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Behavioural, emotional and social development of children who stutter

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Jan McAllister
School of Health Sciences
University of East Anglia

ABSTRACT

Purpose: Developmental stuttering may be associated with diminished psychological well-being which has been documented from late childhood onwards. It is important to establish the point at which behavioural, emotional and social problems emerge in children who stutter.

Methods: The study used data from the Millennium Cohort Study, whose initial cohort comprised 18,818 children. Analysis involved data collected when the cohort members were 3, 5 and 11 years old. The association between parent-reported stuttering and performance on the Strengths and Difficulties Questionnaire was determined in regression analyses which controlled for cohort members' sex, verbal and non-verbal abilities, maternal education, and family economic status.

Results: Compared with typically-developing children, those who stuttered had significantly higher Total Difficulties scores at all three ages; in addition, scores on all of the sub-scales for 5-year-olds who stuttered indicated poorer development than their peers, and 11-year-olds who stuttered had poorer development than peers in all areas except prosocial skills. At ages 5 and 11, those who stuttered were more likely than peers to have scores indicating cause for clinical concern in almost all areas.

Conclusion: Children who stutter may begin to show impaired behavioural, emotional and social development as early as age 3, and these difficulties are well established in older children who stutter. Parents and practitioners need to be aware of the possibility of these difficulties and intervention needs to be provided in a timely fashion to such difficulties in childhood and to prevent the potential development of serious mental health difficulties later in life.

1. Introduction

Developmental stuttering typically emerges during the pre-school years (Bloodstein and Bernstein Ratner, 2008; Yairi & Ambrose, 2013). Compared with the general population, adolescents and adults with persistent developmental stuttering are more likely to experience poor mental health (Craig, Blumgart & Tran, 2009; Craig & Hancock, 1996; Craig & Tran, 2014; Ezrati-Vinacour & Levin, 2004; Iverach, O'Brian, Jones, Block, Lincoln, Harrison, Hewat, Menzies, Packman & Onslow, 2009b; Iverach & Rapee, 2014; McAllister, Collier & Shepstone, 2013). It is clinically important to identify the typical age at which mental health difficulties emerge in people who stutter because this knowledge could contribute to better service planning (Messenger, Packman, Onslow, Menzies & O'Brian, 2015; Smith, Iverach, O'Brian, Kefalianos & Reilly, 2014). First, early intervention to address the mental health difficulties themselves can be effective for both adults (Helgadottir, Menzies, Onslow, Packman & O'Brian, 2014; Menzies, O'Brian, Onslow, Packman, St. Clare & Block, 2008) and children and young people (Kieling, Baker-Henningham, Belfer, Conti, Ertem, Omigbodun, Rohde, Srinath, Ulkuer & Rahman, 2011), and can reduce the burden on the individual and on society. Second, speech treatment outcomes are more favourable for clients without mental health disorders, at least in adults (Craig & Hancock, 1995; Iverach, Jones, O'Brian, Block, Lincoln, Harrison, Hewat, Cream, Menzies, Packman & Onslow, 2009a).

Anxiety is the mental health issue that has received most attention in the research literature about stuttering. In a review focusing on the onset of anxiety problems in people who stutter, Smith et al. (2014) concluded that school-age children and adolescents who stutter are more likely than their typically-developing peers to experience anxiety problems. The majority of studies that they reviewed were consistent with this interpretation, at least for 10- to 18-year-olds who stuttered. Children in this age range who stuttered had significantly higher scores on anxiety measures than their typically-developing peers in a number of studies (Blood &

Blood, 2007; Blood, Blood, Maloney, Meyer & Qualls, 2007; Blood, Blood, Tellis & Gabel, 2001; Davis, Shisca & Howell, 2007; Erikson & Block, 2013; Gunn, Menzies, O'Brian, Onslow, Packman, Lowe & Block, 2013; Mulcahy, Hennessey, Beilby & Byrnes, 2008; see also McAllister, Kelman & Millard, 2015). Several studies in this age group, however, reported null findings (Andrews & Harris, 1964; Craig & Hancock, 1996; Hancock, Craig, McCready, McCaul, Costello, Campbell, & Gillmore, 1998; see also Messenger et al., 2015). There is much less evidence regarding children younger than 10 years. With regard to younger children who stutter, null findings were reported in the only studies that Smith et al. (2014) included. Ortega & Ambrose (2011) reported that their nine 6- to 11-year-old participants who stuttered had levels of salivary cortisol (a steroid which is associated with anxiety) within normal limits. A study about pre-school stuttering (van der Merwe, Robb, Lewis, & Ormond, 2011) found no differences between seven 3- to 4-year olds who stuttered and seven age-matched controls in terms of either salivary cortisol or questionnaire-based measures of anxiety. To summarise, studies that have tried to identify the origins of anxiety problems in people who stutter have suggested an onset in late childhood, but first, the results are not unequivocal; second, some studies are based on relatively small samples; and finally, there is very limited evidence about children younger than 10 years.

Mental health disorders are often classified as "externalising" (psychological distress is expressed outwards, for example as hyperactivity/inattention, behaviour problems, or substance abuse) or "internalising" (psychological distress is experienced internally, for example as anxiety or depression) (Bornstein, Hahn & Haynes, 2010; Carragher, Krueger, Eaton & Slade, 2015; Goodman, Lamping, & Ploubidis, 2010; Krueger, 1999). On the basis of factor analysis, Goodman et al. (2010) also categorised peer problems, such as rejection, teasing and bullying by other children, as internalising factors. Peer problems in childhood are associated with mental health difficulties in adulthood (Lereya, Copeland, Costello &

Wolke, 2015). In children who stutter, peer problems are well attested and may begin as early as the preschool years. Awareness of disfluency can be present even among 3-year-olds (Ambrose & Yairi, 1994; Ezrati, Platzky & Yairi, 2001), and pre-schoolers may have negative perceptions of stuttering (Weidner, St Louis, Burgess & LeMasters, 2015). Negative peer responses to children who stutter have been documented from the pre-school years (Langevin, Packman & Onslow, 2009) and beyond (Blood & Blood, 2004, 2007; Blood, Blood, Tramontana, Sylvia, Boyle, & Motzko, 2011; Davis, Howell & Cook, 2002; DeNil & Brutten, 1991). Experiences such as teasing and bullying give rise to feelings of shame and embarrassment, which are also associated with social anxiety (Iverach & Rapee, 2014).

There has been less research focusing on externalising factors in children who stutter. In a review of the relationship between anxiety, temperament and personality, Alm (2014) reported evidence of associations between hyperactivity/inattention and stuttering, suggesting that a subgroup of children who stutter may be affected by these difficulties even though they might not necessarily warrant a clinical diagnosis of Attention Deficit Hyperactivity Disorder (ADHD). Evidence of poorer inhibitory control in children who stutter compared with typically-developing peers was found among 3- to 5-year olds (Embrechts, Ebben, Franke & van der Poel, 2010) and 7-year-olds (Eggers, DeNil & van den Berg, 2010). These findings suggest that externalising problems may emerge during the pre-school years.

Both internalising and externalising aspects of mental health are evaluated in the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997), a widely-used tool for screening for behavioural, emotional and social development. Reilly, Onslow, Packman, Cini, Ukoumune, Bavin, Prior, Eadie, Block, & Wake (2013) used the SDQ to investigate the impact of stuttering in a prospective community-based study of 4-year-olds. They found no significant association between stuttering and Total Difficulties scores (that is, scores amalgamating the

internalising and externalising dimensions). However, they did not report findings for externalising and internalising factors separately.

The present study traced the emergence of both internalising and externalising aspects of behavioural, emotional and social difficulties in children who stutter and their typically-developing peers at the ages of 3, 5 and 11 years, using secondary analysis of data from a large British prospective community-based observational study, the Millennium Cohort Study (see www.cls.ioe.ac.uk). It was hypothesised that cohort members who were reported to stutter would display greater difficulties than their typically-developing peers.

2. Methods

2.1 Data source

The present study involved secondary analysis of data from the Millennium Cohort study (MCS), an ongoing prospective community sample of children growing up in the United Kingdom. The original cohort of MCS comprised 18,818 children sampled from all live births that occurred in the United Kingdom over 12 months (from 1st September 2000 in England and Wales and 1st December 2000 in Scotland and Northern Ireland). To ensure that there would be a large enough number of participants in the later sweeps of the study across all sub-groups, including those traditionally subject to attrition, the MCS sample was designed to over-represent ethnic minorities in England, families with high child poverty, and residents of Wales, Scotland and Northern Ireland and was thus non-random. To date, information about the cohort members (CMs) is available from data collection carried out when they were 9 months old and 3, 5, 7 and 11 years old. Data about a diverse range of factors including physical and emotional health, cognitive abilities, education and socio-economic circumstances have been collected from parents, teachers and siblings as well as

the CMs themselves. The data for the analyses reported here were collected via face-to-face interviews conducted by trained interviewers.

The size of the study means that data collection is very costly, and as a result, questions that are asked in a particular survey are not necessarily carried over to the next survey. For example, although parents were asked to indicate whether their child stuttered at ages 3, 5 and 11, this question was not asked in the age 7 survey, so age 7 data were not included in the study. In addition, the impact scale of the Strengths and Difficulties Questionnaire was omitted at age 11. Decisions about which items are included in surveys are taken by staff at the Centre for Longitudinal Studies at the Institute of Education, University College London (http://www.cls.ioe.ac.uk/), which coordinates data collection. The UK Data Service (http://ukdataservice.ac.uk/) curates the data in a manner that protects the anonymity and confidentiality of the participants. Details of ethical review are available at www.cls.ioe.ac.uk/shared/get-file.ashx?id=1601&itemtype=document. The original ethics approval allows registered users of the UK Data Service to use the data for secondary analysis as long as they abide by the terms and conditions of the service, ensuring appropriate and ethical use of the data. The research described here was carried out in line with these terms and conditions.

2.2 Variables

The MCS dataset contains thousands of variables relating to the CMs' development. The key predictor of interest was parental report of stuttering and the outcome was performance on the SDQ. The other variables that were included in the analyses were chosen to enable, as far as possible, a comparison with another prospective community-based study, that Reilly et al (2013), and had been shown in other studies to be associated with SDQ outcomes: sex (Searle, Sawyer, Miller-Lewis & Baghurst, 2014), maternal education (Hartas, 2011),

economic circumstances (Pastor, Reuben & Duran, 2012), verbal ability (Clegg, Law, Rush, Peters and Roulstone, 2015) and non-verbal ability (Adams, Snowling, Hennessy & Kind, 1999). Further details of the variables are as follows:

Stuttering. When the CMs were 3, 5 and 11 years old, parents were asked to indicate whether their child stuttered at the time of data collection, as part of a set of questions about whether the parent had any concerns about the child's speech and language development. Two groups were identified at each age: those who were reported to stutter at that age, and those whose parents reported no speech difficulties at that age or earlier (typically developing children).

Behavioural, emotional and social development. When CMs were 3, 5 and 11 years old, parents completed the age-appropriate version of the SDQ, a brief questionnaire designed to investigate behavioural, emotional and social development in 2-17 year olds. Various versions can be used, depending on the age of the child and the identity of the respondent (the young person themselves or a parent, teacher, etc). The SDQ consists of 25 items, comprising 5 items each from scales relating to emotional symptoms (e.g., whether the child is nervous and clingy or worries a lot), conduct problems (e.g., whether he or she fights with other children or argues with adults), hyperactivity/inattention (e.g., whether he or she is fidgety or easily distracted), peer relationship problems (e.g. whether he or she often plays alone or is bullied by other children), and pro-social behaviour (e.g., whether he or she is considerate of others or good at sharing). Each of the 25 items is scored from 0-2 (not true, somewhat true, certainly true), making a maximum score of 10 for each of the five sub-scales. Higher scores on the pro-social scale, which reflects positive aspects of development, are indicative of better social abilities, while on the remaining scales, higher scores indicate greater difficulty. A total difficulties score is also computed by summing the emotional, conduct,

hyperactivity/inattention and peer sub-scales, with a maximum possible score of 40. The pro-social score does not contribute to the total difficulties score, because it reflects strengths rather than difficulties. In addition to these scales, when CMs were 3 and 5 years old, parents completed the SDQ's impact scale which asks the parent to indicate the degree to which any difficulties interfere with the child's everyday life. The impact scale was not administered at age 11 due to funding restrictions. Scores on all of the scales can also be dichotomised using age-specific values published at http://www.sdqinfo.com/py/sdqinfo/c0.py to identify participants with scores at or beyond these cut-offs that might be cause for clinical concern, such as the need for referral to specialist services.

CM's sex. Parents were asked to report whether the CM was male or female.

Maternal education. At the first data collection sweep, when the child was 9 months old, the mother was asked at what age she completed full-time education. This information was used to determine whether she left full-time education at or before the minimum school leaving age (16 years) or continued beyond this age.

Economic circumstances. When CMs were 3, 5 and 11 years old, families were classified according to whether or not they fell below the 60% median poverty indicator published by the Organisation for Economic Co-operation and Development (OECD; United Nations Economic Commission for Europe, 2013).

Verbal ability. The measures of verbal ability that were used were part of the British Ability Scales (BAS; Elliott, Murray & Pearson, 2007), a battery of tests for measuring cognitive development. When CMs were 3 and 5 years old they completed the Naming Vocabulary subtest, which consists of 36 items in total. The assessment is terminated if five successive items are answered incorrectly. The "ability score", which reflects both the raw score and the difficulty of the items that the child completed, was used in the analyses reported here. When

CMs were 11 years old they completed BAS Verbal Similarities subtest; the ability score was again used in the analyses reported here. All tests were administered by trained interviewers.

Non-verbal ability. The Bracken Basic Concepts Scale, which includes sub-scales assessing knowledge of colours, letters, numbers/counting, sizes, comparisons and shapes, was administered to the 3-year-olds. The School Readiness Composite, which combines scores from these sub-scales, was used in the analyses reported here. The BAS Picture Similarities task was used to measure non-verbal ability in the 5-year-olds; as with the BAS measures collected at age 3, the ability score was used in the analyses reported here. The speed score of the CANTAB Visuospatial Working Memory Task (Robbins, James, Owen, Sahakian, Lawrence, McInnes, & Rabbitt, 1998) was used as a measure of non-verbal ability at age 11. This task is a computerised test which involves recalling the locations of hidden squares in a visual array, without benefit of verbal cues (see http://www.cambridgecognition.com/academic/cantabsuite/tests).

2.3 Analysis

As noted above, MCS employed non-random sampling. This has implications for the analysis of the data, and statistical weighting procedures were employed (Plewis, 2007; Jones & Ketende, 2010).

Three sets of regression analyses were carried out, using data from ages 3, 5 and 11 respectively. In all analyses, the outcome (dependent) variable related to the SDQ scales: either the raw score on the scale in question, or the dichotomised variable derived using the published cut-off values (see section 2.2). Unadjusted analyses were carried out to determine the association between stuttering and the SDQ outcome; adjusted analyses that included the other predictors described in Section 2.2 (cohort members' sex, verbal and non-verbal

abilities, maternal education, and family economic status) were then carried out, to determine whether stuttering significantly influenced the outcome when these other predictors were held constant. Separate analyses were carried out for each of the five SDQ sub-scales (Emotional, Conduct, Hyperactivity/Inattention, Peer and Pro-social) and for Total Difficulties and Impact. Linear regression analyses were carried out using cohort members' raw scores for each of the scales, and logistic regression for the dichotomised data indicating cause for clinical concern.

All analyses were carried out using SPSS 22 (IBM Corp, 2013).

3. Results

Table 1 shows descriptive statistics for categorical predictors (sex; OECD poverty categorisation) for CMs in the three age-defined samples who were reported to stutter compared with those who were reported to have no speech difficulties. Table 2 shows descriptive statistics for continuous predictors (measures of verbal and non-verbal ability and mother's age when she left full-time education). Note that cell sizes may vary due to some respondents failing to complete all parts of questionnaires; note also that due to attrition and non-response, the participants whose data were included at each age are not completely identical, although there is a substantial carry-over from sweep to sweep.

[INSERT TABLES 1 AND 2 ABOUT HERE]

Table 3 shows the results of linear regression analyses of the effect of the predictors on the SDQ scores at three ages. At age 3, the unadjusted analyses revealed a significantly greater level of difficulty for children who stuttered compared with their typically developing peers for conduct, hyperactivity/inattention and total difficulties. However, when other factors were controlled for in the adjusted analyses, the two groups differed significantly only on total

difficulties scores. Children who were reported to stutter at age 5 had significantly higher scores than their typically-developing peers on all of the scales in both the adjusted and unadjusted analyses. Those who were reported to stutter at age 11 had significantly higher scores than those with typical speech development on all scales in both the unadjusted and adjusted analyses.

Table 4 shows the results of logistic regression analyses of the likelihood of CMs having SDQ scores at or beyond the published cut-off values at the three ages, indicating possible cause for clinical concern. According to the unadjusted analyses, 3-year-olds who stuttered were more likely than their typically developing peers to have high scores on the hyperactivity/inattention, total difficulties and impact scales; however, the two groups did not differ significantly in the adjusted analyses. In the unadjusted analyses, 5-year-olds who stuttered were significantly more likely than their peers to have high scores on all scales; in the adjusted analyses, the groups did not differ significantly on the emotional scale (p=.068), but all other differences were significant. In the unadjusted analyses, on all of the sub-scales, 11-year-olds who were reported to stutter were significantly more likely than their peers to have high scores; in the adjusted analyses, the two groups did not differ significantly for the pro-social scale (p=.105), but all other differences were significant

[INSERT TABLES 3 AND 4 ABOUT HERE]

4. Discussion

This study set out to trace the emergence of both internalising and externalising aspects of behavioural, emotional and social difficulties in children who stutter and their typically-developing peers. It used a community sample to determine whether there was an association between parent-reported stuttering and social, emotional and behavioural difficulties

measured at 3, 5 and 11 years. As hypothesised, there was evidence that cohort members who were reported to stutter were more likely than those with typically developing speech to experience behavioural, emotional and social difficulties.

It is important to establish how early such difficulties emerge because they can be associated with serious mental health problems such as social anxiety disorder (Hudson and Rapee, 2000), which can have substantial psychological costs to the individual and economic costs to the individual and to society (Chowdry & Oppenheim, 2015). Early intervention to address these difficulties soon after they appear can potentially reduce the impact on the individual and the financial cost to health services (Kieling et al., 2011), but planning the relevant service provision requires identification of the point at which difficulties emerge. In addition, for people who stutter, speech treatment may be more successful if psychological issues have first been addressed (Craig & Hancock, 1995; Iverach et al., 2009a), so the timing of interventions for psychological issues relative to speech treatment is particularly important.

The unadjusted analyses of the SDQ scores for 3-year-olds suggested that those who stuttered experienced greater difficulties than their typically-developing peers on the two externalising scales (conduct and hyperactivity/inattention) and on the total difficulties scale. However, in the adjusted analyses that controlled for other relevant factors, stuttering was associated with significantly higher scores only on the total difficulties scale, and there were no significant differences between the groups in terms of the likelihood of producing extreme scores that might indicate the need for specialist referral. Difficulties with externalising factors, specifically hyperactivity, have previously been reported in pre-schoolers who stutter (Alm, 2014; Embrechts et al., 2010).

However, in another study of pre-schoolers which, like the present study, used the SDQ in a community sample, Reilly et al. (2013) found no significant differences between the total

difficulties scores of 4-year-olds who did and did not stutter. The discrepancy between the findings may have arisen indirectly from the methods that the studies used to identify stuttering, which may have resulted in differences in stuttering severity between the stuttering group in the present study and that in Reilly et al's (2013) sample. It is noticeable that the prevalence of pre-school stuttering in the present study is much lower than that reported by Reilly et al. (2013) and it is possible that, as a group, the children who were identified as stuttering in the present study stuttered more severely than the group in Reilly et al's study, and conversely, that milder cases of stuttering may have been missed. In Reilly et al's (2013) study, parents were primed to monitor their children's speech for particular speech behaviours, including prolongations, blocks and syllable and word repetitions. The status of word repetitions as a feature of early stuttering has been debated in the literature, and it has been argued that, even if they are counted as stuttering, they may be less noticeable to listeners than other speech features such as prolongations and blocks, and less likely to incur negative listener responses (Ward, 2013). In the present study, parents were not primed to monitor for particular speech behaviours, but were just asked whether or not their child stuttered at the time of data collection. Although it is not known exactly which aspects of speech behaviours the MCS parents were using when they reported that their child stuttered, presumably they based their opinion on speech features that were salient to them. Features that were salient to the parents would be likely to be noticeable to other listeners as well, including the child's peers, who may notice disruptions to fluency as early as 3 years (Ambrose & Yairi, 1994; Ezrati et al., 2001) and have adverse perceptions of stuttering (Weidner et al., 2015); they may also respond negatively to children who stutter (Langevin et al., 2009; Blood & Blood, 2004, 2007; Blood et al., 2011; Davis et al., 2002; DeNil & Brutten, 1991).

Boyle (2015) has applied a model of self-stigma to the emergence of psychological difficulties in people who stutter. According to this model, when the individual who stutters realises that they are stigmatised by others, they may apply these negative attitudes to themselves, and as a result experience psychological harm. A basic tenet of this model is that the pathway towards psychological harm is triggered when the individual is stigmatised by others. If the 3-year-olds who stuttered in the present study exhibited speech features that listeners considered noticeably abnormal, they might be more likely than the stuttering participants in Reilly et al.'s (2013) study to attract negative responses from others, which could lead to earlier self-stigma and psychological harm. The relationship between speech presentation and psychological outcomes should be the focus of future research.

The behavioural, emotional and social impact of childhood stuttering is clearly evident among the 5-year-olds. This age is the point at which children enter primary education in many countries. The findings reported here suggest that 5-year-olds who stutter may lack some of the most important skills for succeeding in this new environment, particularly in terms of their ability to form successful relationships with peers and to moderate their behaviour. In both the unadjusted and adjusted analyses, 5-year-olds who were reported to stutter had significantly higher scores than their peers on all scales. Children who stuttered were more likely than their peers to have extreme scores for all scales in the unadjusted analyses, and in all scales except emotional in the adjusted analyses (although the result on the emotional scale almost reached statistical significance). Many psychiatric disorders do not emerge until adolescence (Paus, Keshavan & Giedd, 2008), possibly due to changes associated with brain maturation. The absence of clinically significant emotional difficulties in this age range is consistent with the findings of another study (Ortega & Ambrose, 2011) which found that levels of salivary cortisol (which is associated with anxiety) in 6- to 11-year-olds who stuttered were within normal limits. The finding in the present study that

externalising behaviours (conduct and hyperactivity/inattention) were more evident in the 5-year-olds who stuttered than in their peers is consistent with another study (Eggers, DeNil & van den Berg, 2010) which found more adverse externalising behaviours in primary school aged children who stuttered than in their typically developing peers.

Among 11-year-olds in this study, those who were reported to stutter had significantly higher scores than typically-developing children on all scales in both the unadjusted and adjusted analyses. According to the unadjusted analyses they were also significantly more likely to have scores suggesting the need for specialist referral on all scales, and on all scales except pro-social in the adjusted analyses. It is possible that the apparent improvement in the pro-social skills of those who stuttered at age 11 (in contrast to the age 5 findings) may be due to the CMs who stuttered receiving interventions to improve these skills in the intervening years; however, it is not possible to determine the validity of this or any other explanation from the existing dataset. The absence of a statistically significant effect for prosocial skills in the adjusted analysis, when the effect was statistically significant in the unadjusted analysis, indicates that any difference between the groups on this outcome are likely to be due to other factors, such as the fact that those who stutter tend to be boys, rather than stuttering *per se*.

The age 11 findings in the present study are consistent with those from some other studies of the psychosocial impact of stuttering on children and young people (Blood, Blood, Maloney, Meyer & Qualls, 2007; Davis, Shisca & Howell, 2007; Erikson & Block, 2013; McAllister et al, 2015). At age 11, children are at an important transition point in their lives. In many countries, it is the point at which they enter secondary education. The findings of the present study suggest that children who stutter are likely to be less well equipped than their typically-developing peers to meet the challenges of this transition; for example, they are likely to find it harder to deal with the pressures of forming relationships with new teachers and peers,

especially in the context of new organisational structures and a more complex curriculum. Parents, teachers and other professionals need to be aware of this. Children whose stuttering persists to age 11 are unlikely to recover (Dworzynski, Remington, Rijsdijk, Howell & Plomin, 2007), and stuttering in adolescence and adulthood can be associated with various negative outcomes including mental health problems (Iverach & Rapee, 2014; McAllister et al, 2013; Craig, Blumgart & Tran, 2015), of which these earlier problems are potential precursors (Hudson and Rapee, 2000).

A strength of the present study is its use of data from a community sample in the present study, which should mean that the results are more representative of the wider population of children who stutter than studies that have recruited participants from clinical populations, that is, those attending clinic or on clinical waiting lists (Skeat, Eadie, Ukoumunne, & Reilly, 2010). Despite this, the limitations of using secondary data analysis must be acknowledged. The most obvious limitation is that the researcher has limited influence on the nature of the data collected. For example, only parental report was used to identify cohort members who stuttered, and clinical confirmation of the stuttering status of the cohort members would have enhanced the study. As noted above, reliance on parental report without priming parents for which speech features to monitor for may have resulted in cases of mild stuttering being missed. Nonetheless, parental report of stuttering is usually highly accurate (Einarsdottir & Ingham, 2009; Reilly et al, 2009; Yairi & Ambrose, 2005), and the validity of the present study is further supported by the fact that the male:female ratio is consistent with that found in other studies where stuttering has been diagnosed by a clinician (Yairi & Ambrose, 2013). It would, however, have enhanced the present study if it had been possible to identify the criteria that parents were using when they reported that their child stuttered.

5. Conclusion

The results of the present study suggest that early social, emotional and behavioural difficulties may be apparent in children who stutter as young as 3 years old. Children whose stutter persists into the school years may require additional support around key transitions points such as entry into primary and secondary education. Appropriately timed intervention may lessen the impact of these difficulties on those who stutter, and may allow them to gain more lasting benefit from speech treatment. Given the association between social, emotional and behavioural difficulties in childhood and later mental health difficulties, this study suggests that parents and professionals who work with children who stutter need to be vigilant for these early signs, and ensure that timely intervention is provided.

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Table 1: Distributions on categorical predictors for cohort members reported to stutter at ages 3, 5 and 11 compared with controls reported to have no speech problems

	Age 3					Age 5					Age 11				
	Stutter			Typically developing		Stutter			Typically developing			Stutter			Typically developing	
	N	(%)		N	(%)	N	(%)		N	(%)		N	(%)		N	(%)
Sex																
Male	115	(66.5)		6586	(48.6)	138	(71.1)		6571	(48.7)		133	(78.2)		5903	(49.0)
Female	58	(33.5)		6962	(51.4)	56	(28.9)		6922	(51.3)		37	(21.8)		6132	(51.0)
Poverty																
> OECD 60% median	113	(65.3)		9167	(67.9)	108	(56.0)		9037	(67.1)		112	(65.9)		9713	(80.7)
< OECD 60% median	60	(34.7)		4335	(32.1)	85	(44.0)		4424	(32.9)		58	(34.1)		2322	(19.3)
Maternal education																
Left school at or before 16	78	(49.1)		6015	(46.5)	96	(53.3)		5960	(46.1)		98	(56.5)		5334	(44.7)
Continued past 16	81	(50.9)		6919	(53.5)	84	(46.7)		6972	(53.9)		75	(43.3)		6600	(55.3)

Table 2: Means and standard deviations for continuous predictor variables

	Age 3		Age 5		Age 11	
	Stutter	Typically developing	Stutter	Typically developing	Stutter	Typically developing
	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)	Mean (s.d.)
Non-verbal ability	23.94 (12.55)	25.59 (13.63)	77.90 (12.57)	82.97 (11.82)	30412 (7128.84)	28804 (6208.70)
Verbal ability	72.25 (14.21)	74.36 (17.59)	101.66 (16.73)	108.23 (15.99)	113.7 (22.47)	121.5 (16.19)

Note: different measures were used at different ages. See text for details.

Table 3: Mean scores on Strengths and Difficulties Questionnaire at ages 3, 5 and 11

	Stutter	Typically Developing	Unadjusted Regression Coefficient (95%CI)	Adjusted Regression Coefficient (95%CI)
Age 3	Mean (sd)	Mean (sd)	(Age 3 N=13,119)	(Age 3 N=11,337)
Emotional	1.58 (1.53)	1.33 (1.49)	0.19 (-0.06 to 0.43)	0.12 (-0.15 to 0.40)
Conduct	3.22 (2.12)	2.75 (2.04)	0.49 (0.16 to 1.82)**	0.32 (-0.02 to 0.67)
Hyperactivity	4.38 (2.32)	3.78 (2.31)	0.51 (0.11 to 0.91)*	0.25 (-0.16 to 0.66)
Peer	1.76 (1.72)	1.48 (1.54)	0.27 (-0.04 to 0.58)	0.23 (-0.09 to 0.55)
Prosocial	7.15 (1.98)	7.44 (1.83)	-0.25 (-0.57 to 0.07)	-0.19 (-0.53 to 0.16)
Total difficulties	10.87 (5.25)	9.28 (5.14)	1.43 (0.56 to 2.30)**	0.92 (0.01 to 1.84)*
Impact	0.19 (0.68)	0.07 (0.44)	0.07 (-0.02 to 0.17)	0.06 (-0.04 to 0.17)
Age 5			(Age 5 N=13,309)	(Age 5 N=12,651)
Emotional	2.09 (1.97)	1.32 (1.54)	0.76 (0.45 to 1.07)***	0.65 (0.35 to 0.95)***
Conduct	2.24 (1.97)	1.44 (1.47)	0.94 (0.59 to 1.29)***	0.61 (0.31 to 0.92)***
Hyperactivity	4.56 (2.73)	3.14 (2.29)	1.57 (1.10 to 2.04)***	1.03 (0.59 to 1.46)***
Peer	1.66 (1.65)	1.09 (1.38)	0.60 (0.36 to 0.83)***	0.38 (0.16 to 0.61)**
Prosocial	7.78 (2.09)	8.46 (1.61)	-0.77 (-1.10 to -0.44)***	-0.50 (-0.81 to -0.18)**
Total difficulties	10.59 (6.41)	6.96 (4.73)	3.91 (2.85 to 4.98)***	2.71 (1.77 to 3.65)***
Impact	0.59 (1.42)	0.11 (0.59)	0.49 (0.27 to 0.71)***	0.35 (0.16 to 0.54)***
Age 11			(Age 11 N=12,092)	(Age 11 N=10,920)
Emotional	2.90 (2.35)	1.73 (1.88)	1.28 (0.87 to 1.68)***	1.19 (0.79 to 1.59)***
Conduct	2.05 (1.83)	1.29 (1.49)	0.88 (0.53 to 1.23)***	0.53 (0.20 to 0.85)**
Hyperactivity	4.35 (2.86)	2.92 (2.34)	1.58 (1.08 to 2.08)***	0.95 (0.42 to 1.48)***
Peer	2.62 (2.31)	1.25 (1.55)	1.43 (0.95 to 1.92)***	1.41 (0.89 to 1.93)***
Prosocial	8.11 (2.09)	8.86 (1.49)	-0.65 (-1.00 to -0.31)***	-0.40 (-0.73 to 0.08)*
Total difficulties	12.25 (7.378)	7.27 (5.39)	5.17 (3.75 to 6.60)***	4.08 (2.64 to 5.52)***

* <.05
** <.01
*** <.001

Table 4: Number of cohort members with scores at or beyond clinical threshold on the Strengths and Difficulties Questionnaire at ages 3, 5 and 11

	Stutter		Control		Unadjusted Regression Coefficient (95%CI)	Adjusted Regression Coefficient (95%CI)
Age 3	N	(%)	N	(%)	(Age 3 N=13,119)	(Age 3 N=11,337)
Emotional	22	(12.9)	1100	(8.5)	1.38 (0.82 to 2.33)	1.55 (0.86 to 2.80)
Conduct	42	(24.4)	2424	(18.7)	1.23 (0.88 to 1.93)	1.05 (0.68 to 1.63)
Hyperactivity	34	(20.1)	1703	(13.3)	1.56 (1.03 to 2.34)*	1.45 (0.96 to 2.20)
Peer	20	(11.8)	1463	(11.4)	0.94 (0.55 to 1.61)	0.86 (0.46 to 1.62)
Prosocial	37	(21.8)	2115	(16.4)	1.35 (0.90 to 2.03)	1.33 (0.86 to 2.05)
Total difficulties	31	(18.8)	1547	(12.2)	1.68 (1.10 to 2.57)*	1.45 (0.90 to 2.34)
Impact	10	(6.1)	233	(1.8)	2.27 (1.03 to 5.02)*	2.09 (0.89 to 4.91)
Age 5					(Age 5 N=13,309)	(Age 5 N=12,651)
Emotional	19	(10.1)	638	(4.9)	2.13 (1.22 to 3.72)**	1.73 (0.96 to 3.13)
Conduct	44	(23.4)	1216	(9.3)	3.30 (2.17 to 5.04)***	2.33 (1.53 to 3.54)***
Hyperactivity	47	(25.1)	1148	(8.8)	3.74 (2.43 to 5.74)***	2.49 (1.58 to 3.92)***
Peer	28	(14.9)	868	(6.6)	2.57 (1.63 to 4.05)***	1.76 (1.07 to 2.90)*
Prosocial	13	(6.9)	205	(1.6)	3.96 (1.97 to 7.98)***	2.17 (1.02 to 4.63)*
Total difficulties	36	(19.4)	581	(4.5)	5.55 (3.66 to 8.41)***	3.34 (2.16 to 5.15)***
Impact	25	(13.6)	334	(2.6)	6.50 (4.07 to 10.40)***	4.22 (2.61 to 6.81)***
Age 11					(Age 11 N=12,092)	(Age 11 N=10,920)
Emotional	49	(28.8)	1144	(9.5)	3.83 (2.73 to 5.36)***	3.37 (2.29 to 4.95)***
Conduct	34	(20.0)	1038	(8.6)	2.65 (1.67 to 4.22)***	1.89 (1.15 to 3.40)*
Hyperactivity	42	(24.9)	1021	(8.5)	3.36 (2.25 to 5.02)***	2.28 (1.47 to 3.54)***
Peer	47	(27.6)	1137	(9.5)	3.43 (2.25 to 5.22)***	3.38 (2.21 to 5.17)***
Prosocial	8	(4.7)	173	(1.4)	2.96 (1.40 to 6.27)**	2.00 (0.87 to 4.63)
Total difficulties	49	(29.0)	814	(6.8)	5.35 (3.39 to 8.44)***	4.49 (2.71 to 7.42)***

* <.05
** <.01
*** <.001