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Short Report

The impact of adolescent stuttering and other speech problems on psychological well-being in adulthood: evidence from a birth cohort study

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Abstract

Background: Developmental stuttering is associated with increased risk of psychological distress and mental health difficulties. Less is known about the impact of other developmental speech problems on psychological outcomes, or the impact of stuttering and speech problems once other predictors have been adjusted for.
Aims: To determine the impact of parent-reported adolescent stuttering and other speech difficulties on psychological distress and associated symptoms as measured by the Rutter Malaise Inventory.
Method & Procedures: A British birth cohort dataset provided information about 217 cohort members who stuttered and 301 cohort members who had other kinds of speech problem at age 16 according to parental report, and 15,694 cohort members who had experienced neither stuttering nor other speech difficulties. The main analyses concerned associations between adolescent stuttering or speech difficulty and score on the Rutter Malaise Inventory at age 42. Other factors that had previously been shown to be associated with score on the Malaise Inventory were also included in the analyses.
Outcomes & Results: In the adjusted analyses that controlled for other predictors, cohort members who were reported to stutter had higher malaise scores than controls overall, indicating a higher level of psychological distress, but they were not at significantly more likely to have malaise scores in the range indicating a risk of serious mental health difficulties. Cohort members who were reported to have other speech difficulties during adolescence had malaise scores that overall did not differ significantly from those of controls in the adjusted analyses, but they were at significantly greater risk of serious mental health difficulties.
Conclusions & Implications: These findings support those of other studies that indicate an association between stuttering and psychological distress. This study is the first to have shown that adolescents who experience speech difficulties other than stuttering are more likely than controls to be at risk of poorer mental health in adulthood. The results suggest a need for therapeutic provision to address psychosocial issues for both stuttering and other developmental speech disorders in adulthood, as well as further research into the consequences in adulthood of stuttering and other developmental speech disorders.

Keywords: speech difficulties, stuttering, psychological health, birth cohort.

What this paper adds?

What is already known on this subject?
Developmental stuttering is associated with poorer psychological well-being in adulthood.

What this paper adds?
The results reported here support prior reports of an association between developmental stuttering and psychological distress and suggest that developmental speech difficulties other than stuttering may also be associated with poorer psychological health in adulthood.

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Introduction

Much recent evidence has indicated that developmental stuttering in adults is associated with higher levels of negative mood or psychological distress (Craig & Tran, 2006; Tran, Blumgart & Craig, 2011) and an increased risk of mental health problems (Blumgart, Tran & Craig, 2010; Iverach, Jones, O'Brian, Block, Lincoln, Harrison, Hewat, Cream, Menzies, Packman & Onslow, 2009; Iverach, O'Brian, Jones, Block, Lincoln, Harrison, Hewat, Menzies, Packman & Onslow, 2009), particularly social phobia (Blumgart, Tran & Craig, 2010; Craig & Tran, 2006; Kraaimaat, Janssen, & Van Dam-Baggen, 1991; Mahr & Torosian, 1999; Messenger, Onslow, Packman, & Menzies, 2004; Stein, Baird, & Walker, 1996). Such psychological consequences of developmental stuttering are unsurprising given that it is also associated with negative peer reactions during childhood and adolescence, including bullying (Blood, Boyle, Blood & Nalesnik, 2010; Davis, Howell & Cooke, 2002; Langevin, Packman & Onslow, 2009).

Children may experience other developmental speech difficulties apart from stuttering. Like stuttering, these other developmental speech difficulties are also associated with behavioural and social problems among children at school age and in early adolescence (Conti-Ramsden & Botting, 2004; Campbell, Dollaghan, Rockette, Paradise, Feldman, Shriberg, Sabo & Kurs-Lasky, 2003; Fujiki, Brinton & Todd, 1996). Both dysfluency and other developmental speech difficulties may be secondary to other more generalized or complex disorders such as autism or syndromes that are associated with intellectual impairment (Van Borsel & Tetnowski, 2007; Keating, Turrell & Ozanne, 2001). There has been no research on the long-term effects in adulthood of these other childhood speech difficulties.

Because of the similarity between stuttering and other speech difficulties in terms of their impact in childhood, it seems likely that these other developmental speech difficulties could be associated with similar risks to psychological well-being in adulthood to those associated with stuttering, particularly if negative mood and mental ill health are a result of the social responses to stuttering rather than a cause or a concomitant factor. This question has, however, been neglected by researchers.

Evidence about stuttering and other speech difficulties can be gleaned from a series of British birth cohort studies that are freely available to the research community (see http://www.cls.ioe.ac.uk). Although the National Child Development Study (NCDS), British Cohort Study (BCS-70) and Millenium Cohort Study (MCS) all gathered information from parents about their children's speech development, the NCDS was selected for the present study because it has data relating to both adolescence and adulthood (unlike the MCS) and it had a much better response rate than the BCS-70 at age 16. The NCDS (Power & Elliott, 2006) is an ongoing multidisciplinary project that has followed several thousand individuals from birth and throughout life. The original cohort of the NCDS comprised 18,558 children who were either born in Britain in a particular week in 1958, or born abroad in the same week but moved to Britain before age 16. Surveys were conducted at birth and when the cohort members (CMs) were 7, 11, 16, 23, 33, 42, 46 and 50 years of age. In addition to information provided by the parents, data were collected in medical and school questionnaires and later from the CMs themselves. When CMs were 7 and 16 years of age, their parents were asked directly whether they stuttered and whether they experienced any other speech difficulties; if they answered either question in the affirmative they were asked whether the problem was mild or severe; additionally, in the case of other speech difficulties, they were asked to comment further on the nature of the difficulty.

When CMs were 23, 33 and 42 years old, they completed the Rutter Malaise Inventory (Rutter, Tizard, & Whitmore, 1970). The Rutter Malaise Inventory is a 24-item self-completion scale which measures emotional distress such as depression and anxiety and related somatic symptoms such as headaches and tiredness. It was developed from the psychiatric sub-scales of the Cornell Medical Index and has good levels of reliability and validity in community samples (Rodgers, Pickles, Power *et al*, 1999). It has been used as a measure of emotional functioning in many studies in which resources are insufficient to allow clinical interviewing. Respondents who score 8 or more on the scale are considered to have an elevated risk of mental health problems (Schoon, Sacker, & Bartley, 2003). Higher scores on the scale are predicted by various factors including being female (Collishaw, Maughan, Natarajan & Pickles, 2010), low birthweight (Gale & Martyn, 2004), childhood behavioural maladjustment (Clark, Rodgers, Caldwell, Power, & Stansfeld, 2007), lower childhood cognitive ability (Gale, Hatch, Batty & Deary, 2009), and socioeconomic disadvantage (Schoon *et al*, 2003). Some, though not all, of these predictors are also associated with childhood speech difficulties: for example, stuttering and other speech disorders have been linked with gender (both more common in boys), lower childhood cognitive ability and adverse socio-economic circumstances (Andrews & Harris, 1964; Butler, Peckham & Sheridan, 1973), but not with birthweight (Butler, Peckham & Sheridan, 1973).

The goal of the research reported here was to determine the degree of association between Rutter malaise

score at age 42, adolescent stuttering and other speech difficulties, and other known predictors of malaise score. We examined the malaise outcome variables in the age 42 sample because we wished to compare our results with those from prior work examining psychological health in people who stutter, which have tended to focus on adults and have had a similar mean age.

Two sets of analyses were conducted to determine the relationship between parent-reported adolescent stuttering or "other speech difficulties" and two measures of psychological outcomes, both based on malaise inventory score: the first set of analyses investigated whether those who were reported to stutter or have other speech difficulties in adolescence were more likely than controls to report a greater number of malaise symptoms, and the second whether their scores were more likely to fall within the range that is considered a risk for clinical levels of mental health difficulty. Based on the evidence summarized above, it was hypothesised that both stuttering and speech difficulties in adolescence should be associated with higher malaise scores in adulthood and/or greater risk of poor mental health in adulthood.

Method

Sample

Three groups of cohort members were identified for the purposes of this study: those whose parents reported that, when they were 16 years old, they stuttered (stutter group), had another form of speech problem (other speech problem group), or neither stuttered nor experienced any other speech difficulties (control group). Figure 1 provides information about the cases that were selected for analysis.

Variables

The following variables were included in the analyses. Variables (c) and (d) were the outcome variables.

a) Stuttering reported by parent when CM was 16 years old. Parents were asked "Does [the CM] stammer or stutter?" Possible responses were "No", "Yes, mildly" and "Yes, severely". Where the parent answered "No", the CM was included in the control group unless they reported in the age 16 questionnaire that the CM had another speech problem, or they had indicated in an earlier data collection sweep that the CM stuttered or had another speech problem, in which case they were excluded from the 'stuttering' analysis.

b) Other speech problem reported by parent when CM was 16 years old. Parents were asked "Has he/she any difficulty with speech other than stammering or stuttering?". As with the previous variable, possible responses were "No", "Yes, mildly" and "Yes, severely". Where the parent answered "No", the CM was included in the control group unless they reported in the age 16 questionnaire that the CM stuttered, or they had indicated in an earlier data collection sweep that the CM stuttered or had another speech problem, in which case they were excluded from the 'other speech problem' analysis.

c) Malaise score at age 42. As in the age 23 and 33 sweeps, this variable was significantly positively skewed, making it unsuitable for analysis using linear regression. It was therefore dichotomised at the median (scores of 0–2, which accounted for 48.8% of the data, versus scores of 3–24).

d) Risk of mental health problems, which was also based on malaise score at age 42. Scores of 0–7 are considered to indicate no increased risk of serious mental health disorders, while scores of 8–24 are associated with increased risk.

e) Family's social class, measured at time of CM's birth, using a six-point scale: (1) unskilled, (2) semi-skilled manual, (3) skilled manual, (4) skilled non-manual, (5) intermediate, (6) professional.

f) CM's birthweight in kilograms.

g) CM's gender.

h) CM's scores on three tests taken at age 11: reading comprehension, mathematics, and copying designs. The reading comprehension and mathematics tests were designed by the National Foundation for Educational Research in England and Wales. The reading comprehension test consisted of 35 sentences, for each of which the child had to select the appropriate final word from a list of five alternatives. The mathematics test consisted of 40 items. The copying designs test consisted of 6 regular geometric shapes (e.g. circle, rhombus, cross) which the child had to copy twice.

i) CM's behavioural adjustment in childhood. This variable was derived from parental responses made when CMs were 7 and 11 years old to items from the Rutter A Scale (Rutter, Tizard & Whitmore, 1970), which asked about aspects of the child's behaviour such as irritability, disobedience and destructiveness. In the analyses reported here, a CM was recorded as having had behavioural problems if their score at 7 or 11 indicated maladjustment; otherwise they were recorded as having no behavioural problems.

j) Material disadvantage during CM's childhood. This measure was derived from information in the surveys at age 7 and 11 concerning four indices of

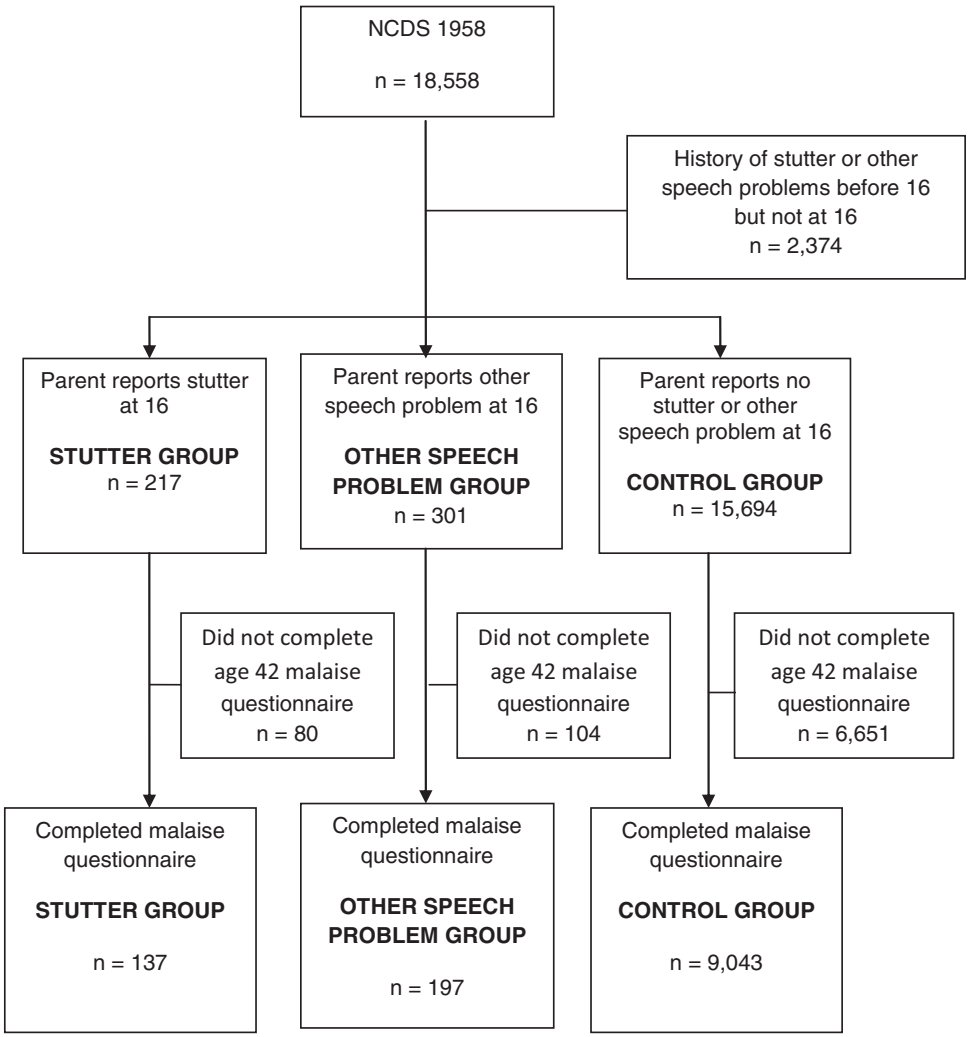

Figure 1. Selection of cases for analysis.
Note: The Stutter group included 29 CMs who also had other speech difficulties, and these 29 CMs were also included in the Other Speech group.

material disadvantage (see Schoon, Sacker & Bartley, 2003).

k) CM's occupation at age 42. The same scale was used as in (e) above.

l) Highest academic or vocational qualification obtained by age 42, recorded in terms of the National Vocational Qualification (NVQ) framework: no qualifications obtained; NVQ1/sub-GCSE; NVQ2/GCSE grades A-C; NVQ3/A-level; NVQ4/sub-degree higher education; NVQ5–6/first or higher degree (Dodgeon, Hancock, Johnson & Parsons, 2011). NVQ1/sub-GCSE and NVQ2/GCSE grades A-C relate to examinations in the British educational system that are typically taken at age 16, and NVQ3/A-level to examinations that are typically taken at age 18.

Analyses

Binary logistic regression analyses were conducted. To determine the effect of stuttering, other speech difficulties, and other non-speech predictors on the two types of malaise outcome, analyses were carried out with outcome variables (c) and (d) respectively, and with predictor variables (e) to (l) plus, in separate analyses, either variable (a) or variable (b).

In all cases, univariate regression analyses were first conducted (that is, each analysis involved an outcome variable and a single predictor variable). Predictors were entered into multivariate analyses if they were significant at $p \leq 0.1$ in the univariate analyses. Variables (a) or (b) were included in the multivariate analyses regardless of whether they were significant in the univariate analyses, because they were the key predictors

of interest in this study. An association that is statistically significant in the univariate analysis may be non-significant in the multivariate analysis, when other predictors are held constant (or vice versa). The multivariate significance value of a predictor therefore provides a more realistic indication of its influence on the outcome variable. The multivariate analyses used the backwards stepwise method, in which the analysis is run repeatedly, with one variable removed at each step until only statistically significant predictors remain in the final model.

Results

Descriptive statistics

There were 15,694 CMs (7,823 males) who had no report of stuttering or any other speech problem up to and including age 16. There were 217 CMs (160 males) whose parents said they stuttered at age 16 of whom 14 (all males) were said to stutter severely.

There were 301 CMs (188 males) whose parents said they had a different form of speech problem at age 16, of whom 21 (12 males) were reported to have a severe speech problem. Of these 301 cases, parents provided a free text comment about the nature of the speech difficulty in 212 cases. These comments were hand-transcribed by the interviewer; 4 comments were classed as illegible or uninterpretable. Fifty-four CMs were reported to have difficulties that were confined to specific speech sounds, predominantly /s/ (20) and /θ/ (15). Fifty were reported to have vague 'pronunciation problems' and 7 comments indicated that the CM had 'difficulty expressing' himself or herself. Two referred to underbite/overbite and one to a 'high roof to mouth'. Twenty-six of the CMs were reported to have problems with speech rate, either too fast (18) or too slow (8). Five CMs were reported to have little or no vocabulary. Twenty were described as having speech difficulties associated with other health conditions: cleft or malformed palate (5), deafness or hearing impairment (13) and learning disabilities (2). The remaining 43 comments related to a wide range of non-specific factors such as communication, intelligibility and nervousness.

In view of the relatively small number of individuals with severe stuttering or speech difficulties, no distinction between mild and severe problems was made in the subsequent analyses. Twenty nine CMs (23 males) were reported to both stutter and have another form of speech problem in adolescence. In view of this, in the main analyses reported below, separate analyses were conducted to compare each speech difficulty group with controls, and the 29 CMs who were reported to experience both kinds of difficulty were included in each analysis in turn (stutter versus controls; other speech problem versus controls).

Distributions of respondents with respect to the categorical variables are shown in table 1 and descriptive statistics for continuous variables in table 2. Note that the sample size (N) differs from variable to variable because some respondents at any given data collection sweep provided incomplete information.

Regression analyses

The results that are reported in the tables in this section are based on the sample described in Figure 1, which included the 29 CMs who were reported by parents to both stutter and experience another form of speech difficulty. A further set of analyses was carried out which excluded these 29 CMs. The results of these analyses were almost identical, but where they differed, this is reported below.

Similarly, additional analyses were conducted which excluded cases diagnosed in an age-16 medical examination with "mental retardation" (sic), to use the terminology of the time. In the control group, 110 CMs (0.7%) were given such a diagnosis, compared with 20 CMs who were reported to stutter (9.2%) and 51 CMs who were reported to have other speech difficulties (16.9%). Where the pattern of significance differed from the original analyses, this is reported below.

For both of the analyses with outcomes relating to malaise score, the interactions between the speech variable and gender were examined. These were not statistically significant, although in the analysis of risk of mental health problems, the gender X speech difficulties interaction was $p = 0.056$; this will be explored further below.

Factors associated with higher malaise scores at age 42

Factors associated with higher malaise scores at age 42 are shown in table 3. For both comparisons (i.e. stutter vs controls; other speech difficulties vs controls), in the univariate analyses, all the predictors, including adolescent stuttering or other speech difficulties, were significantly associated with the outcome.

In the multivariate analysis of those who stuttered at 16 and controls, higher malaise scores in adulthood were significantly associated with stuttering at age 16, being female, having a lower mathematics score at age 11, having behavioural problems in childhood, and experiencing material disadvantage in childhood. The final multivariate model predicted a minority of the variance (Nagelkerke $R^2 = 0.052$), but provided a satisfactory fit to the data (Hosmer & Lemeshow $\chi^2 = 5.499$, d.f. $= 8$, $p = 0.703$).

Table 1. Distribution of cohort members

	Stutter at 16		Other Speech Problem at 16		Controls	
	N	(%)	N	(%)	N	(%)
Gender						
Female	43	(19.8)	101	(33.6)	7,869	(50.2)
Male	174	(80.2)	200	(66.4)	7,820	(49.8)
Total	217		301		15,689	
Family social class at birth						
Unskilled	23	(11.5)	32	(11.8)	1,327	(9.2)
Semi-skilled manual	27	(13.5)	30	(11.0)	1,751	(12.1)
Skilled manual	106	(53.0)	118	(43.4)	7,188	(49.6)
Skilled non-manual	20	(10.0)	31	(11.4)	1,655	(11.4)
Intermediate	20	(10.0)	47	(17.3)	1,910	(13.2)
Professional	4	(2.0)	14	(5.1)	657	(4.5)
Total	200		272		14,488	
Childhood behavioural adjustment						
No problems	71	(54.2)	102	(59.0)	6,438	(75.3)
Problems	60	(45.8)	71	(41.0)	2,108	(24.7)
Total	131		173		8,546	
Childhood material disadvantage						
No signs	25	(19.5)	43	(24.0)	2,285	(27.0)
1 sign	32	(25.0)	39	(21.8)	2,282	(26.9)
2 signs	42	(32.8)	52	(29.1)	2,471	(29.2)
3 signs	19	(14.8)	37	(20.7)	1,159	(13.7)
4 signs	10	(7.8)	8	(4.5)	279	(3.3)
Total	128		179		8,476	
CM's occupation at age 42						
Unskilled	8	(7.0)	10	(6.2)	256	(3.2)
Semi-skilled manual	13	(11.4)	26	(16.1)	976	(12.2)
Skilled manual	31	(27.2)	45	(28.0)	1,562	(19.4)
Skilled non-manual	19	(16.7)	24	(14.9)	1,757	(21.9)
Intermediate	37	(32.5)	51	(31.7)	3,039	(37.8)
Professional	6	(5.3)	5	(3.1)	442	(5.5)
Total	114		161		8,032	
Highest qualification by 42						
No qualifications	31	(21.4)	55	(26.4)	1,409	(14.8)
NVQ1	24	(16.6)	25	(12.0)	1,160	(12.2)
NVQ2	26	(17.9)	48	(23.1)	2,429	(25.6)
NVQ3	24	(16.6)	28	(13.5)	1,751	(18.4)
NVQ4	37	(25.5)	48	(23.1)	2,467	(26.0)
NVQ5–6	3	(2.1)	4	(1.9)	275	(2.9)
Total	145		208		9,491	
Total malaise score						
0–2	52	(38.0)	81	(41.1)	4,575	(48.7)
3–24	85	(62.0)	116	(58.9)	4,828	(51.3)
Total	137		197		9,403	
Malaise score / mental health risk						
No increased risk (score of 0–7)	111	(81.0)	167	(84.8)	8,188	(87.1)
Increased risk (score of 8–24)	26	(19.0)	30	(15.2)	1,215	(12.9)
Total	137		197		9,403	

In the multivariate analysis of those with other adolescent speech difficulties and controls, higher malaise scores in adulthood were significantly associated with being female, having a lower mathematics test score, having behavioural problems in childhood, and attaining lower maximum qualifications in adulthood. Having other adolescent speech difficulties was non-significant ($p = 0.054$). Again the model was weak (Nagelkerke $R^2 = 0.053$), but provided a satisfactory fit to the data (Hosmer & Lemeshow $\chi^2 = 7.203$, d.f. $= 8$, $p = 0.515$).

Analyses excluding CMs with a diagnosis of "mental retardation", and those excluding CMs with both types of speech problem, yielded the same pattern of results.

Table 2. Descriptive statistics for continuous variables

	Stutter at 16			Other speech problem at 16			Controls		
	N	Mean	s.d.	N	Mean	s.d.	N	Mean	s.d.
Birthweight in kilograms	202	3.31	0.606	276	3.30	0.574	14,635	3.29	0.596
Age 11 reading score	189	12.84	6.606	250	12.93	7.407	11,689	16.28	6.177
Age 11 mathematics score	189	12.87	10.157	250	13.47	10.771	11,685	17.00	10.286
Age 11 copying designs score	189	7.80	1.821	248	7.71	2.183	11,666	8.38	1.448

Table 3. Final regression models for multivariate analysis of factors associated with higher malaise score

Predictors that were significant in univariate analysis[a]	Stutter vs controls OR (95% CI)	Other speech vs controls OR (95% CI)
Stutter/other speech problem at 16		
No	1.00	1.00
Yes	1.82 (1.10 to 3.03) $p = 0.021$	1.45 (0.99 to 2.12) $p = 0.054$
Birthweight	Removed from model as n.s.	Removed from model as n.s.
Gender		
Male	1.00	1.00
Female	1.77 (1.58 to 1.98) $p < 0.001$	1.74 (1.57 to 1.94) $p < 0.001$
Family social class at birth		
Professional		
Intermediate	Removed from model as n.s.	Removed from model as n.s.
Skilled non-manual		
Skilled manual		
Semi-skilled manual		
Unskilled		
Reading comprehension score	Removed from model as n.s.	Removed from model as n.s.
Mathematics test score	0.98 (0.98 to 0.99) $p < 0.001$	0.99 (0.98 to 0.99) $p < 0.001$
Copying designs test score	Removed from model as n.s.	Removed from model as n.s.
Childhood behavioural adjustment		
No problems	1.00	1.00
Problems	1.43 (1.25 to 1.64) $p < 0.001$	1.47 (1.30 to 1.66) $p < 0.001$
Childhood material disadvantage	$p = 0.013$	
No signs	1.00	
1 sign	1.03 (0.88 to 1.20) $p = 0.720$	
2 signs	1.12 (0.96 to 1.30) $p = 0.161$	Removed from model as n.s.
3 signs	1.25 (1.02 to 1.53) $p = 0.030$	
4 signs	1.78 (1.22 to 2.62) $p = 0.003$	
CM's occupation at age 42		
Professional		
Intermediate		
Skilled non-manual	Removed from model as n.s.	Removed from model as n.s.
Skilled manual		
Semi-skilled manual		
Unskilled		
Highest qualification by age 42		$p = 0.001$
NVQ5–6		1.00
NVQ4		1.01 (0.73 to 1.41) $p = 0.937$
NVQ3	Removed from model as n.s	1.27 (0.91 to 1.79) $p = 0.164$
NVQ2		1.22 (0.88 to 1.71) $p = 0.238$
NVQ1		1.31 (0.91 to 1.88) $p = 0.150$
No qualifications		1.56 (1.09 to 2.24) $p = 0.016$

[a]Predictors were only entered into the multivariate analysis if they were significant at $p <= 0.1$. They were removed from the model if their significance during the backwards stepwise regression analysis was less that .05, so that only significant results are reported.

Factors associated with an increased risk of mental health problems at age 42

Scores of 8 or above on the malaise inventory are considered to indicate a clinically significant risk of mental health problems. Table 4 shows the factors associated with a malaise score indicative of an increased risk of mental health problems at age 42 when those who stuttered or had other speech difficulties at 16 were compared with controls. For the analysis of CMs reported to stutter versus controls, all the predictors in the unadjusted analyses, including adolescent

Table 4. Final regression model for multivariate analysis of factors associated with risk of mental health problems

Predictors that were significant in univariate analysis[a]	Stutter vs controls OR (95% CI)	Other speech vs controls OR (95% CI)
Stutter/other speech problem at 16		
No	1.00	1.00
Yes	1.80 (0.91 to 3.56) p = 0.089	1.87 (1.06 to 3.29) p = 0.031
Birthweight	Removed from model as n.s	Removed from model as n.s.
Gender		
Male	1.00	1.00
Female	1.91 (1.52 to 2.39) p < 0.001	1.84 (1.47 to 2.30) p < 0.001
Family social class at birth	p = 0.048	p = 0.045
Professional	1.00	1.00
Intermediate	0.88 (0.48 to 1.61) p = 0.669	0.92 (0.50 to 1.69) p = 0.787
Skilled non-manual	0.79 (0.42 to 1.48) p = 0.464	0.90 (0.48 to 1.67) p = 0.732
Skilled manual	1.19 (0.68 to 2.07) p = 0.055	1.26 (0.72 to 2.20) p = 0.416
Semi-skilled manual	1.43 (0.78 to 2.62) p = 0.243	1.56 (0.85 to 2.85) p = 0.150
Unskilled	1.06 (0.55 to 2.04) p = 0.867	1.07 (0.56 to 2.07) p = 0.833
Reading comprehension score	1.03 (1.00 to 1.05) p = 0.017	1.02 (1.00 to 1.04) p = 0.028
Mathematics test score	Removed from model as n.s	Removed from model as n.s.
Copying designs test score	Removed from model as n.s	Removed from model as n.s.
Childhood behavioural adjustment		
No problems	1.00	1.00
Problems	1.73 (1.40 to 2.14) p < 0.001	1.73 (1.40 to 2.13) p < 0.001
Childhood material disadvantage		
No signs		
1 sign		
2 signs	Removed from model as n.s.	Removed from model as n.s.
3 signs		
4 signs		
CM's occupation at age 42	p = 0.001	p = 0.001
Professional	1.00	1.00
Intermediate	1.44 (0.78 to 2.68) p = 0.246	1.56 (0.82 to 2.97) p = 0.172
Skilled non-manual	2.19 (1.15 to 4.16) p = 0.017	2.34 (1.20 to 4.54) p = 0.012
Skilled manual	1.97 (1.02 to 3.79) p = 0.044	2.16 (1.10 to 4.25) p = 0.026
Semi-skilled manual	1.50 (0.76 to 2.97) p = 0.239	1.69 (0.84 to 3.40) p = 0.140
Unskilled	3.33 (1.56 to 7.09) p = 0.002	3.63 (1.67 to 7.90) p = 0.001
Highest qualification by age 42	p < 0.001	p < 0.001
NVQ5–6	1.00	1.00
NVQ4	1.07 (0.50 to 2.28) p = 0.866	1.08 (0.51 to 2.30) p = 0.842
NVQ3	1.35 (0.62 to 2.94) p = 0.446	1.41 (0.65 to 3.06) p = 0.384
NVQ2	1.12 (0.51 to 2.45) p = 0.773	1.11 (0.51 to 2.42) p = 0.787
NVQ1	1.58 (0.70 to 3.55) p = 0.268	1.57 (0.70 to 3.53) p = 0.271
No qualifications	2.58 (1.15 to 5.78) p = 0.022	2.47 (1.11 to 5.52) p = 0.027

[a]Predictors were only entered into the multivariate analysis if they were significant at p < = 0.1. They were removed from the model if their significance during the backwards stepwise regression analysis was less that .05, so that only significant results are reported.

stuttering, were significantly associated with the outcome. Following manual backward stepwise regression of those predictors with a univariate p value of 0.1 or smaller, a malaise score indicative of an increased risk of mental health problems was significantly associated with being female, being born into a family in a lower social class, having a lower reading comprehension test score at age 11, having behavioural problems in childhood, having a lower-status job at age 42, and attaining lower maximum qualifications by age 42. Stuttering was not a significant predictor in the final multivariate analysis. The model was weak (Nagelkerke $R^2 = 0.069$), but it provided a satisfactory fit to the data (Hosmer & Lemeshow $\chi^2 = 4.798$, d.f. = 8, p = 0.779).

When the 29 CMs who were reported to both stutter and have other speech difficulties were excluded, the family's social class at the time of the CM's birth did not significantly predict the likelihood of having a malaise score indicative of a greater risk of mental health problems. The pattern of results for all other predictors was as reported in table 4. Excluding CMs who had a diagnosis of "mental retardation" made no difference to the pattern of results.

Table 4 also shows the factors associated with a malaise score indicative of an increased risk of mental health problems at age 42 when those who had other adolescent speech difficulties were compared with controls. In the unadjusted analyses, all the predictors except

other adolescent speech difficulties were significantly associated with the outcome.

Multivariate analysis indicated that a malaise score indicative of an increased risk of mental health problems was significantly associated with having other adolescent speech difficulties once other factors were adjusted for. The other significant predictors were being female, being born into a family in a lower social class, having a lower reading comprehension test score at age 11, having behavioural problems in childhood, having a lower-status job at age 42, and attaining lower maximum qualifications by age 42. The model was weak (Nagelkerke $R^2 = 0.067$), but it provided a satisfactory fit to the data (Hosmer & Lemeshow $\chi^2 = 4.484$, d.f. $= 8$, $p = 0.811$). Excluding CMs who were reported to have both types of speech difficulty made no difference to the results. In the analysis excluding CMs with a diagnosis of "mental retardation", only gender, childhood behavioural problems, social class of occupation at age 42, and highest qualification were significant predictors.

As was noted earlier in this section, the interaction between gender and other adolescent speech difficulties had a p value of 0.056 for this analysis. Further exploration of the data revealed that adolescent speech difficulties were significantly associated with a malaise score indicative of an increased risk of mental health problems for males ($p = 0.013$) but not for females ($p = 0.533$). This gender difference was also found when CMs with "mental retardation" were excluded (males, $p = 0.005$; females, $p = 0.983$).

Discussion

Results for total malaise scores were consistent with other research indicating higher levels of psychological distress in adults who stutter (e.g. Tran, Blumgart and Craig, 2011). Parental report of adolescent stuttering was associated with higher malaise scores, even when other known predictors were introduced into the model. Other adolescent speech difficulties did not predict higher malaise scores in the multivariate analysis.

Those who stuttered as adolescents were no more likely than controls to have malaise scores indicating an increased risk of mental health disorders in the multivariate analysis, but other adolescent speech difficulties were associated with a malaise score indicative of an increased risk of mental health disorders when other factors were taken into account. This effect was non-significant in an analysis that excluded those with intellectual impairment, but boys with developmental speech difficulties other than stuttering, even without intellectual impairment, were at risk of mental health problems. Taken together with the fact that boys are more likely than girls to experience such speech difficulties, this possibility warrants further investigation.

Much recent research has indicated that in adults who stutter and experience psychosocial problems, social anxiety (rather than generalised anxiety) is a common problem (Blumgart, Tran & Craig, 2010; Craig & Tran, 2006; Kraaimaat, Janssen, & Van Dam-Baggen, 1991; Mahr & Torosian, 1999; Messenger, Onslow, Packman, & Menzies, 2004; Stein, Baird, & Walker, 1996), with between 21% and 60% of adults who stutter receiving a clinical diagnosis of social phobia (Iverach, O'Brian *et al*, 2009; Menzies *et al*, 2008). The malaise inventory that was used in the research reported here is not designed to detect social anxiety, but in view of the similar levels of psychological distress that the present findings indicate in those with adolescent stuttering and those with other kinds of adolescent speech difficulty, as well as the similar social developmental experiences that have been reported for the two groups (Conti-Ramsden & Botting, 2004; Campbell, Dollaghan, Rockette, Paradise, Feldman, Shriberg, Sabo & Kurs-Lasky, 2003; Fujiki, Brinton & Todd, 1996), it seems likely that adults with speech difficulties other than stuttering may also be vulnerable to social anxiety and phobia. This question needs to be the subject of further research.

In Britain, speech and language therapy services for adults who stutter are available in some areas, and therapists recognise the need to address psychosocial issues in this client group (Davidson Thompson, McAllister, Adams & Horton, submitted), but there is rarely if ever therapeutic provision to address psychosocial issues in those with other kinds of developmental speech disorder (Royal College of Speech & Language Therapists, 2009). This clinical service deficiency needs to be addressed, and health professionals should be aware of the potential need for psychosocial issues to be addressed in clients who stutter or have other speech disorders.

The limitations of using secondary data such as this must be acknowledged. The most obvious limitation is that the diagnosis of stuttering or other speech difficulty was made by the parent rather than a speech and language therapist, and may thus be unreliable. It should be noted, however, that other studies have indicated that, for stuttering at least, parental report and description of stuttering is usually highly accurate (Reilly, Onslow, Packman, Wake, Bavin, Prior, Eadie, Cini, Bolzonello, & Ukoumunne, 2009; Yairi & Ambrose, 2005). In addition, the percentage in the sample of those reported to be stuttering or to have other speech difficulties at 16 is similar to figures reported in other studies, as is the male-to-female ratio (e.g. Craig, Hancock, Tran, Craig & Peters, 2002; Keating, Turrell and Ozanne, 2001). Nonetheless, a professional diagnosis would have been preferable, particularly in the case of the stuttering sample, where parental report of 'mild' stuttering may have included those with a covert stuttering problem that could have serious educational, social

and emotional consequences for the child. In addition, the small number of parental reports of 'severe' stuttering or other speech problems meant that it was necessary to conflate the two categories, but if it had been possible to analyse severe cases separately a different pattern might have emerged.

A further potential limitation is that nothing is reported about whether the participants stuttered or had other speech difficulties in later life. This does not, however, invalidate the present findings regarding psychological functioning, since psychopathology frequently has its origins early in life and extends into adolescence and later life (Rutter, 1985; Tran, Blumgart & Craig, 2011; Treon, Dempster & Blaesing, 2006), so the fact that the participants were reported to stutter during this period of psychological development is of greatest relevance to the issues discussed here.

Conclusion

The link between stuttering and psychological distress and mental health problems is already well established, and this study further supports this link with evidence from a community sample. This study is the first to have considered whether adolescents who experience other kinds of speech disorder are more likely than those without speech difficulties to experience psychological distress in adulthood. These findings indicate the need for therapeutic services to address psychosocial issues targeting both groups, and for further research to investigate psychological outcomes for people with other speech disorders beyond stuttering.

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