not true' (0), 'somewhat true' (1) or 'certainly true' (2) about their child's behaviour, with scores reversed for positive attributes. Scores within each scale are summed, giving a range of 0-10 for each scale, with a higher score representing more problems. Following standard practice (see e.g. Midouhas, Kuang and Flouri 2014), we model the scores as linear outcomes.

Independent Variables

Disability measures

Our key independent variable is an overarching measure of child disability, operationalised using survey data from different sweeps to construct three measures:

1. Mild or more severe developmental delay at 9 months of age.

This was derived from a set of 8 questions included in the first MCS survey that were taken from the Denver Developmental Screening Test. They were used to assess fine and gross motor coordination typical for a 9-month-old child, based on parental report. In addition, five items from an UK adaptation of the MacArthur Communicative Development Inventories (CDI) were used to identify early communicative gestures. The CDI is a checklist of words and gestures assessing the child's development of receptive and productive vocabulary through parental report. An overall score across the 13 variables was constructed, and a child was identified with 'developmental delay' if their total score was either 1 standard deviation above the mean score: 'mild' developmental delay (MDD), or 2 standard deviations above the mean score: 'severe developmental delay (SDD). Since not all the children were aged exactly nine months at the time of the survey, an adjustment for the differential development based on age was included in all analysis.

2. Long-standing limiting illness [LSLI] at 3, 5 or 7 years.

LSLI was identified based on two successive questions that first asked the parent if the child had a longstanding illness; and if so asked if that illness limited their daily activities. This measure approximates to the definition of disability as defined in relevant UK legislation, as discussed above. The two questions fielded were introduced in order to measure disability according to the DDA. Following consultation with the Council for Disabled Children, we

defined a child as disabled if they had an LSLI at one or more of the occasions it was asked between age 3 and age 7. This was on the basis of the well-attested substantial mobility in measures even of long-standing conditions (Burchardt 2003; Jenkins and Rigg 2004), and the recognition that those who ‘move out of’ or ‘move into’ disability are likely to share a common experience of disadvantage with those who are consistently measured as disabled. LSLI may include long-term health conditions, such as type 1 diabetes or asthma; mental health problems; and impairments, such as partial sight.

3. Special Educational Needs (excluding ‘gifted and talented’) and a Statement of Needs at age 7.

We use parent report or teacher report of whether a child had a special educational need at age 7. Special educational needs (SEN) are defined within the school system for those children who need additional support with their learning. Those whose additional learning needs cannot be met within the normal school provision and resources may be assessed for a Statement of Needs, which specifies the additional resources required to support their learning (Statement). SEN may relate to learning difficulties or impairments such as hearing loss, ADHD or dyslexia.

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

Family background characteristics

Income poverty: Poverty is an established predictor of poor cognitive and behavioural outcomes in children (Cullis and Hansen 2008; Gregg, Propper and Washbrook 2007; Kiernan and Mensah 2008; Schoon et al. 2012) and is strongly associated with child and adult disability (Hills et al. 2010; Prime Minister's Strategy Unit 2005). Here we used a longitudinal measure of income poverty that counted that number of sweeps of data collection (range=0-4) that the family's household income was less than 60 per cent that of adjusted median household income. Forty-six per cent (46%) of children had been in poverty at one or more interviews, and 14 per cent at all four interviews.

Lone parenthood: Lone parenthood holds implications for both the economic and cultural resources available to a family (Bradshaw et al. 2005; Bradshaw and Holmes 2008; Gregg, Harkness and Machin 1999). The measure used was, again, longitudinal and captured the number of sweeps (range=0-4) that the child was living in a lone parent household. Twenty

nine per cent (29%) of children had been part of a lone parent household at one or more interviews, and 7% at all four interviews.

Parental education: Parental educational attainment has a strong association with positive outcomes in children (Cullis and Hansen 2008; Jones, Gutman and Platt 2013; Midouhas, Kuang and Flouri 2014; Sullivan, Ketende and Joshi 2013). Our measure of parental education recorded the highest qualification held by a parent living in the household when the child was 9 months old (sweep one). Qualifications were grouped according to the national qualification framework levels, and were rated on 5-point scale, ranging from no qualifications (10% of families) to NVQ4 or 5, which equates to having a first degree or higher (43% of families).

Maternal mental well-being: Poor mental well-being holds implications for how a parent responds and interacts with a child and thus is linked to children's behaviour (Cullis and Hansen 2008; Katz et al. 2007; Kiernan and Mensah 2009). Previous research suggests that it may be particularly relevant for mothers of disabled children (Eisenhower, Baker and Blacher 2005). We used the Malaise score (Rutter, Tizard and Whitmore 1970), measured at the first sweep to capture maternal mental health prior to the measurement of child behaviour.

Mother's malaise score ranged from 0-9, with a mean of 1.63

Child characteristics

Age: Child's age was central to the measurement of development of social/behavioural problem trajectories over time. In order to assess the initial differences in behavioural problems among disabled and non-disabled children we measured age in fractions of years centred at age 3 (i.e. those aged exactly 3 at the first measurement point took the value of 0). We also included a quadratic age term to measure non-linearity in the development of behaviour over time. This was based on the actual age measure to avoid co-linearity with the centred age variable.

Sex: Child's sex was included in all models, and was additionally interacted with disability and age to isolate any differences in disability trajectories between boys and girls.

Cognitive ability: Given that there is some relationship between cognitive ability and behaviour among children of all ages (Flouri, Midouhas and Joshi 2014; Hinshaw 1992) and that cognitive scores for disabled children are, on average, considerably lower than those for non-disabled children, we included a control for children's cognitive ability at age 3, namely

the child's score in the British Ability Scale Naming Vocabulary assessment (Elliott, 1996). In this assessment a child is shown a series of pictures of objects and is asked to name them, measuring their Expressive Verbal Ability. For further details on assessments used in MCS see Connelly (2013). Children's cognitive scores ranged from 10-141, with a mean of 74.4.

Parent-child relationship

Home learning environment: Research has documented links between parents' provision of stimulating early home learning environments and children's outcomes, most notably in the cognitive domain (CPMO Research Team, 2006; Cullis and Hansen, 2008), and less frequently with children's externalising behaviour (Kiernan and Huerta 2008). The home context, including support for learning, may mitigate the development of behavioural problems associated with disability and which otherwise may be exacerbated once children are in school. The home learning environment scale used here, when the child was age 3, measures how often the parent reads to a child, teaches them letters, numbers, takes them to a library and sings songs, among other activities. For further details on the items and scoring see (de la Rochebrochard 2012). Scores range between 0-42, with a mean of 25.6.

Closeness: Warm parent-child relationships and secure attachments have been associated with positive outcomes among children including adapting to new situations, self-control, task persistence and prosocial behaviour (Karen 1994; O'Connor and Scott 2007). A study using the MCS data has reported links between parent-child closeness and children's behaviour at age 3 (Kiernan and Huerta 2008). We used a measure of parent's self-evaluated closeness to the child measured at age 5, contrasting 'extremely close' (70 per cent) with all other responses.

Discipline practices: While establishing rules and regularity of routines can be beneficial for child well-being (Chan and Koo 2011) and educational outcomes (Kelly, Kelly and Sacker 2013), harsh and arbitrary discipline is significantly linked to behaviour problems (Jones, Gutman and Platt 2013), particularly externalising problems (Kiernan and Huerta 2008). When under stress, parents may be more likely to use more severe discipline techniques (McLoyd 1990). Discipline in the home was captured at sweep 3 (age 5). The *Discipline Practice* items come from Murray Straus's Conflict Tactics Scale (Straus & Hamby, 1997), and it measures physical and psychological maltreatment of children (for further information see Kaufman-Kantor & Jasinski, 1997). Here, the scale adds the number of discipline measures used by the parent together with how frequently they are used. For further details of the individual items see Johnson (2012). Scores range from 7-34, with a mean of 17.9.

Since we measured both closeness and discipline practices at age 5, it is possible that some part of any association of these parenting behaviours with parenting and any heightened association between age 3 and 5 will capture parental response to children's behavioural problems. However, there is no reason to expect that such a feedback association would differ between parents of disabled and non-disabled children.

Table 1 provides descriptive statistics of all variables across the sample for each child. The number of children in the analytic sample varies slightly with disability measure used (from 6,371 for LSLI to 6,359 for SEN and 6,338 for DD). Table 1 additionally provides descriptive statistics for behavioural problem scores at the first point behaviour was measured, that is sweep 2, when the children were aged around 3. Table 1 illustrates how both initial problem scores and child and family characteristics differ between disabled and non-disabled children.

Table 1: Descriptive statistics of family and child characteristics by disability status, column % / mean values

	All	No DD	MDD	SDD	No LSLI	LSLI	No SEN	SEN	Statement
SDQ Scores									
Mean emotional score, sweep 2	1.31	1.28	1.42	1.70	1.27	1.64	1.26	1.53	1.55
(standard error)	(.02)	(.02)	(.07)	(.15)	(.02)	(.06)	(.02)	(.05)	(.13)
Mean hyperactivity score, sweep 2	3.91	3.86	4.26	4.50	3.84	4.53	3.74	4.62	5.46
(standard error)	(.04)	(.04)	(.10)	(.26)	(.04)	(.11)	(.04)	(.10)	(.19)
Mean peer score, sweep 2	1.50	1.46	1.73	1.90	1.45	1.98	1.43	1.72	2.37
(standard error)	(.02)	(.02)	(.07)	(.15)	(.02)	(.08)	(.02)	(.06)	(.15)
Mean conduct score, sweep 2	2.82	2.80	3.01	2.98	2.77	3.27	2.69	3.43	3.70
(standard error)	(.04)	(.04)	(.10)	(.20)	(.04)	(.10)	(.04)	(.08)	(.18)
Child characteristics									
Female	49.5%	50.7%	41.0%	36.9%	50.3%	42.5%	52.3%	37.5%	27.4%
Mean age at sweep 2	3.12	3.12	3.12	3.12	3.11	3.14	3.12	3.13	3.12
(standard error)	(.00)	(.00)	(.01)	(.02)	(.00)	(.01)	(.00)	(.01)	(.01)
Mean BAS naming vocabulary score (S2)	74.4	75.02	70.98	66.18	74.84	70.85	76.09	67.86	59.69
(standard error)	(.34)	(.35)	(.775)	(1.99)	(.35)	(.86)	(.35)	(.65)	(1.26)
Family characteristics									
<i>Education at sweep 1</i>									
Degree or higher	45.4%	45.1%	47.0%	46.7%	46.9%	40.4%	47.8%	34.7%	28.7%
NVQ3 (A Levels)	16.3%	16.4%	16.2%	16.0%	16.6%	13.9%	16.4%	15.8%	18.2%
NVQ2 (O Levels)	25.7%	25.9%	24.4%	23.3%	25.3%	28.7%	24.6%	32.1%	27.9%
NVQ1 (Level 1/CSE)	5.7%	5.6%	6.4%	6.3%	5.6%	6.5%	5.1%	7.9%	9.5%
No qualifications	7.0%	7.1%	6.0%	7.8%	6.6%	10.5%	6.1%	9.6%	15.8%
<i>Household type</i>									
No. of times lone parent (0-4)	0.65	0.64	0.71	0.73	0.62	0.90	0.61	0.85	0.87
(standard error)	(.02)	(.02)	(.07)	(.13)	(.02)	(.07)	(.02)	(.06)	(.11)
No. of times in poverty (0-4)	1.00	1.00	1.09	1.06	0.97	1.40	0.92	1.39	1.73
(standard error)	(.04)	(.04)	(.07)	(.12)	(.04)	(.07)	(.04)	(.07)	(.12)
Mean mother Malaise score, sweep 1	1.60	1.57	1.76	1.97	1.55	2.04	1.53	1.85	2.15
(standard error)	(.03)	(.03)	(.08)	(.16)	(.03)	(.08)	(.03)	(.06)	(.12)
Mean discipline score, sweep 3	17.88	17.83	18.36	17.71	17.84	18.27	17.74	18.53	18.94
(standard error)	(.06)	(.07)	(.19)	(.34)	(.17)	(.17)	(.07)	(.15)	(.33)
Home learning environment, sweep 2	26.08	26.31	24.57	23.80	26.05	26.35	26.47	24.46	22.89
(standard error)	(.18)	(.19)	(.36)	(.62)	(.18)	(.41)	(.18)	(.34)	(.61)
'Extremely' close with child, sweep 3	69.8%	69.9%	68.4%	69.0%	69.5%	72.5%	70.6%	68.0%	60.8%
<i>N(100%)</i>	6371	5588	618	132	5744	627	5380	781	198

	(100%)	(88%)	(10%)	(2%)	(90%)	(10%)	(85%)	(12%)	(3%)
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Note: Values are group percentages except where indicated as mean and standard error. All statistics are adjusted to take account of sample design and attrition.

Analytic sample and exclusions

This research is part of a wider study focusing on disabled children and young people in England, and thus is restricted to families living in England. At wave 1 of the MCS, 11,533 families lived in England. Of these families, 7,387 (63%) took part in all of the first four waves of data collection, which was a precondition of our analysis. Missing information on disability status, behaviour and family and child characteristics reduced the analytic sample further to 6,371. This was largely driven by higher non-response on the self-completion element of the main instrument, which covered key measures, such as the SDQ itself, as well as parenting behaviours and maternal mental health. The rates of disability within the analytic sample (which differed little from those in the full four-wave sample) ranged from 12 per cent DD (10% mild and 2% severe DD) to 10 per cent LSLI to 15 per cent SEN (12% without a statement and 3% with a statement). When inspecting coverage, we found that families with children with DD at 9 months (sweep 1) or a LSLI at age 3 (sweep 2) were as likely to have been continuously involved in MCS as families with children with no disability. ‘Drop-out’ of the study is associated with measures of family socio-economic disadvantage but not childhood disability. Clearly we cannot identify if those subsequently identified with SEN were more likely to attrit, but the evidence from the DD and LSLI measures provide reassurance about the inclusiveness of our sample. The MCS therefore provides a balanced resource for studying the opportunities and challenges met by young disabled children as they develop over time. Each child contributes three observations to the analysis. All analyses were adjusted for the complex survey design of the MCS and non-response (Plewis 2007).

Analytic strategy

In order to assess whether disabled and non-disabled children experience different social/behavioural outcomes, in terms of both average outcomes and change over time from 3 to 7 years, we estimated linear growth models (Rabe-Hesketh and Skrondal 2012; Singer and Willett 2003). This analytic technique capitalises on the repeated measures of social/behavioural outcomes measured at three time points, around the ages of 3, 5 and 7 to examine whether disabled and non-disabled children start off with similar or different social/behavioural outcomes scores at age 3, and whether disability status is associated with differential changes in social/behavioural outcomes scores over the early years, all while controlling for potentially confounding family and child characteristics. We further examine

whether parenting and the home learning environment moderate associations between disability and children's social/behavioural problems over the early years.

In the present study, Level 1 represents within-child change in social/behavioural problems from 3 to 7 years, and Level 2, the between-child variation in the expected mean of children's social/behavioural problems at age 3 (random intercept) and linear change from 3 to 7 years (random slope). We included a fixed quadratic on age to account for the curved shape of children's average trajectories. With only three time points of data, we were unable to model the random quadratic slope.

The composite model can be written as follows:

(1)

$$SDQ_{ij} = (\beta_{00} + \beta_{10}AGE_{ij} + \beta_{20}AGE_{ij}^2 + \beta_{01}disability\ status_i + \beta_{11}disability\ status_i \times AGE_{ij} + \beta_{02-x}child\ and\ family\ background\ characteristics\ and\ parent-child\ relationship\ variables_i) + (u_{0i} + u_{1i}AGE_{ij} + e_{ij})$$

The components in the first set of brackets represent the fixed effects part of the model, and the components in the second set of brackets represent the random intercept and linear slope for each child. For these models, the age variable represents the ages of the child when social/behavioural problems are reported, centred at age 3. We adjusted for survey design by including controls for original stratum (Plewis 2007) and the combined sampling and attrition weights for sweep 4 (Hansen et al. 2014).

In subsequent models, we added two- and three-way interactions between age, disability status and gender in the fixed effects component to assess whether the associations between disability status and change over time in social/behavioural outcomes varied for boys and girls. Similarly, we tested 3-way interactions between age, disability status and the parent-child relationship variables in the final models to explore whether the links between disability and change over time in social/behavioural outcomes was moderated by children's early experiences in the home.

The linear growth models were estimated separately for each of the four social/behavioural problems measures and each of the three disability groups, giving a total of 12 sets of nested

models. Each of the 12 sets of models was estimated sequentially. First, we estimated an unconditional model with only age, age squared and the random intercept and slope. Second, we estimated a model with only disability and sex as predictors as well as the two-way interaction between age and disability. Third, we incorporated the full set of family, and parenting characteristics as covariates. Fourth, we included the two- and three-way interaction between age, disability and child's sex. In the fifth and final set of models, we retained the statistically significant two- and three-way sex-disability-age interactions, and included further three-way interactions between each of the key parent-child relationship variables, disability and age. The series of models is illustrated schematically in Table 2, alongside the research questions (listed above) that they address and the related hypotheses.

Table 2: Estimation strategy and hypotheses

Model number	Variables	Research question addressed	Hypotheses
1	Age (centred at 3), age squared		
2	1 + child sex + disability + disability*age	(a) (b)	Clear associations between LSLI and SEN with problems, and divergence over time. Higher rate of problem behaviours for those with DD but convergence over time.
3	2 + child cognitive scores + family + parenting	(c)	Socio-economic disadvantage and parenting are linked to problem behaviours. Family background and parenting mediate some of the association with disability, but not all.
4	3 + sex*disability +sex*age+ sex*disability*age	(d)	Higher rates of conduct problems for boys and greater persistence over time. This will be greater for SEN and possibly LSLI boys. Higher rates of emotional problems for girls and greater increase over time. Greater again for LSLI girls.
5	4 + parenting*age + disability*parenting +parenting*disability*age	(e)	Positive parenting and home environments are particularly salient for disabled children (moderators) and reduce the divergence between disabled and non-disabled children's outcomes over time.

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

Given the large number of models estimated, we provide in the next section only the full results from the initial, unconditional, model followed by a summary of results from the remaining models. In order to illustrate the key results, we plotted figures of behavioural problems by disability status and sex, using estimates from the full models (4). These figures clearly demonstrate the levels and development of the four problem behaviours and their variation by disability status over time.

Results

Table 3 shows that, in line with previous results, conduct, peer, and hyperactive problem behaviours tended to decrease with age from around age 3, but with a small reversal towards age 7, as illustrated by the positive value for age squared. For emotional problems there was a slow increase that accelerated over time, since the negative coefficient on age is swiftly compensated for by the relatively large positive coefficient on age squared. Table 3 illustrates in the random effects parameters that in this baseline model there was substantial within-child variation both in starting points and in patterns of problem development over time.

Table 3: Base model of development of problems

	Conduct	Peer	Hyperactivity	Emotional
<i>Fixed effects parameters</i>				
Age	-1.792** (0.0525)	-0.695** (0.0390)	-0.936** (0.0593)	-0.140** (0.0460)
Age squared	0.139** (0.00474)	0.0597** (0.00371)	0.0771** (0.00556)	0.0182** (0.00448)
Survey stratum	0.321** (0.0411)	0.373** (0.0326)	0.395** (0.0560)	0.251** (0.0295)
Constant	1.222** (0.0715)	0.481** (0.0646)	2.711** (0.104)	0.797** (0.0536)
<i>Random effects parameters</i>				
Intercept variance	-1.205** (0.0290)	-1.338** (0.0400)	-1.058** (0.0380)	-1.516** (0.0624)
Variance of slope (age)	0.507** (0.0160)	0.109** (0.0203)	0.627** (0.0138)	-0.119** (0.0361)
Intercept slope covariance	-0.941** (0.0378)	-0.468** (0.0346)	-0.211** (0.0289)	0.0920 (0.0796)
Residual variance	0.0310* (0.0150)	-0.00177 (0.0165)	0.311** (0.0120)	0.0969** (0.0159)
<i>N</i>	18939	18863	18832	18899

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$

Table 4 summarizes the results for the subsequent models for each type of problem behaviour and for each type of disability measure. Tables of the full models (4) and the key parameters from the parenting interactions (5) are provided in Appendix 2. We discuss the results relating to disability (questions a, b and c), sex differences (question d) and the potential role of parenting (question e) in turn. For SEN and DD there are two measures of disability that distinguish differing levels of severity: less (MDD and SEN) and more (SDD and Statement). Hence there are coefficients and interactions for each of these. For LSLI there is only one measure. In the table, a plus sign (+) indicates a positive and statistically significant ($p < 0.05$) relationship with the problem behaviour under consideration and a minus sign (-) represents a negative and statistically significant relationship. A blank cell indicates the absence of a statistically significant relationship.

Before turning to the key variables of interest, we should note that we found that the other covariates largely operated in the expected direction in our models, thus helping to account for some of the differences in problem behaviour between disabled and non-disabled children. Specifically, poverty, mother's poor mental well-being, lower educational qualifications and harsh discipline were positively associated with all four problem behaviours and in each of the three disability models. Conversely, parent-child closeness and child cognitive ability were associated with fewer problems across all four behaviour types. Lone parenthood was linked to higher levels of conduct and hyperactivity problems, but not emotional or peer problems.

Disability

Turning to Table 4, in the top panel we see the summary model results for our main variable of interest, disability status. When only the growth parameters (age and age-squared), sex and the random intercept for the child and random slope for age are included, disability tends to be positively (and relatively strongly) associated with levels of problem behaviour at age 3. The only exceptions are MDD for conduct and emotional problems. These findings were largely in line with our hypotheses, although it was surprising that by age 3 disabled children already exhibit more emotional symptoms than non-disabled children. These findings provide clear and consistent evidence that in their early preschool years disabled children do suffer from more challenging expressions of behaviour, and that this is the case for our prospective measure of SDD, as well as for LSLI and for those subsequently identified as SEN.

When we look at changes in problem behaviour over time, we see that disabled children exhibit a divergent trajectory from the 'average' child, showing increases over time in peer problems, hyperactivity and emotional problems, but not for conduct problems. This pattern of findings aligns with our original hypotheses. However, these results are limited to the measures of LSLI and SEN/Statement. In line with our expectation, children with DD do not diverge from other children but neither do they converge, as we had anticipated for some behaviours, in accordance with the expectation of 'delayed' development, since we do not see a significant negative interaction between DD status and age.

Table 4: Summary of Model Results

Model	Variable	CONDUCT			PEER			HYPER			EMOTIONAL			
		SE N	LSL I	D D	SE N	LSL I	D D	SE N	LSL I	D D	SE N	LSL I	D D	
Disability														
Model 2 (only sex and sample design)	SEN/LSLI/MDD	+	+		+	+	+	+	+	+	+	+		
	STATEMENT/SDD	+		+	+		+		+		+		+	
	SEN/LSLI/MDD x age				+	+		+	+		+	+		
	Statement/SDD x age				+			+			+			
Model 3 Full controls	SEN/LSLI/MDD	+	+			+	+	+	+			+		
	STATEMENT/SDD	+			+		+	+					+	
	SEN/LSLI/MDD x age				+	+		+	+		+	+		
	Statement/SDD x age				+			+			+			
Gender differences														
Model 4 inter- action of sex with disability	Girl main effect	-	-	-	-	-	-	-	-	-	-	+		+
	Girl x age				+	+		-	-	-	+	+	+	
	SEN/LSLI/MDD x girl					-								
	Statement/SDD x girl													
	SEN/LSLI/MDD x girl x age					-						-		
	Statement/SDD x girl x age							-						
Moderating role of parenting?														
Model 5, HLE inter- actions	HLE main effect	-	-	-				-	-	-				
	HLE*age		+	-										
	HLE* SEN/LSLI/MDD													
	HLE*Statement/SDD													
	HLE* SEN/LSLI/MDD*age												-	
	HLSE*Statement/SDD* age													
Model 5, Discipline inter- actions	Discipline main effect	+	+	+	+	+	+	+	+	+	+	+	+	
	Discipline*age	-	-	-			+	+	+	+	+	+	+	
	Discipline* SEN/LSLI/MDD	+				+								
	Discipline*Statement/S DD													
	Discipline* SEN/LSLI/MDD*age													
	Discipline*Statement/ SDD*age	+									+			
Model 5, Closeness inter- actions	Closeness main effect	-	-	-	-	-	-	-	-	-	-	-	-	
	Closeness*age	+	+	+										
	Closeness* SEN/LSLI/MDD	-												
	Closeness*Statement /SDD													
	Closeness* SEN/LSLI/MDD*age	+												
	Closeness*Statement/ SDD*age	-											+	

We also see that many of these relationships are robust to the inclusion of the full set of control variables. In the case of SDD for conduct problems; SEN, MDD and SDD for peer problems; and SEN and Statement for emotional problems, family and individual characteristics that are associated with both disability and behaviour (such as poverty, family structure, cognitive ability and home environment) mediate the effects of disability in these instances, attenuating the associations between the disability measure and the problem behaviour to non-significance. However, the differences in trajectories remain. The nature and scale of some of these divergent trajectories can best be illustrated by plotting them by disability status, incorporating the controls for family background. This also reveals the overall shape of average trajectories shown in Table 3, which approximate to those illustrated for non-disabled children.

Figure 1 illustrates the relatively steep decline in conduct problems over time with a slight upswing at about 6 years of age, and how the pattern is echoed at a higher level for those with LSLI, as it is also for SEN and Statement. For peer problems, while non-disabled children's problems largely declined over time (with a small upturn at ages 6-7), peer problems for children with LSLI and SEN started increasing by the time of school entry and increased at a faster rate over time, such that the gaps between disabled and non-disabled children were furthest apart by age 7, as we can see in Figures 2a and 2b. For hyperactivity, we see a slight decline for non-disabled children that levels off by about 5.5 years, with a very slight upward trajectory. Children with LSLI exhibit a similar pattern to their non-disabled peers, but showed a greater increase at 5.5 years. Children with SEN statement exhibited a fairly stable, but not particularly steep, increase in hyperactive problems over time (Figure 3). Emotional problems increased for all children over time. However, they not only started higher but increased faster for SEN (Figure 4b) and LSLI children, while they remained on a similar track but at a higher level for DD children (Figure 4a). We next come to the gender differences, illustrated in these figures.

Figure 1: Predicted conduct problems over ages 2.5-7.5 by sex and LSLI status

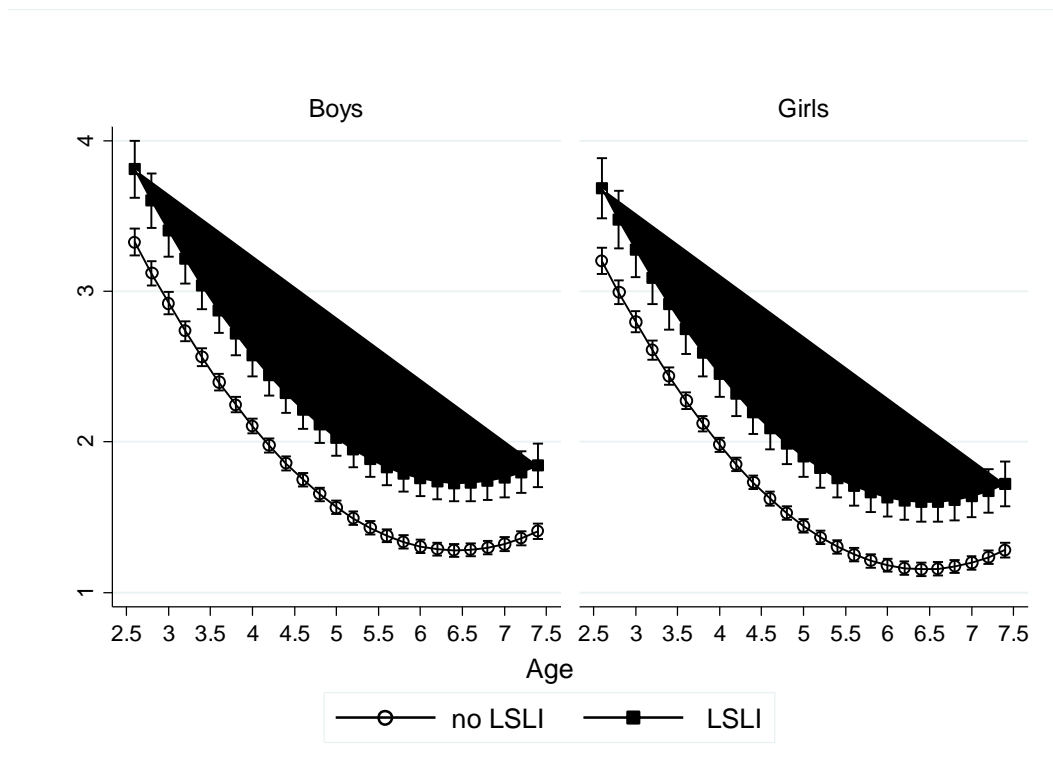


Figure 2a: Predicted peer problems over ages 2.5-7.5 by sex and LSLI status

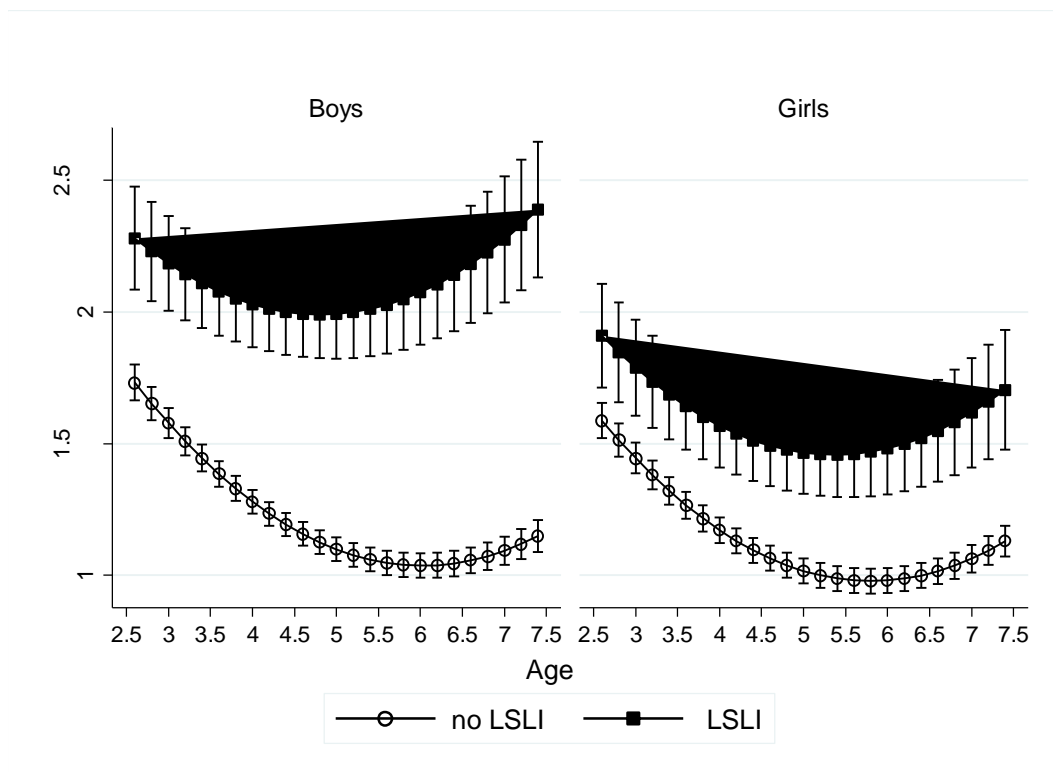


Figure 2b: Predicted peer problems over ages 2.5-7.5 by sex and SEN status

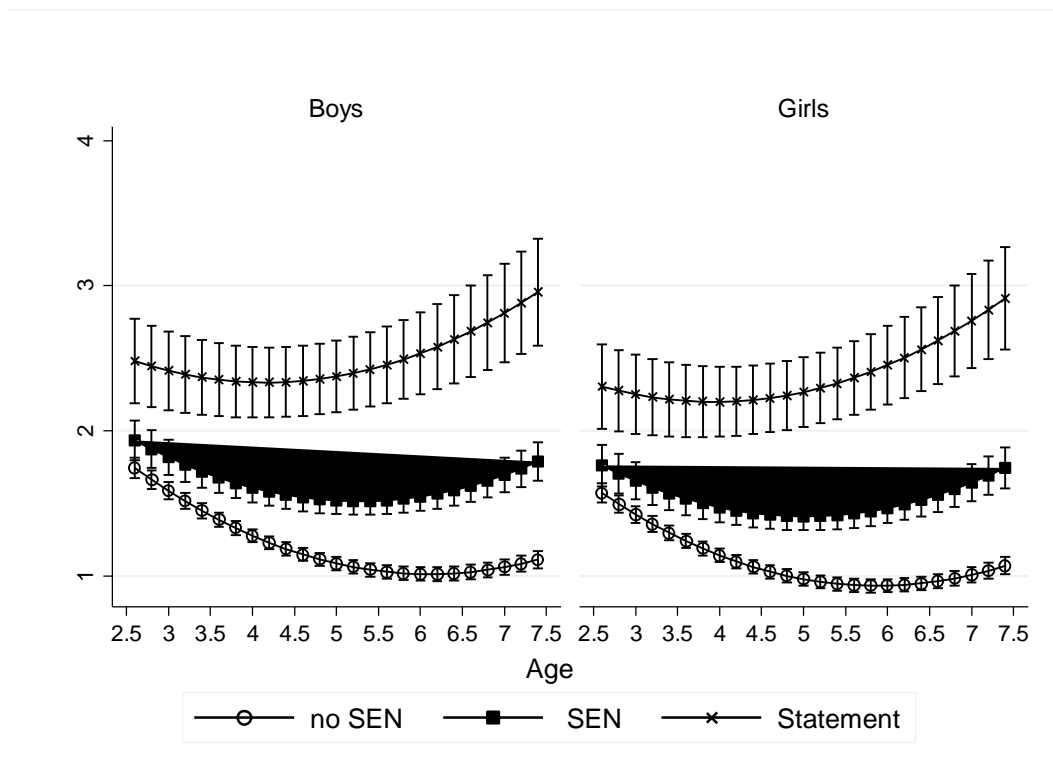


Figure 3: Predicted hyperactivity problems over ages 2.5-7.5 by sex and SEN status

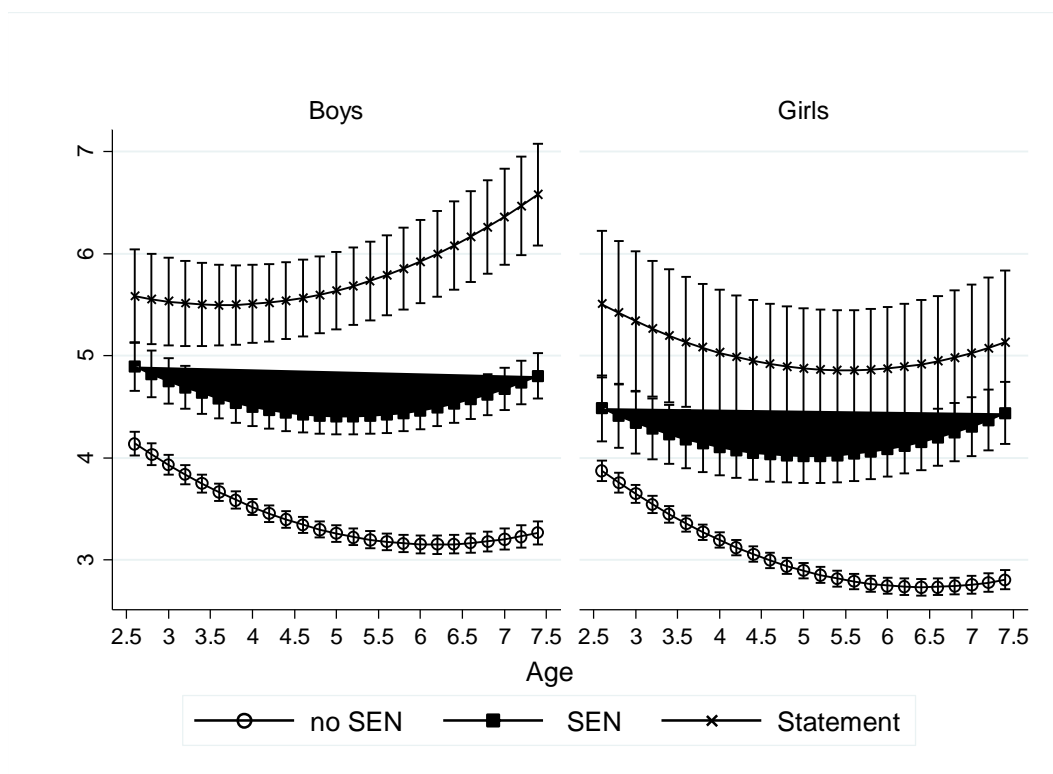


Figure 4a: Predicted emotional problems over ages 2.5-7.5 by sex and DD status

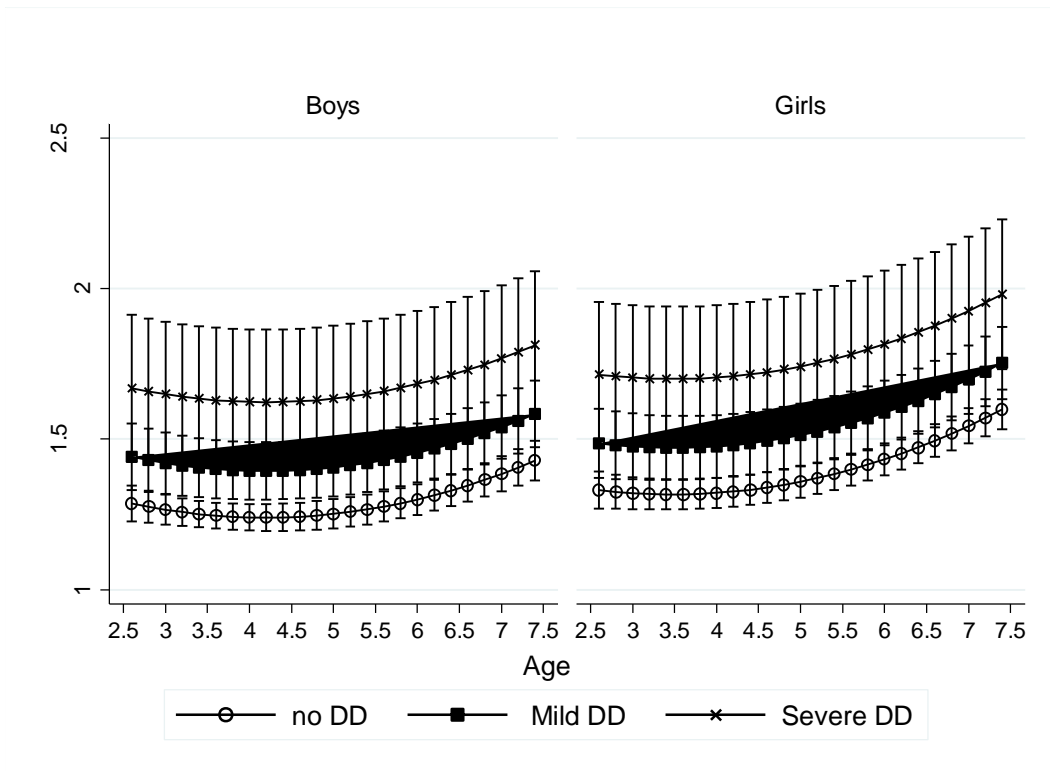
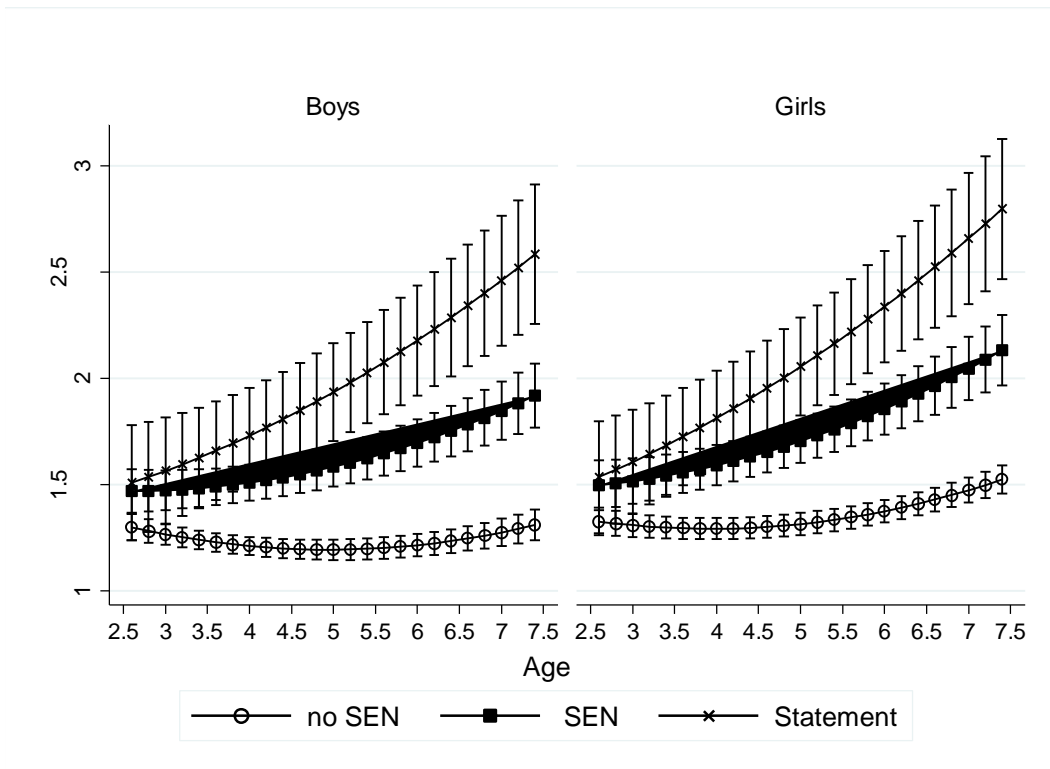


Figure 4b: Predicted emotional problems over ages 2.5-7.5 by sex and SEN status



Sex differences

Turning to the second panel of Table 4, overall girls face lower levels of peer, conduct and hyperactivity behavioural problems across the early years than boys (see also the “no disability” lines in Figures 1-3). They are more at risk of emotional problems, however, and experience more of an increase in these over time, so that by age 7 there is divergence between boys and girls (Figure 4a). We can, nevertheless see from Figure 4b that the differences between non-disabled boys and girls are dwarfed by the differences between children with and without SEN. Non-disabled girls start with lower rates of hyperactivity and experience declines relative to boys over time, resulting in divergence by age 7 (Figure 3). On the other hand, non-disabled girls’ peer problems declined less over time than boys, resulting in convergence between boys and girls by age 7 (Figure 2a).

Table 4 then summarises how sex interacts with disability. We see that boys with LSLI face considerably higher peer problems than girls with LSLI at age 3. The differences between disabled and non-disabled children is much greater for boys than for girls, and this divergence between disabled and non-disabled boys grows more over time than it does for girls. We can see this pattern clearly in Figure 2a. Girls with a Statement face a compensating decline in hyperactivity problems, balancing out the main interaction between Statement and hyperactivity over time. This can be seen in Figure 3, where the upward trajectory for Statement is only found for boys. Nevertheless, both girls with Statement/SEN and boys with SEN experience a fairly flat distribution of hyperactivity, resulting still in divergence; this contrasts with LSLI where the overall trend for hyperactivity is downwards even if to a lesser degree than for non-disabled children.

Parenting as a moderator of trajectories and/ or disability effects

Finally, we turn to the bottom panel of Table 4 to look at parenting measures. It is clear that parenting matters, with harsh discipline being consistently associated with higher levels of problem behaviours, and parent-child closeness being linked to lower rates of problem behaviours. However, in general the effect for closeness effect tends to be strongest in the early years and to either have a steady influence or, for conduct disorder, dissipate with time. By contrast, harsh discipline exerts an even stronger effect on children’s emotional problems and hyperactivity as they get older. This may be partly linked to the fact that it was measured at sweep 3 (age 5), but still implies some enduring effect.

In relation to how this relates to disability status, contrary to our expectations we see very little evidence of parenting moderating the relationship between disability and problem behaviours, either at age 3 or over time. Harsh discipline does however seem to exacerbate (or be associated with, since cause and effect are not easily distinguishable) conduct problems for those with SEN and peer problems for those with LSLI. Where there are significant 3-way interactions these tend simply to counteract the 2-way interaction, hence implying a steady relationship rather than a moderating effect. Hence we would conclude that parenting matters for the reduction in behaviour problems – for which disabled children are more at risk – but it does not have much role in modifying the specific trajectories of problem behaviours associated with disability.

Summary and conclusions

The early development of problem behaviours can have consequences for children's later childhood and adult outcomes. While most children 'grow out' of the sorts of problem behaviours that are relatively common in early childhood, others do not, and may even show elevated levels of problems over time. It is for these children, who do not exhibit desistance of problem behaviour in childhood, that subsequent outcomes into adolescence and even adulthood may be an issue. Given that disabled children are at risk of disadvantage in adulthood on a range of outcomes, educational (Department for Children Schools and Families 2010; Loprest and Maag 2003), economic (Aston et al. 2005; Berthoud 2008) and social (Janus 2009), it is relevant to ascertain whether disabled children experience higher levels and different trajectories of behaviour problems in their early childhood. If so, this could indicate a critical – but also potentially modifiable – pathway to subsequent structural inequalities linked to disability. This was the motivation for our study, and here we reflect on our key findings for each of the problem behaviours in turn.

In line with our expectations, we found that disabled children exhibited more conduct problems at age 3 relative to non-disabled children, regardless of the measure. While disabled children's development of conduct problems during the early years tracked those of other children, they did not exhibit significant declines over time. Thus, disabled children consistently displayed more conduct problems through to age 7 than their peers.

Disabled children had a higher initial rate of peer problems, and for children with LSLI and SEN, peer problems increased over time. As children grow older, their developmental ecologies expand, for example, to schools and neighbourhoods, which pose new challenges and put children into contact with new people. This rise in peer problems for these children is concerning and may be linked to the entry to school, where disabled children are more at risk of bullying than other children (Chatzitheochari, Parsons and Platt 2014). It may therefore imply more stringent anti-bullying strategies for those identified as ‘different’, and also points to the ways in which social contexts can ‘disable’ children (Connors and Stalker 2006) through the challenges they are put under in developing strong social relations.

We found that disabled boys consistently demonstrated more hyperactive problems than non-disabled boys, and that these differences grew over time for boys with LSLI and SEN. The increase for SEN was in line with our expectations given that it may be that boys tend to be labelled as disabled in the first place as a result of their hyperactive behaviour, especially since this result (as are all of the findings in the present study) is net of cognitive skills. Thus, their behaviour is interpreted and treated as a potentially stigmatizing learning problem. However, the fact that this pattern was also shown for LSLI indicates that the story may be more complicated, and relate more to either the type of disability experienced or the interaction with the school environment, which may be particularly challenging for disabled children.

When combined with the findings for peer problems, it suggests that early school environments may exacerbate behavioural problems for disabled children in ways that cannot solely be solved by learning support. There may be school cultures which are more or less supportive for disabled children and young people and more or less conducive to stabilising or reducing these problem behaviours. Future research would benefit from incorporating school level factors into analyses as an additional level in the models.

Further, the fact that harsh parental discipline increased levels and growth of hyperactive problems may indicate that, to the extent that parents of disabled children may be struggling more, greater parenting support may be of value. While it was not conditional on children’s disability status, our findings did also reveal a significant main effect between the home learning environment and children’s conduct as well as hyperactive problems. This finding

suggests that the creation of stimulating outlets within the home or via short breaks provision could help to direct children's energy in a productive, rather than problematic, manner.

Turning to emotional problems, both disabled children relative to non-disabled children (LSLI and SEN) and girls relative to boys faced greater emotional problems and greater increases in them over time. By the age of 7 then, disabled girls experienced the highest levels of emotional problems relative to other children, though the difference between disabled and non-disabled children was much greater than that between girls and boys. This was in line with our expectations, since as children become more advanced cognitively, there is more room for negative thoughts and beliefs to fester and grow. Nevertheless, the findings still raise concern. The gap between disabled and non-disabled children suggests that we seriously consider the implications, for disabled girls particularly, in terms of future risks in areas such as depression and self-harm. Closeness and harsh discipline were implicated in greater or lesser levels of emotional problems, respectively. While they did not moderate the impact of disability specifically, given the higher rates of emotional problems among disabled children there may nevertheless be scope for some early intervention through parenting support.

Interestingly, relationships with behaviour were remarkably consistent across LSLI and SEN, with higher starting rates and comparable trajectories in most cases. This indicates that what we are seeing in the attribution of SEN upon school entry is not simply recognition of challenging behaviour, but that disabled children are faced with growing difficulties in engaging with the social world as they pass from toddlers to mid-primary school age. These cast doubt on the case that SEN is predominantly a way of labelling behavioural problems, and instead suggest that experience of disablement is linked to socio-psychological manifestations in terms of behaviour. Given the divergence over the early school years, better understanding of school effects could be crucial here to developing appropriate, 'non-disabling' environments.

Contrary to findings for children with LSLI and SEN, the developmental trajectories of children identified as DD did not diverge from those without DD. Yet, while for emotional and conduct problems DD children were (already) no different from their non-disabled peers, for peer and hyperactive problems they started off at higher rates and were not necessarily 'growing out of' these problems and closing the gap with non-DD children. Since these

children were defined as disabled prior to assessment of their behaviour, it further re-inforces the implication that disabled children face ongoing difficulties with social relations and ordered social contexts that cannot adequately adapt to or accommodate their impairments (Shakespeare and Watson 1997).

Our study is not without its limitations, specifically in relation to the dependence on parental (mother's) report of family context, child behaviour, child disability and her own parenting, and in the limited number of sweeps across the period of interest, restricting the analytical purchase. Nevertheless, it represents a contribution in providing clear and consistent evidence that disabled children experience greater behavioural problems in their early years and that these do not dissipate – and in some cases increase – over time. Child behavioural 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.

References

- Alloway, Tracy Packiam, Susan Elizabeth Gathercole, Hannah Kirkwood, and Julian Elliott. 2009. "The cognitive and behavioral characteristics of children with low working memory." *Child Development* 80(2):606-21.
- Aston, Jane, Sara Dewson, George Loukas, and Alan Dyson. 2005. *Post-16 Transitions: a Longitudinal Study of Young People with Special Educational Needs (Wave Three)*. DfES Research Report RR655. Brighton: Institute of Employment Studies.
- Baker, B.L., L.L. McIntyre, J. Blacher, K. Cmic, C. Edelbrock, and C. Low. 2003. "Pre-school children with and without developmental delay: Behaviour problems and parenting stress over time." *Journal of Intellectual Disability Research* 47(4/5):217-30.
- Baker, Kristan, and Michelle Donnelly. 2001. "The social experiences of children with disability and the influence of environment: A framework for intervention." *Disability & Society* 16(1):71-85.
- Baumrind, Diana. 1966. "Effects of authoritative control on child behavior." *Child Development* 37:887-907.
- Belsky, Jay. 1999. "Interactional and contextual determinants of attachment security." Pp. 249-64 in *Handbook of Attachment Theory and Research*, edited by J Cassidy and P Shaver. New York: Guilford.
- Berlin, Lisa J, and J Cassidy. 2000. "Understanding parenting: Contributions of attachment theory and research." Pp. 133-70 in *The World Alliance for Infant Mental Health handbook of infant mental health*, edited by Joy Osofsky and Hiram E Fitzgerald. New York: John Wiley and Sons.

- Berthoud, Richard. 2008. "Disability employment penalties in Britain." *Work Employment and Society* 22: (1):129–48.
- Blackburn, C., N. Spencer, and J. Read. 2010. "Prevalence of childhood disability and the characteristics and circumstances of disabled children in the UK: Secondary analysis of the Family Resources Survey." *BMC Pediatrics* 10:21-32.
- Bongers, Ilja L., Hans M. Koot, Jan van der Ende, and Frank C. Verhulst. 2003. "The normative development of child and adolescent problem behavior." *Journal of Abnormal Psychology* 112(2):179-92.
- Bradshaw, J. , E. Mayhew, S. Dex, H. Joshi, and K. Ward. 2005. "Socioeconomic origins of parents and child poverty." Pp. 71-108 in *Children of the 21st Century: From birth to nine months*, edited by S. Dex and H. Joshi. Bristol: The Policy Press.
- Bradshaw, Jonathan, and John Holmes. 2008. *Family Poverty Assessed at Three Years Old*. London: Centre for Longitudinal Studies, Institute of Education, University of London.
- Broidy, Lisa, M., Richard E. Tremblay, Bobby Brame, David Fergusson, John L. Horwood, Robert Laird, Terrie E. Moffitt, Daniel S. Nagin, John E. Bates, Kenneth A. Dodge, Rolf Loeber, Donald R. Lynam, Gregory S. Pettit, and Frank Vitaro. 2003. "Developmental trajectories of childhood disruptive behaviors and adolescent delinquency: A six-site, cross-national study." *Developmental Psychology* 39(2):222-45.
- Burchardt, Tania. 2000. "The dynamics of being disabled." *Journal of Social Policy* 29(4):645-68.
- . 2003. *Being and Becoming: Social exclusion and the onset of disability*. CASereport 21, Centre for Analysis of Social Exclusion: London School of Economics.
- . 2004. "Aiming high: the educational and occupational aspirations and of young disabled people." *Support for Learning* 19(4):181-86.
- Campbell, Susan.B., Daniel.S. Shaw, and Miles Gilliom. 2000. "Early externalizing behavior problems: Toddlers and preschoolers at risk for later maladjustment." *Development and Psychopathology* 12(3):467-88.
- Chan, Tak Wing, and Anita Koo. 2011. "Parenting Style and Youth Outcomes in the UK." *European Sociological Review* 27(3):385–99.
- Chatzitheochari, Stella, Samantha Parsons, and Lucinda Platt. 2014. *Bullying experiences among disabled children and young people in England: Evidence from two longitudinal studies*. Department of Quantitative Social Science Working Paper No. 14-11. London: Institute of Education.
- Connors, Clare, and Kirsten Stalker. 2006. "Children's experiences of disability: pointers to a social model of childhood disability." *Disability & Society* 22(1):19-33.
- Crawford, Claire, and Anna Vignoles. 2010. *An analysis of the educational progress of children with special educational needs*. DoQSS Working Paper No. 10-19. London: Institute of Education.
- Cullis, Andy, and Kirstine Hansen. 2008. *Child Development in the First Three Sweeps of the Millennium Cohort Study*. London: Department for Children, Schools and Families.
- DCSF. 2010. "Breaking the link between special educational needs and low attainment: Everyone's business." Nottingham: Department for Children, Schools and Families.
- de la Rochebrochard, Elise. 2012. *Millennium Cohort Study Data Note 1: The home learning environment as measured at age 3*. London: Centre for Longitudinal Studies, Institute of Education.
- Department for Children Schools and Families. 2010. *Breaking the Link Between Special Educational Needs and Low Attainment: Everyone's business*. London: Department for Children Schools and Families.

- Dishion, Thomas J., Arin Connell, Chelsea Weaver, Daniel Shaw, Frances Gardner, and Melvin Wilson. 2008. "The Family Check-Up with high-risk indigent families: Preventing problem behavior by increasing parents' positive behavior support in early childhood." *Child Development* 79(5):1395-414.
- Dowling, Monica, and Linda Dolan. 2001. "Families with children with disabilities: Inequalities and the social model." *Disability & Society* 16(1):21-35.
- Eisenhower, A.S., Bruce L. Baker, and J. Blacher. 2005. "Preschool children with intellectual disability: Syndrome specificity, behaviour problems, and maternal well-being." *Journal of Intellectual Disability Research* 49(9):657-71.
- Emerson, Eric, and Stewart Einfeld. 2010. "Emotional and behavioural difficulties in young children with and without developmental delay: a bi-national perspective." *Journal of Child Psychology and Psychiatry* 51(5):583-93.
- Fanti, Kostas A., and Christopher C. Henrich. 2010. "Trajectories of pure and co-occurring internalizing and externalizing problems from age 2 to age 12: Findings from the National Institute of Child Health and Human Development Study of Early Child Care." *Developmental Psychology* 46(5):1159-75.
- Flouri, Eirini, Emily Midouhas, and Heather Joshi. 2014. "Family poverty and trajectories of children's emotional and behavioural problems: The moderating roles of self-regulation and verbal cognitive ability." *Journal of Abnormal Child Psychology*.
- Gilliom, Miles, and Daniel S. Shaw. 2004. "Codevelopment of externalizing and internalizing problems in early childhood." *Development and Psychopathology* 16:313-33.
- Goodman, R. 1997a. "The Strengths and Difficulties Questionnaire: A research note." *Journal of Child Psychology and Psychiatry* 38:581-86.
- Goodman, R, H Meltzer, and V Bailey. 1998. "The Strengths and Difficulties Questionnaire: A pilot study on the validity of the self-report version." *European Child and Adolescent Psychiatry* 7:125-30.
- Goodman, R. 1997b. "The Strengths and Difficulties Questionnaire: A Research Note." *Journal of Child Psychology and Psychiatry* 38:581-86.
- Goodman, Robert. 2001. "Psychometric properties of the strengths and difficulties questionnaire." *Journal of the American Academy of Child and Adolescent Psychiatry* 40(11):1337-45.
- Gordon, D., R. Levitas, C. Pantazis, D. Patsios, S. Payne, P. Townsend, L. Adelman, K. Ashworth, S. Middleton, J. Bradshaw, and J. Williams. 2000. *Poverty and Social Exclusion in Britain*. York: Joseph Rowntree Foundation.
- Gregg, P. , S. Harkness, and S. Machin. 1999. *Child Development and Family Incomes*. York: York Publishing Services.
- Gregg, Paul, Carol Propper, and Elizabeth Washbrook. 2007. *Understanding the Relationship Between Parental Income and Multiple Child Outcomes: A decomposition analysis*. London: Centre for Analysis of Social Exclusion (CASE), London School of Economics.
- Hansen, Kirstine, Jon Johnson, Lisa Calderwood, Tarek Mostafa, Lucinda Platt, Rachel Rosenberg, and Kate Smith (Eds.). 2014. *MCS User Guide: Guide to the Datasets for the First, Second, Third, Fourth and Fifth Surveys (eighth edition)*. London: Centre for Longitudinal Studies.
- Hatton, Chris, Michelle Collins, Vicki Welch, Janet Robertson, Eric Emerson, Susanne Langer, and Emma Wells. 2011. "The Impact of Short Breaks on Families with a Disabled Child over Time: The second report from the quantitative study." Sheffield: Department for Education.

- Herring, S., K. Gray, J. Taffe, B. Tonge, D. Sweeney, and S. Einfeld. 2006. "Behaviour and emotional problems in toddlers with pervasive developmental disorders and developmental delay: associations with parental mental health and family functioning." *Journal of Intellectual Disability Research* 50(12):874-82.
- Hills, John, Mike Brewer, Stephen Jenkins, Ruth Lister, Ruth Lupton, Stephen Machin, Colin Mills, Tariq Modood, Teresa Rees, and Sheila Riddell. 2010. *An Anatomy of Economic Inequality in the UK: Report of the National Equality Panel*. London: Government Equalities Office / Centre for Analysis of Social Exclusion.
- Hinshaw, Stephen P. 1992. "Externalizing behavior problems and academic underachievement in childhood and adolescence: Causal relationships and underlying mechanisms." *Psychological Bulletin* 111(1):127-55.
- Howe, David. 2006. "Disabled children, parent-child interaction and attachment." *Child & Family Social Work* 11(2):95-106.
- Jaffee, Sara R., Terrie E. Moffitt, Avshalom Caspi, Eric Fombonne, Eric Poulton, and Judith Martin. 2002. "Differences in early childhood risk factors for juvenile-onset and adult-onset depression." *Archives of General Psychiatry* 59(3):215-22.
- Janus, Alexander L. 2009. "Disability and transition to adulthood." *Social Forces* 88(1):99-120.
- Jenkins, S.P., and J.A. Rigg. 2004. "Disability and disadvantage: selection, onset, and duration effects." *Journal of Social Policy* 33(3):479-501.
- Jones, E., L. Gutman, and L. Platt. 2013. *Family Stressors and Children's Outcomes*. Department for Education Research Report DFE-RR254. London: DfE. .
- Karen, R. 1994. *Becoming attached: First relationships and how they shape our capacity to love*. Oxford: Oxford University Press.
- Katz, Ilan , Judy Corlyon, Vincent La Placa, and Sarah Hunter. 2007. *The Relationship Between Parenting and Poverty*. York: Joseph Rowntree Foundation.
- Keil, Sue, Olga Miller, and Rory Cobb. 2006. "Special educational needs and disability." *British Journal of Special Education* 33(4):168-72.
- Kelly, Y., J. Kelly, and A. Sacker. 2013. "Time for bed: associations with cognitive performance in 7-year-old children: a longitudinal population-based study." *Journal of Epidemiology and Community Health* Online First, July 2013.
- Keslair, Francois, Eric Maurin, and Sandra McNally. 2011. *An Evaluation of "Special Educational Needs" Programmes in England*. CEE DP 129. London: Centre for Economics of Education, London School of Economics and Political Science.
- Keslair, Francois, and Sandra McNally. 2009. *Special Educational Needs in England: Final Report for the National Equality Panel*. London: Centre for Economic Performance, London School of Economics and Political Science.
- Kiernan, K.E., and F.K. Mensah. 2009. "Poverty, maternal depression, family status and children's cognitive and behavioural development in early childhood: A longitudinal study." *Journal of Social Policy* 38:569-88.
- Kiernan, Kathleen E, and MCarmen Huerta. 2008. "Economic deprivation, maternal depression, parenting and children's cognitive and emotional development in early childhood." *British Journal of Sociology* 59(4):783-806.
- Kiernan, Kathleen E., and Fiona K. Mensah. 2008. *Poverty, Maternal Depression, Family Status and Children's Cognitive and Behavioural Development in Early Childhood: A longitudinal study*. London: Centre for Longitudinal Studies, Institute of Education, University of London.
- Landa, Rebecca J., Alden L. Gross, Elizabeth A. Stuart, and Ashley Faherty. 2013. "Developmental trajectories in children with and without autism spectrum disorders: The first 3 years." *Child Development* 84(2):429-42.

- Leve, Leslie D., Hyoun K. Kim, and Katherine C. Pears. 2005. "Childhood temperament and family environment as predictors of internalizing and externalizing trajectories from age 5 to age 17." *Journal of Abnormal Child Psychology* 33(5):505-20.
- Lewis, Jane, Ann Mooney, Louca-Mai Brady, Chloe Gill, Amanda Henshall, Natasha, Willmott, Charlie Owen, Kate Evans, and June Statham. 2010. *Special Educational Needs and Disability: Understanding Local Variation in Prevalence, Service Provision and Support*. Research Report DCSF-RR211. London: Department for Children, Schools and Families.
- Lindstrom, Lauren. 2011. "Waging a living: Career development and long-term employment outcomes for young adults with disabilities." *Exceptional Children* 77(4):423-34.
- Loprest, Pamela , and Elaine Maag. 2003. *The Relationship between Early Disability Onset and Education and Employment*. Washington, DC: The Urban Institute.
- Marchant, Ruth, and Mary Jones. 2010. *Disabled children and young people: 21 years of policy*: Action for Children.
- McLoyd, Vonnie C. 1998. "Socioeconomic disadvantage and child development." *American Psychologist* 53:185-204.
- McLoyd, Vonnie C. 1990. "The impact of economic hardship on black families and children: Psychological distress, parenting, and socioemotional development." *Child Development* 61:311-46.
- Midhouhas, Emily, Ye Kuang, and Eirini Flouri. 2014. "Neighbourhood human capital and the development of children's emotional and behavioural problems: The mediating role of parenting and schools." *Health and Place* 27:155-61.
- Midhouhas, Emily, Amy Yogaratnam, Eirini Flouri, and Tony Charman. 2013. "Psychopathology trajectories of children with autism spectrum disorder: The role of family poverty and parenting." *Journal of the American Academy of Child and Adolescent Psychiatry* 52(10):1057-65.
- Midouhas, Emily, Ye Kuang, and Eirini Flouri. 2014. "Neighbourhood human capital and the development of children's emotional and behavioural problems: The mediating role of parenting and schools." *Health & Place* 27(0):155-61.
- Mishna, Faye. 2003. "Learning disabilities and bullying: Double jeopardy." *Journal of Learning Disabilities* 36:1-15.
- O'Connor, Thomas G, and Stephen B C Scott. 2007. *Parenting and Outcomes for Children*. London: Joseph Rowntree Foundation.
- Office for Disability Issues. 2011. *Life Opportunities Survey Wave one results, 2009/11*. London: Department for Work and Pensions.
- Oliver, Michael. 1990. *The Politics of Disablement*. London: MacMillan.
- . 2009. *Understanding Disability: From theory to practice*. 2nd Edition. Basingstoke: Palgrave Macmillan.
- Parsons, S. , and L. Platt. 2013. *Disability among young children: Prevalence, heterogeneity and socio-economic disadvantage*. CLS Working Paper 2013/11. London: Institute of Education.
- Pianta, Robert C., and Deborah J. Lothman. 1994. "Predicting behavior problems in children with epilepsy: Child factors, disease factors, family stress, and child-mother interaction." *Child Development* 65:1415-28.
- Plewis, I. . 2007. *Millennium Cohort Study First Survey: Technical Report on Sampling (4th Edition)*. London: Centre for Longitudinal Studies, Institute of Education.
- Powell, J. 2003a. "Constructing disability and social inequality early in the life course: the case of of speical education in Germany and the United States " *Disability Studies Quarterly* 23(2):57-75.

- Powell, Martin. 2003b. "The Third Way." Pp. pp. 100-06 in *The Student's Companion to Social Policy*, edited by P. Alcock, Erskine, A. & May, M. Oxford: Blackwell.
- Prime Minister's Strategy Unit. 2005. "Improving the life chances of disabled people." London: Cabinet Office.
- Rabe-Hesketh, Sophia, and Anders Skrondal. 2012. *Multilevel and Longitudinal Modeling Using Stata*. 3rd edition. College Station, TX: Stata Press.
- Rutter, M., J. Tizard, and K. Whitmore. 1970. *Education, Health and Behaviour*. London: Longmans.
- Schoon, Ingrid, Elizabeth Jones, Helen Cheng, and Barbara Maughan. 2012. "Family hardship, family instability, and children's cognitive development." *Journal of Epidemiology and Community Health* 66(8):716-22.
- Shahtahmasebi, Said, Eric Emerson, Damon Berridge, and Gillian Lancaster. 2011. "Child Disability and the Dynamics of Family Poverty, Hardship and Financial Strain: Evidence from the UK." *Journal of Social Policy* 40(4):653-73.
- Shakespeare, Tom, and Nicholas Watson. 1997. "Defending the social model." *Disability & Society* 12(2):293-300.
- Shonkoff, John P, and Deborah A Phillips. 2000. *From neurons to neighborhoods: The science of early child development*. Washington DC: National Academy of Sciences.
- Singer, Judith D., and John B. Willett. 2003. *Applied Longitudinal Data Analysis: Modeling change and event occurrence*. New York: Oxford University Press.
- Sullivan, Alice, Sosthenes Ketende, and Heather Joshi. 2013. "Social class and inequalities in early cognitive scores." *Sociology* 47(6):1187-206.
- Sylva, Kathy, Edward Melhuish, Pam Sammons, Iram Siraj-Blatchford, and Brenda Taggart. 2008. *Effective Pre-school and Primary Education 3-11 Project (EPPE 3-11). Final report from the primary phase: Pre-school, school and family influences on children's development during Key Stage 2 (Age 7-11)*. London: Department for Children, Schools and Families.
- Tremblay, Richard E., Daniel S. Nagin, Jean R. Seguin, Mark Zoccolillo, Philip D. Zelazo, Michel Boivin, Daniel Perusse, and Christa Japel. 2004. "Physical aggression during early childhood: Trajectories and predictors." *Pediatrics* 114(1):e43-e50.

Appendix 1: SDQ Items

The SDQ is designed as a self-completion for either a parent or teacher to complete about a child aged 4-17 or, from around age 11, for the young person to complete for themselves (Goodman 1997b; Goodman 2001). See also <http://www.sdqinfo.org>. It comprises 25 statements. There is a separate version of the SDQ for children aged 2-4, which differs only for items 18 and 22 (as indicated below). This version was used at Sweep 2 (age 3); while the main parent report version for children aged 4-17 was used at Sweeps 3 (age 5) and 4 (age 7).

For each item, the respondent is asked to consider the child's behaviour over the last six months and say for each item whether it is not true, somewhat true or certainly true of the child.

“Somewhat true” gains a score of 1 for all items. “Not true” gains a score of 0 for items 1, 2, 3, 4, 5, 6, 8, 10, 12, 13, 15, 16, 17, 18, 19, 20, 22, 23, 24 and a score of 2 for items 7, 11, 14, 21, 25. Conversely, “certainly true” gains a score of 2 for items 2, 3, 4, 5, 6, 8, 10, 12, 13, 15, 16, 17, 18, 19, 20, 22, 23, 24 and a score of 0 for items 7, 11, 14, 21, 25. The score for each sub-scale is the sum of scores from the sub-scale items. Total difficulties can be calculated as the sum from all scores except pro-social scores.

No	Item	Sub-scale
1	Considerate of other people's feelings	Pro-social
2	Restless, overactive, cannot stay still for long	Hyperactivity
3	Often complains of headaches, stomach-aches or sickness	Emotional
4	Shares readily with other children	Prosocial
5	Often has temper tantrums or hot tempers	Conduct
6	Rather solitary, tends to play alone	Peer
7	Generally obedient, usually does what adults request	Conduct
8	Many worries, often seems worried	Emotional
9	Helpful if someone is hurt, upset or feeling ill	Prosocial
10	Constantly fidgeting or squirming	Hyperactivity
11	Has at least one good friend	Peer
12	Often fights with other children or bullies them	Conduct
13	Often unhappy, down-hearted or tearful	Emotional
14	Generally liked by other children	Peer
15	Easily distracted, concentration wanders	Hyperactivity
16	Nervous or clingy in new situations, easily loses confidence	Emotional
17	Kind to younger children	Prosocial
18	Often argumentative with adults (age 2-4) / Often lies or cheats (age 4-17)	Conduct
19	Picked on or bullied by other children	Peer
20	Often volunteers to help others	Prosocial
21	Thinks things out before acting	Hyperactivity
22	Can be spiteful to others (age 2-4) / Steals from home, school or elsewhere (age 4-17)	Conduct
23	Gets on better with adults than with other children	Peer
24	Many fears, easily scared	Emotional
25	Sees tasks through to the end, good attention span	Hyperactivity

- Goodman, R. 1997. "The Strengths and Difficulties Questionnaire: A Research Note." *Journal of Child Psychology and Psychiatry* 38:581-86.
- Goodman, Robert. 2001. "Psychometric properties of the strengths and difficulties questionnaire." *Journal of the American Academy of Child and Adolescent Psychiatry* 40(11):1337-45.

Appendix 2: Model Estimates for full models

Tables A1-A4 show for each disability measure (DD, LSLI and SEN) and for each outcome (Conduct, Peer, Hyperactivity and Emotional problems) the full models used for the graphs – and conclusions - in the main paper. Only statistically significant interactions between sex and age or sex and age and disability were retained in the full models.

Table A5 illustrates just the interactions between parenting measures and disability status, in models including all other covariates.

Table A1: Conduct problems by each disability measure

	DD	LSLI	SEN
Fixed effects parameters			
Age	-1.789** (0.0530)	-1.790** (0.0531)	-1.795** (0.0522)
Age squared	0.139** (0.00478)	0.139** (0.00476)	0.139** (0.0047)
MDD	0.144** (0.0540)		
SDD	0.162 (0.107)		
LSLI		0.283** (0.0919)	
LSLI*age		-0.00994 (0.0257)	
SEN			0.383** (0.0614)
Statement			0.451** (0.154)
SEN*age			-0.0111 (0.0211)
Statement*age			0.0811 (0.0455)
Girls	-0.129** (0.0295)	-0.125** (0.0300)	-0.0991** (0.0295)
Times poor	0.129** (0.0177)	0.127** (0.0172)	0.117** (0.0175)
Times lone parent	0.0730** (0.0180)	0.0737** (0.0180)	0.0723** (0.0181)
Highest parental qualification	0.126** (0.0160)	0.123** (0.0158)	0.117** (0.0159)
Maternal malaise	0.112** (0.00975)	0.109** (0.00976)	0.108** (0.00969)
Home learning environment	-0.00927** (0.00250)	-0.0101** (0.00250)	-0.00816** (0.00244)
Harsh discipline	0.124** (0.00416)	0.124** (0.00416)	0.120** (0.004)
Parent close to child	-0.276** (0.0389)	-0.286** (0.0389)	-0.276** (0.0374)

Cognitive score	-0.00624** (0.00110)	-0.00623** (0.00112)	-0.00465** (0.001)
Sweep 1 age (DD model only)	0.0186 (0.0335)		
Constant	-0.123 (0.134)	-0.0898 (0.134)	-0.279* (0.131)
Random effects parameters			
Variance intercept	-1.203** (0.0291)	-1.202** (0.0291)	-1.212** (0.0294)
Variance slope	0.336** (0.0187)	0.335** (0.0184)	0.335** (0.0187)
Covariance intercept and slope	-1.023** (0.0359)	-1.022** (0.0355)	-1.054** (0.0371)
Residual variance	0.0316* (0.0151)	0.0306* (0.0151)	0.0302* (0.0151)
<i>N</i>	18842	18939	18860

Table A2: Peer problems by each disability measure

	DD	LSLI	SEN
<i>Fixed effects parameters</i>			
Age	-0.693** (0.0398)	-0.714** (0.0400)	-0.727** (0.0408)
Age squared	0.0596** (0.00378)	0.0593** (0.00373)	0.0596** (0.00376)
MDD	0.181** (0.0482)		
SDD	0.281** (0.104)		
MDD*age			
SDD*age			
LSLI		0.466** (0.0969)	
LSLI*age		0.144** (0.0345)	
SEN			0.0716 (0.0641)
Statement			0.510** (0.139)
SEN*age			0.101** (0.0218)
Statement*age			0.231** (0.0471)
Girls	-0.130** (0.0288)	-0.134** (0.0397)	-0.163** (0.0383)

Girls*age		0.0260*	0.0274*
		(0.0125)	(0.0126)
Girls*LSLI		-0.262*	
		(0.127)	
Girls*LSLI*age		-0.0915*	
		(0.0458)	
Times poor	0.111**	0.103**	0.0957**
	(0.0173)	(0.0170)	(0.0166)
Times lone parent	0.0313	0.0308	0.0377*
	(0.0177)	(0.0169)	(0.0172)
Highest parental qualification	0.0843**	0.0852**	0.0789**
	(0.0148)	(0.0145)	(0.0142)
Maternal malaise	0.0998**	0.0947**	0.0967**
	(0.0108)	(0.0109)	(0.0104)
Home learning environment	0.000354	-0.00101	0.00164
	(0.00217)	(0.00217)	(0.00216)
Harsh discipline	0.0172**	0.0163**	0.0149**
	(0.00402)	(0.00396)	(0.00404)
Parent close to child	-0.225**	-0.235**	-0.224**
	(0.0342)	(0.0345)	(0.0335)
Cognitive score	-0.00741**	-0.00692**	-
	(0.00108)	(0.00101)	0.00556**
Age at sweep 1 (DD only)	0.0502		
	(0.0311)		
Constant	0.858**	0.903**	0.739**
	(0.129)	(0.127)	(0.123)
<i>Random effects parameters</i>			
Variance intercept	-1.338**	-1.349**	-1.359**
	(0.0395)	(0.0403)	(0.0407)
Variance slope	0.0428*	0.0385	0.0380
	(0.0213)	(0.0211)	(0.0214)
Covariance intercept and slope	-0.523**	-0.549**	-0.558**
	(0.0353)	(0.0347)	(0.0351)
Residual variance	-0.00111	-0.00113	-0.00238
	(0.0164)	(0.0165)	(0.0166)
<i>N</i>	18767	18863	18784

Table A3: Hyperactivity problems

	DD	LSLI	SEN
<i>Fixed effects parameters</i>			
Age	-0.910**	-0.910**	-0.954**
	(0.0601)	(0.0595)	(0.0603)
Age squared	0.0774**	0.0768**	0.0772**
	(0.00560)	(0.00557)	(0.00556)
MDD	0.157*		

SDD	(0.0770) 0.220 (0.212)		
LSLI		0.472** (0.0965)	
LSLI*age		0.0593 (0.0327)	
SEN			0.413** (0.124)
Statement			0.914** (0.222)
SEN*age			0.163** (0.0345)
Statement*age			0.390** (0.0661)
Girls	-0.316** (0.0635)	-0.307** (0.0645)	-0.284** (0.0684)
Girls*age	-0.0627** (0.0166)	-0.0619** (0.0165)	-0.0402* (0.0188)
Girls*SEN			-0.124 (0.190)
Girls*Statement			0.0928 (0.424)
Girls*SEN*age			0.0502 (0.0500)
Girls*Statement*age			-0.245* (0.102)
Times poor	0.109** (0.0272)	0.103** (0.0268)	0.0844** (0.0266)
Times lone parent	0.0762** (0.0246)	0.0764** (0.0240)	0.0826** (0.0243)
Highest parental qualification	0.177** (0.0246)	0.174** (0.0240)	0.165** (0.0249)
Maternal malaise	0.119** (0.0142)	0.111** (0.0146)	0.110** (0.0140)
Home learning environment	-0.0252** (0.00352)	-0.0265** (0.00345)	-0.0223** (0.00349)
Harsh discipline	0.138** (0.00605)	0.138** (0.00605)	0.134** (0.00590)
Parent close to child	-0.241** (0.0543)	-0.257** (0.0538)	-0.243** (0.0512)
Cognitive score	-0.0166** (0.00150)	-0.0161** (0.00151)	-0.0126** (0.00148)
Age at sweep 1 (DD models only)	0.0322 (0.0530)		
Constant	2.447**	2.455**	2.059**

	(0.216)	(0.214)	(0.207)
<i>Random effects parameters</i>			
Variance intercept	-1.060** (0.0379)	-1.063** (0.0378)	-1.101** (0.0405)
Variance slope	0.496** (0.0156)	0.493** (0.0158)	0.493** (0.0156)
Covariance intercept and slope	-0.297** (0.0296)	-0.303** (0.0296)	-0.342** (0.0307)
Residual variance	0.311** (0.0121)	0.311** (0.0121)	0.310** (0.0121)
<i>N</i>	18735	18832	18753

Table A4: Emotional Problems by disability measure

	DD	LSLI	SEN
<i>Fixed effects parameters</i>			
Age	-0.154** (0.0469)	-0.169** (0.0468)	-0.191** (0.0466)
Age squared	0.0184** (0.00450)	0.0182** (0.00449)	0.0193** (0.00448)
MDD	0.0993 (0.0527)		
SDD	0.281* (0.122)		
MDD*age			
SDD*age			
LSLI		0.162* (0.0774)	
LSLI*age		0.141** (0.0337)	
SEN			0.0332 (0.0544)
Statement			-0.0414 (0.129)
SEN*age			0.0915** (0.0217)
Statement*age			0.222** (0.0411)
Girls	0.0552 (0.0348)	0.0377 (0.0356)	0.0426 (0.0341)
Girls*age	0.0259* (0.0122)	0.0384** (0.0122)	0.0391** (0.0123)
Girls*LSLI		0.158 (0.141)	
Girls*LSLI*age		-0.105*	

		(0.0520)	
Times poor	0.112** (0.0168)	0.105** (0.0168)	0.107** (0.0172)
Times lone parent	-0.00425 (0.0143)	-0.00576 (0.0142)	-0.00399 (0.0147)
Highest parental qualification	0.0586** (0.0163)	0.0608** (0.0165)	0.0545** (0.0164)
Maternal malaise	0.143** (0.0110)	0.140** (0.0111)	0.143** (0.0110)
Home learning environment	0.000513 (0.00232)	-0.000405 (0.00229)	0.000720 (0.00235)
Harsh discipline	0.0286** (0.00426)	0.0279** (0.00412)	0.0270** (0.00413)
Parent close to child	-0.129** (0.0359)	-0.137** (0.0356)	-0.127** (0.0347)
Cognitive score	-0.00657** (0.000939)	-0.00634** (0.000925)	-0.00587** (0.000958)
Age at sweep 1 (DD only)	0.0543 (0.0323)		
Constant	0.701** (0.138)	0.748** (0.133)	0.683** (0.140)
<i>Random effects parameters</i>			
Variance intercept	-1.521** (0.0627)	-1.533** (0.0636)	-1.545** (0.0643)
Variance slope	-0.218** (0.0400)	-0.218** (0.0400)	-0.206** (0.0387)
Covariance intercept and slope	0.0517 (0.0831)	0.0474 (0.0831)	0.0424 (0.0802)
Residual variance	0.0985** (0.0159)	0.0973** (0.0159)	0.0935** (0.0158)
<i>N</i>	18802	18899	18821

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$

Models include adjustments for sample design and non-response weights.

Table A5: Parenting and disability interactions

	Conduct			Peer			Hyperactivity			Emotional		
	HLE	Discip	Close	HLE	Discip	Close	HLE	Discip	Close	HLE	Discip	Close
<i>DD</i>												
Parenting	-0.0165** (0.00389)	0.150** (0.00641)	-0.395** (0.0613)	-0.00146 (0.00282)	0.00763 (0.00578)	-0.249** (0.0469)	-0.0272** (0.00450)	0.121** (0.00762)	-0.183** (0.0638)	-0.000130 (0.00277)	0.0193** (0.00529)	-0.137** (0.0449)
par*age	0.00319** (0.00105)	- (0.00180)	0.0458** (0.0166)	0.00113 (0.000880)	0.00416* (0.00169)	0.00385 (0.0152)	0.00262* (0.00131)	0.00780** (0.00230)	-0.0307 (0.0189)	0.00123 (0.000973)	0.00698** (0.00167)	0.00287 (0.0150)
MDD*par	-0.0147 (0.0101)	-0.0192 (0.0229)	0.0471 (0.182)	-0.00316 (0.0109)	0.00117 (0.0177)	0.230 (0.150)	-0.0134 (0.0142)	0.0174 (0.0254)	0.00701 (0.242)	0.000606 (0.00839)	-0.0128 (0.0143)	0.110 (0.132)
SDD*par	-0.0265 (0.0250)	0.00416 (0.0453)	-0.313 (0.342)	0.0121 (0.0201)	-0.00240 (0.0491)	0.0446 (0.326)	-0.0291 (0.0399)	-0.0371 (0.0604)	-0.444 (0.491)	-0.0275 (0.0172)	-0.0340 (0.0426)	0.611* (0.282)
MDD*par*age	0.00139 (0.00287)	0.0112 (0.00625)	- (0.0558)	-0.000821 (0.00278)	0.00465 (0.00542)	-0.0170 (0.0441)	-0.00484 (0.00437)	0.00494 (0.00619)	0.0405 (0.0678)	-0.00556* (0.00281)	0.00228 (0.00520)	-0.0631 (0.0483)
SDD*pare*age	0.00182 (0.00672)	0.00349 (0.0121)	-0.0812 (0.0951)	-0.00560 (0.00857)	-0.00706 (0.0181)	-0.0854 (0.114)	0.00261 (0.00794)	-0.0113 (0.0136)	0.0453 (0.105)	0.00399 (0.00588)	-0.00723 (0.00980)	-0.318** (0.0880)
<i>LSLI</i>												
Parenting	-0.0185** (0.00371)	0.149** (0.00660)	-0.418** (0.0573)	-0.00339 (0.00303)	0.00792 (0.00542)	-0.225** (0.0437)	-0.0289** (0.00448)	0.122** (0.00764)	-0.229** (0.0617)	-0.000337 (0.00264)	0.0175** (0.00499)	-0.138** (0.0427)
par*age	0.00351** (0.000986)	- (0.00190)	0.0474** (0.0154)	0.00110 (0.000848)	0.00316 (0.00166)	-0.0101 (0.0143)	0.00150 (0.00135)	0.00835** (0.00231)	-0.0323 (0.0178)	0.000129 (0.000951)	0.00635** (0.00157)	-0.00633 (0.0144)
LSLI*par	-0.00538 (0.0148)	-0.0120 (0.0220)	0.103 (0.203)	0.00738 (0.0105)	0.00316 (0.00166)	-0.0597 (0.178)	-0.0148 (0.0158)	0.00507 (0.0262)	0.237 (0.227)	-0.00561 (0.0103)	-0.0107 (0.0173)	0.210 (0.154)
LSLI*par*age	-0.00264 (0.00382)	0.00880 (0.00623)	-0.0341 (0.0533)	-0.00328 (0.00321)	0.0108* (0.00548)	0.0835 (0.0567)	0.00498 (0.00429)	-0.00276 (0.00811)	0.0591 (0.0681)	0.00180 (0.00405)	0.00756 (0.00510)	-0.0594 (0.0545)
<i>SEN</i>												
Parenting	-0.0180** (0.00396)	0.140** (0.00648)	-0.359** (0.0583)	-0.00143 (0.00296)	0.00562 (0.00587)	-0.205** (0.0437)	-0.0326** (0.00431)	0.120** (0.00750)	-0.214** (0.0613)	-0.00134 (0.00281)	0.0171** (0.00548)	-0.0988* (0.0441)
par*age	0.00355** (0.00109)	- (0.00175)	0.0390* (0.0152)	0.00132 (0.000901)	0.00395* (0.00164)	0.00253 (0.0133)	0.00275 (0.00141)	0.00529* (0.00210)	-0.0147 (0.0157)	0.000417 (0.000948)	0.00631** (0.00171)	-0.00937 (0.0144)
SEN*par	-0.00266 (0.0120)	0.0449* (0.0179)	-0.516** (0.160)	-0.00110 (0.00927)	-0.000382 (0.0140)	-0.194 (0.139)	0.0223 (0.0142)	0.0110 (0.0234)	-0.346 (0.195)	0.00445 (0.00766)	0.0125 (0.0137)	-0.118 (0.123)
S'ment*par	0.0203 (0.0232)	-0.00403 (0.0393)	0.487 (0.301)	-0.00768 (0.0212)	0.0197 (0.0316)	0.0922 (0.320)	0.0164 (0.0290)	-0.0114 (0.0467)	1.412** (0.370)	-0.0102 (0.0192)	-0.0538 (0.0277)	-0.134 (0.261)
SEN*par*age	0.00129 (0.00379)	-0.00356 (0.00490)	0.113* (0.0493)	0.00307 (0.00354)	-0.00375 (0.00459)	0.00540 (0.0466)	0.00430 (0.00431)	0.00484 (0.00699)	0.0166 (0.0586)	0.00459 (0.00355)	-0.00733 (0.00447)	0.0356 (0.0457)
S'ment*par*age	-0.00929 (0.00379)	0.0212* (0.00490)	-0.168* (0.0493)	-0.00282 (0.00354)	0.0156 (0.00459)	-0.0386 (0.0466)	0.00238 (0.00431)	0.00484 (0.00699)	-0.128 (0.0586)	0.00341 (0.00355)	0.0263** (0.00447)	0.00421 (0.0457)

(0.00561) (0.00881) (0.0820) (0.00814) (0.0109) (0.100) (0.00703) (0.0128) (0.114) (0.00670) (0.00940) (0.0841)

All models include all covariates as in Full models (Tables A1-A4), random intercepts and slopes and adjustments for sample design and weights for non-response. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$