

1 **Factors associated with symptoms of anxiety and depression in children who stutter**

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22 *Abstract.*

23 Purpose: Children and adolescents who stutter may be at risk of elevated anxiety and
24 depression symptoms, although studies have indicated variability in reported internalizing
25 symptoms in this population. This study considers the association between anxiety and
26 depression symptoms and stuttering, as well as child, family, and contextual factors that may
27 affect this association.

28 Method: Thirty-five school-aged children who stutter completed the Revised Children's
29 Anxiety & Depression Scale-short version (RCADS-25). We fitted regression models to
30 examine the association between anxiety and depression symptoms with bullying, stuttering
31 severity, family history of adverse mental health, and age in children who stutter.

32 Results: Family history of adverse mental health was found to significantly predict anxiety
33 and depression scores. Age also predicted depression scores, with older children reporting
34 higher scores.

35 Conclusion: Family history of adverse mental health is associated with higher self-reported
36 internalizing symptoms in children who stutter. The interaction between child, family, and
37 contextual factors may change with age, and this requires further exploration in larger,
38 longitudinal studies. The association between bullying and anxiety scores indicates the
39 importance of anti-bullying initiatives in promoting psychosocial development in school-aged
40 children who stutter. This study also highlights the contribution of known risk factors for
41 mental health, such as family history, to variability in symptom reporting.

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44 Developmental stuttering is a complex, neurodevelopmental condition characterized
45 by behavioral, affective, and cognitive features (Bloodstein, et al., 2021). Behavioral features
46 include speech characteristics that result in disruptions in the rhythm and timing of speech,
47 such as repetitions, prolongations, and blocks of airflow, as well as secondary behaviours,
48 such as the head nods, blinking, and muscle tension observed in some individuals who
49 stutter. These disruptions in spoken fluency may be accompanied by emotional responses
50 (affective features), such as fear of speaking (Bloodstein et al., 2021). Additionally, cognitive
51 factors may develop over time and include attitudes and beliefs about stuttering and
52 communicating, such as anticipation of stuttering and avoidance of words and situations
53 (Bloodstein et al., 2021).

54 Many individuals who stutter report negative attitudes from peers, bullying
55 victimization, and teasing related to their speech (Blood et al., 2011; Blood & Blood, 2007;
56 Davis et al., 2002). Stuttering has also been associated with low self-perceived
57 communication competence, heightened communication apprehension and fear of negative
58 evaluation in adolescence (Erickson & Block, 2013; Mulcahy et al., 2008; Blood et al., 2001).
59 These negative experiences may put children and young people who stutter at greater risk of
60 adverse mental health outcomes, particularly anxiety, relative to non-stuttering peers (Smith
61 et al., 2014).

62 Internalizing conditions refer to those characterized by disordered mood or emotion,
63 such as anxiety and depression (Kovacs & Devlin, 1998; Liu et al., 2011). Internalizing
64 problems in childhood are associated with adverse educational, social, and quality of life
65 outcomes (Liu et al, 2011; Stevanovic, 2013). Anxiety and depression are among the most
66 common mental health disorders that affect children and young people, and commonly co-
67 occur in adolescents and adults (Brady & Kendall, 1992; Lewinsohn et al., 1997). Anxiety
68 refers to a negative emotional state involving anticipation of threat, which although a natural

69 fight or flight response, becomes pathological when it interferes with everyday functioning
70 (Essau, 2007). Depression is characterized by excessive sadness and loss of interest in
71 otherwise enjoyable activities (Liu et al., 2011). While the onset of anxiety may occur in
72 childhood, depression typically develops during mid to late adolescence (Huberty, 2012).
73 Several social, familial, and psychological factors are associated with increased risk for
74 anxiety and mood disorders among children and adolescents, including female sex, economic
75 deprivation, parental history of either condition, childhood adversity and stressful life events
76 (Hyland et al., 2016; Kovacs & Devlin, 1998). Experiencing anxiety and depression in
77 adolescence also increases the likelihood for recurrence in adulthood (Kovacs & Devlin,
78 1998), further underscoring the importance of early identification and appropriate support for
79 childhood mental health.

80 Community studies have indicated that stuttering in adolescence is associated with
81 higher levels of psychological distress and holding lower status jobs in adulthood (McAllister
82 et al., 2013; McAllister et al., 2012). It has been suggested that the difficulties with
83 communication, negative peer reactions, and bullying experienced in social contexts may
84 increase the risk for anxiety amongst children who stutter (Briley et al., 2019; Smith et al.,
85 2014). Improving our understanding of factors that may be involved in any association
86 between internalizing problems and stuttering would serve to inform clinical management of
87 this population. If children who stutter are at elevated risk of internalizing problems relative
88 to children who do not stutter, there is a need to focus on how clinicians work with this
89 population to offset the adverse consequences of poor mental health.

90 **Stuttering and mental health**

91 Stuttering can be associated with negative attitudes and emotions, and adults who
92 stutter experience increased risk for anxiety and social anxiety disorder compared to the non-
93 stuttering population (Craig & Tran, 2014; Iverach & Rapee, 2014). It has been proposed that

94 maintenance of social anxiety disorder in adults who stutter may be related to several
95 interrelated risk factors, such as fear of negative evaluation, attentional biases, negative
96 social-evaluative cognition and safety behaviours, such as avoiding socially threatening
97 situations and difficult words (Iverach et al., 2017a).

98 However, findings regarding anxiety in children who stutter have been more mixed.
99 A recent meta-analysis indicated that some children and adolescents who stutter are at risk of
100 elevated anxiety symptoms relative to non-stuttering peers ($g = 0.42$, 95% CI [0.10, 0.74]),
101 although findings were variable across studies (Bernard et al., 2022). Previous reviews of the
102 literature have cited several factors that may contribute to these inconsistent findings, such as
103 small sample sizes, under-powered analyses, selection bias, use of anxiety measures that are
104 insufficiently sensitive to the experiences of individuals who stutter, and limited control of
105 potential confounding variables, including co-occurring disorders and previous mental health
106 intervention (Bernard et al., 2022; Menzies et al., 1999; Smith et al, 2014). Although the
107 approximate age of onset for anxiety in children who stutter is unclear, Smith et al. (2014)
108 suggested that anxiety levels may increase as children reach adolescence and young
109 adulthood until they exceed normal limits.

110 There have been fewer studies to date focusing on depression symptoms in the
111 stuttering population, despite the comorbidity between anxiety and depression in the typical
112 population (Brady & Kendall, 1992; Lewinsohn et al., 1997). There appears to be little
113 evidence that children and adolescents who stutter (< 18 years) report elevated depression
114 symptoms (Bernard et al., 2022; Livingstone-Pountney & Mitrevski, 2019). However, some
115 studies have found a significant relationship between stuttering and depression in adults (see
116 Livingstone-Pountney & Mitrevski, 2019), while higher anxiety scores have been found to
117 significantly predict higher depression symptoms in adolescents seeking treatment for
118 stuttering (Iverach et al., 2017b).

119 **Contextual factors: Bullying and mental health**

120 Bullying or victimization can be defined as repeated exposure to negative actions by
121 one or more peers, and typically implies an imbalance of strength or power (Olweus, 1993).
122 Negative actions are characteristic of aggressive behaviours in which an individual intends to
123 inflict injury or discomfort; these may be verbal, for example teasing and name calling, or
124 physical, for instance kicking and punching. Similarly, a distinction can be drawn between
125 direct bullying, in which the victim is openly attacked, and indirect bullying, which may
126 involve efforts to socially exclude an individual (Olweus, 1993).

127 Bullying is associated with a number of educational and health consequences during
128 childhood, adolescence, and adulthood, which are determined by the frequency and type of
129 bullying, whether the individual is the perpetrator, victim or both, and the point at which
130 these consequences are observed (Armitage, 2021). Meta-analyses of cross-sectional and
131 longitudinal studies indicate a strong association between bullying victimization in childhood
132 and internalizing problems, particularly depression and anxiety (Moore et al., 2017; Reijntjes,
133 et al., 2010). Bullying experienced in childhood and adolescence has also been associated
134 with increased risk for depression and anxiety in adulthood (Lereya et al., 2015; Sigurdson et
135 al., 2015). On the other hand, Shoeler et al. (2018) performed a meta-analysis of quasi-
136 experimental studies ($k = 16$) to examine the consequences of bullying victimization, and
137 found that the adverse effects on mental health reduced in the longer term. They concluded
138 that bullying may be causally associated with adverse mental health outcomes in the short
139 term, especially anxiety and depression, but that the reduction in these effects over time
140 highlights the potential for resilience (Schoeler, et al., 2018).

141 ***Peer reactions and bullying in childhood stuttering***

142 Children and adolescents who stutter appear to be at increased risk of negative peer
143 reactions, peer rejection, and bullying (Blood & Blood, 2004; Blood & Blood, 2007; Davis et

144 al., 2002). Negative peer reactions may be associated with increasing age and stuttering
145 severity (Bloodstein et al., 2021). Blood et al. (2011) reported that 44% of the adolescents
146 who stutter (13 – 18 years) experienced bullying victimization, compared to 9% of the non-
147 stuttering group. A higher proportion of adults who stutter have also retrospectively reported
148 being bullied in primary and secondary school (30.6% and 27.8% respectively) compared
149 with 13.9% of the non-stuttering group (Blood & Blood, 2016). Using the Teasing/Bullying
150 Questionnaire for Children who Stutter (TBQ-CS; Langevin et al., 1998), studies have
151 reported bullying victimization and teasing in 53% to 59% of children and adolescents who
152 stutter (Erikson & Block, 2013; Langevin et al., 1998).

153 Similar to the general population, bullying victimization has been associated with
154 poorer psychosocial and quality of life outcomes in adolescents who stutter. Studies have
155 reported that bullying victimization correlates with lower self-esteem, poorer communication
156 competence, and higher anxiety scores (Blood & Blood, 2004; Blood & Blood, 2007; Blood
157 et al., 2011; Cook & Howell, 2014). The increased rates of bullying experienced by children
158 and adolescents who stutter may therefore increase risk for anxiety and depression in this
159 clinical population.

160 **Child factors: stuttering severity**

161 Stuttering severity could be considered a risk factor for elevated anxiety as more
162 frequent disruptions in fluency may result in negative reactions from peers. For instance,
163 when listening to school-aged children who stutter, positive reactions from peers decrease as
164 stuttering severity increases (Panico et al., 2015).

165 Negative communication attitudes and poor self-perceived communication
166 competence have also been observed in children and adolescents who stutter relative to peers
167 who do not stutter, and these negative speech-related attitudes have been found to increase
168 with age but not differ by sex (Blood et al., 2001; Guttormsen et al., 2015). Blood et al.

169 (2001) found that stuttering severity was significantly associated with poorer self-perceived
170 communication competence and higher communication apprehension in adolescents who
171 stutter. Studies with children who stutter have also shown that negative communication
172 attitudes increase with stuttering severity (Kawai et al., 2012; Vanryckeghem & Brutten,
173 1996). Negative communication attitudes have been found to mediate the relationship
174 between stuttering severity and self-esteem in adolescents who stutter (Adriaensens et al.,
175 2015). Low self-esteem is associated with internalizing disorders, particularly depression, in
176 children and young people (Keane & Loades, 2017). Therefore, the severity of one's stutter
177 may affect the way an individual perceives their communicative ability, which could have
178 implications for self-reported emotional well-being, such as anxiety or depression.

179 However, evidence that stuttering severity is associated with anxiety levels has been
180 mixed. Although they found stuttering severity to be significantly associated with negative
181 communication attitudes, Miller and Watson (1992) reported no significant association
182 between self-rated stuttering severity and anxiety or depression in adults who stutter. Craig et
183 al. (2003) found that adults with more severe stuttering did not report significantly higher
184 trait anxiety than those with less severe stuttering, as measured by per cent syllables stuttered
185 (%SS). On the other hand, Ezrati-Vinacour and Levin (2004) found that stuttering severity
186 was related to state anxiety, which is situation dependent. This led them to conclude that “it is
187 not the mere stuttering that perpetuates the state anxiety but the severity of the stuttering
188 accounts for the extent to experience anxiety in social communication” (Ezrati-Vinacour &
189 Levin, 2004, p143). Several studies have found no significant correlation between stuttering
190 severity and anxiety symptom scores in children and adolescents (see Bernard et al., 2022),
191 though others have (Iverach et al., 2017b; Veerabhadrapa et al., 2021).

192 **Family factors: history of mental health and stuttering**

193 Family history of mental health conditions, particularly parental anxiety and
194 depression, are acknowledged risk factors for child anxiety and depression (Hyland et al.,
195 2016; Thapar et al., 2012). Examination of social, psychological, and family risk factors in
196 anxiety and mood disorders highlights the cumulative effect of a number of risk factors in
197 development of internalizing problems (Hyland et al., 2016). As well as child and contextual
198 factors that may increase risk for elevated symptoms in stuttering, family history of mental
199 health issues may also be contributing to the variability in symptom reporting across studies.
200 We therefore hypothesized that family history of adverse mental health would have a
201 significant effect on anxiety and depression scores in the present sample.

202 Stuttering is a disorder with high heritability (Frigerio-Domingues & Drayna, 2017).
203 We anticipated a substantial proportion of respondents would report a positive family history
204 of stuttering in our sample. Positive family history of stuttering may influence parents'
205 perceptions of the impact of stuttering on their children (Rocha et al., 2020), which could
206 affect the way parents and children interact. Family experience of stuttering may also result
207 in increased understanding of the condition, the challenges it can pose and the broader
208 experience of living with a stutter. This may mean that families can draw on their own
209 experiences and strategies to support their children. We hypothesize that increased exposure
210 to stuttering through close family members will facilitate greater understanding and support,
211 which may help to offset adverse mental health symptoms.

212 **The present study**

213 This study aimed to investigate the factors that affect associations between anxiety
214 and depression symptoms and stuttering in children. In this study we consider the association
215 between self-reported anxiety and depression symptoms and child, family, and contextual
216 factors identified from the literature that may predict anxiety and depression symptoms in this

217 population. We used the Revised Children’s Anxiety and Depression Scale-short version
218 (RCADS-25) to measure self-reported anxiety and depression symptoms in a cohort of
219 children who stutter in the UK. Should RCADS-25 scores, bullying and stuttering severity
220 ratings correlate, we intend to explore whether bullying victimization mediates the
221 relationship between stuttering severity and RCADS-25 subscale score.

222 Because we recruited a smaller sample than anticipated, we focused on only three of our
223 pre-registered hypotheses (<https://osf.io/cr392/>) for this study, which are as follows:

- 224 1. There will be an association between family history of mental health conditions and
225 RCADS-25 scores.
- 226 2. There will be a negative association between family history of stuttering and RCADS-
227 25 scores.
- 228 3. Self-reported experience of bullying mediates the relationship between stuttering
229 severity and RCADS-25 scores.

230 **Method**

231 This study was pre-registered on the Open Science Framework in October 2019 and
232 amended in March 2021 in response to the COVID-19 pandemic prior to data analysis
233 (<https://osf.io/4fgex>). Ethical approval was granted by University College London (UCL)
234 Research Ethics Committee (15535/001). Parental consent and child assent were obtained at
235 the start of the questionnaire.

236 **Participants**

237 *Recruitment.* Details about the study were made available on the website of a UK
238 stuttering charity and advertised to families engaged in the work of that charity. Additionally,
239 information about the study was advertised through other organizations in the UK that work
240 with families of children who stutter and speech and language therapists, online support
241 groups and via social media platforms. Study leaflets were distributed to mainstream primary

242 and secondary schools in London. Participants were recruited to this study through volunteer
243 self-selection; individuals who registered interest in the study were sent a link to the
244 questionnaire.

245 Inclusion criteria to take part in the questionnaire were as follows: (i) child has a
246 developmental stutter; (ii) child is aged between 8 and 13 years; (iii) child lives in the UK.
247 Five participants who completed the questionnaire fell outside this age range. As the Revised
248 Children's Anxiety and Depression Scale (RCADS-25) is normed on children aged 8 – 18
249 years, data for children under eight were removed ($n = 3$). One participant aged 14 years was
250 retained in the analyses. Demographic data (age, sex, SES) were unavailable for one
251 participant but complete data for all outcome and predictor variables was available for this
252 individual and therefore their data were retained in the analyses. Participants completed the
253 questionnaire between February 2020 and August 2021.

254 *Sample characteristics.* In total, 46 families took part in the questionnaire, however
255 only 35 children completed the child version of the RCADS-25 and therefore the final sample
256 for this study included 35 children and adolescents. Background information, such as family
257 history, access to intervention, and confirmation of stuttering, was available for all
258 participants ($n = 35$). Complete demographic data (sex, age, socio-economic status) were
259 available for 30 participants: four participants had no SES data and one participant reported
260 no information about sex, age or SES. We imputed the mean sample age for the sole
261 participant with missing age data.

262 Socio-economic status (SES) was measured using the Income Deprivation Affecting
263 Children Index (IDACI), which is a supplementary index of the English Indices of
264 Deprivation (IoD) and measures the proportion of children (0-15 years) living in income
265 deprived families (Ministry of Housing, Communities & Local Government, 2019). The IoD
266 ranks all neighborhoods in England from 1 (most deprived area) to 32,844 (least deprived

267 area). For those living outside of England, it was not possible to calculate the IDACI rank as
268 a UK-wide version of the IoD is unavailable. SES data were missing for five participants in
269 total.

270 The sample comprised nine female and 25 male participants (one undisclosed), with a
271 mean age of 10 years ($M = 128$ months, $SD = 20.4$ months). All participants spoke English as
272 their first language, and six participants reported speaking an additional language. The IDACI
273 ranks for this sample ranged from 2,569 to 32,200 ($M = 17,868$, $SD = 8,404$).

274 The reported age of stuttering onset ranged from two to seven years old ($M = 3.69$, SD
275 $= 1.48$). All participants reported that they had accessed speech and language therapy and
276 31/35 had received a diagnosis of stuttering from a speech and language therapist. Half of
277 participants reported a family history of stuttering ($n = 18$) and nine of these participants did
278 not have a family history of mental health issues. Of the participants with a positive family
279 history of mental health difficulties ($n = 18$), nine did not have a family history of stuttering.
280 A quarter of participants ($n = 9$) reported a positive family history of both mental health and
281 stuttering. Only three respondents reported that their child had accessed support for mental
282 health previously. Sample characteristics can be found in Table 1.

283 **Online questionnaire**

284 The authors involved individuals with experience of stuttering in the development of
285 the questionnaire by piloting it with the Youth Panel of a stuttering charity, composed of
286 young people who stutter (aged 16 – 25 years) who advocate for greater public awareness
287 about stuttering, and the charity's Board of Trustees. Responses collected as part of the pilot
288 testing of the questionnaire were not included in the final sample. The questionnaire
289 comprised two sections, one for parents and one for children who stutter. Parents completed
290 the background questionnaire and the RCADS-25-P (Ebesutani et al., 2017). The children's
291 section of the questionnaire involved completion of the RCAD-25-C (Ebesutani et al., 2012),

292 Illinois Bullying Scale (IBS; Espelage & Holt, 2001) and self-perceived stuttering severity
293 rating scale. The questionnaire asked that children complete their section independently.
294 Families had up to 60 days to complete the questionnaire and did not have to complete it in
295 one sitting.

296 **Outcome variable**

297 ***Revised Children's Anxiety & Depression Scale-short version.***

298 The Revised Children's Anxiety & Depression Scale (Chorpita et al., 2000) is a self-
299 report measure that assesses the frequency of anxiety and low mood symptoms relating to
300 DSM-IV symptom criteria in children and adolescents between 8 and 18 years of age. It is
301 one of the Child Outcome Research Consortium (CORC) measures.

302 A shortened version of the RCADS (RCADS-25; Ebesutani et al., 2012) is available,
303 which provides three scores: 'Total Anxiety', 'Total Depression', and 'Total Anxiety &
304 Depression'. The RCADS-25 is based on the full 47-item RCADS, and retains the 10-item
305 Depression Scale from the full version. However, the Anxiety Scale comprises 15-items and
306 these items are based on the five subtypes of anxiety measured in the full RCADS. Given that
307 we were interested in broad anxiety symptoms and wanted to optimize questionnaire
308 completion, the RCADS-25 was used rather than the 47-item RCADS.

309 There are parent and child versions of the RCADS-25 (RCADS-25-C, Ebesutani et
310 al., 2012; RCADS-25-P, Ebesutani et al., 2017), which allow for symptom reporting to be
311 obtained from the child (self-report) and their parent. For the purposes of the present
312 analyses, we report data obtained from the child version of the RCADS-25 (RCADS-25-C)
313 Similarly to the RCADS, the RCADS-25-C illustrates good discriminatory validity for
314 anxiety and depression. Both the Depression Scale and Anxiety Scale have good reliability in
315 clinical ($\alpha = 0.80$, $\alpha = 0.96$ respectively) and school ($\alpha = 0.79$, $\alpha = 0.94$ respectively) samples
316 (Ebesutani et al., 2012; Ebesutani et al., 2017). Normative data are provided to calculate T-

317 scores that indicate whether symptom scores are in the normal, borderline or clinical range
318 (see Ebesutani et al., 2012).

319 **Predictor variables**

320 Predictor variables were extracted mainly from the background questionnaire
321 completed by parents. These included factors associated with internalizing symptoms, such as
322 sex, age and family history of mental health. Stuttering severity and bullying victimization
323 measures were based on child-report.

324 ***Illinois Bullying Scale***

325 The Illinois Bullying Scale (IBS; Espelage & Holt, 2001) is an 18-item self-report
326 questionnaire that assesses frequency of peer victimization, bullying behavior, and fighting in
327 children and young people (8 – 18 years). It is one of the measures included in the
328 Compendium of Assessment Tools for measuring bullying victimization, perpetration, and
329 bystander experiences (Hamburger et al.2011). The IBS comprises three subscales: Bully,
330 Fight, and Victim. Subscale scores are calculated by summing the scores for subscale items.
331 We were particularly interested in responses to the Victim Subscale as this measures the
332 frequency with which an individual experiences bullying victimization. Participants are
333 presented with a series of statements and asked to indicate how often they experienced the
334 activity in the last 30 days. The victim subscale comprises the following four statements:
335 *'other students picked on me'*, *'other students made fun of me'*, *'other students called me*
336 *names'* and *'I got hit or pushed by other students'*. Scoring corresponds to the choice of
337 response: 'never' (0), '1 or 2 times' (1), '3 or 4 times' (2), '5 or 6 times' (3) or '7 or 8 times'
338 (4). Scores on the Victim Subscale range from 0 – 16, with higher scores indicating more
339 victimization. Norms are unavailable for this scale and instead scores indicate frequency of
340 bullying victimization. Good reliability ($\alpha = 0.88$) has been reported for this scale (Espelage
341 & Holt, 2001).

342 ***Self-perceived stuttering severity***

343 Stuttering severity can be measured in terms of overt surface features, such as
344 stuttering frequency, tension and duration, as well as more subtle features, including word
345 avoidance, escape behaviours, and affective responses (Manning & DiLollo, 2018).
346 Researchers and clinicians typically assess stuttering frequency by estimating the percentage
347 of stuttered syllables (%SS) or words (%SW). However, self-rating scales of stuttering
348 severity can offer insight into the individuals' perception of their stutter, and can be useful in
349 initial clinical assessment (Manning & DiLollo, 2018). In this study, children were asked to
350 self-rate the severity of stuttering on a Likert-style scale (1 = not very severe/bumpy, 10 =
351 very severe/bumpy). Self-rating scales have been found to correlate well with clinician
352 ratings in adults who stutter (O'Brian et al., 2004), and have been used in previous studies of
353 anxiety in children who stutter (Gunn et al., 2014; Iverach et al., 2017; Messenger et al.,
354 2015). We chose to include a 9-point self-rating scale as we were interested in the association
355 between a number of self-report measures and because it offered a simple and time-efficient
356 way of obtaining a measure of stuttering severity from the child's perspective.

357 ***Family history of mental health***

358 Families were asked whether there was a history of mental health conditions in their
359 family as part of the background section of the online questionnaire. Families responded
360 'yes', 'no', 'not sure' or 'prefer not to say' and were asked to include the types of difficulties
361 experienced, for example anxiety, depression, bipolar disorder. These data were coded as
362 follows for the purposes of analyses: no = 0 (negative family history), yes = 1 (positive
363 family history), not sure/prefer not to say = 2.

364 ***Family history of stuttering***

365 The background questionnaire also included a question about family history of
366 stuttering. Families responded 'yes', 'no' or 'not sure' and were asked to indicate whether

367 family members had continued to stutter into adulthood. Responses were coded as follows:
368 no = 0, yes = 1 (positive family history of stuttering) or not sure = 2.

369 **Analyses**

370 The main objective of the present study was to analyze the influence of child
371 (stuttering severity), family (family history of mental health and stuttering) and contextual
372 (bullying victimization) factors on RCADS-25-C subscale scores.

373 All analyses were performed in R version 4.0.3 (R Core Team, 2020). The primary
374 outcome was raw scores on the RCADS-25-C anxiety and depression subscales, which were
375 used in all analyses ($n = 35$). To indicate whether scores reached clinical threshold, mean T-
376 scores, which take into account the child's sex and US school grade, are also reported for this
377 sample. T-scores could be calculated for only 34 participants as sex information was missing
378 for one participant. Scores above 70 are considered to be above clinical threshold, while those
379 between 65 and 70 are considered borderline (Ebesutani et al., 2012).

380 Predictor variables of interest included age, sex, stuttering severity, IBS score, socio-
381 economic status and family history of adverse mental health and stuttering. To test the
382 strength of the association between the outcome variables and continuous dependent
383 variables and check for multicollinearity amongst predictors ($r > .80$), Pearson's Product
384 Moment Correlation Coefficients were generated using the *corr.test* function in the Psych
385 Package in R (Revelle, 2021). In order to investigate whether family history variables were
386 associated with symptoms scores, the sample was divided into two groups: positive and
387 negative family history of (i) stuttering and (ii) mental health. Participants who reported
388 'don't know' or 'prefer not to say' were omitted from the analyses. Welch two sample t-tests
389 compared subscale scores in the group of children with a family history of stuttering and the
390 group with no family history.

391 Multiple regression models were fitted to the data to examine whether these family,
 392 contextual, and child variables predicted anxiety or depression subscale scores. The
 393 regression models were fitted using the *lm* function in R. The *lm* function automatically
 394 generates dummy variables for categorical variables, and family history variables were
 395 entered as a dummy variable with two levels (0 = negative family history; 1 = positive family
 396 history).

397 Results

398 *Table 1: Participant characteristics (n = 35)*

Participant characteristics	Stuttering group (n = 35)			
	Mean	SD	n	% of sample
Age (months)	128	20	35	-
Socio-economic status (IDACI Rank)	17869	8404	30	-
Approximate age of stuttering onset (years)	3.69	1.48	35	-
Sex				
Female	-	-	9	25.7%
Male	-	-	25	71.4%
First Language English	-	-	35	100%
Family history of mental health				
Yes	-	-	18	51.4%
No	-	-	17	48.6%
Previous access to mental health services	-	-	3	8.6%
Family history of stuttering	-	-	18	51.4%
Ever accessed Speech and Language Therapy for stuttering	-	-	35	100%
Diagnosis of stuttering confirmed	-	-	31	88.6%

399

400 **Anxiety and depression symptoms**

401 Table 2 presents scores on all child-reported measures for the total sample and by sex.
 402 Results of Welch two sample t-tests indicated there were no differences in mean scores by
 403 sex for anxiety ($t(10.91) = 0.07$, 95% CI [-6.01, 6.43], $p = .94$) or depression symptom scores
 404 ($t(18.81) = -1.47$, 95% CI[-4.74, 0.83], $p = .16$). The whole sample was included in all
 405 subsequent analyses.

406 Mean T-scores ($n = 34$) were below clinical threshold (Ebesutani et al., 2012). One
 407 participant obtained a T-score above clinical threshold on the anxiety subscale. All T-scores
 408 for the depression subscale were within the normative range.

409 *Table 2: Summary statistics for all outcome and predictor variables: RCADS-25-C total and subscale*
 410 *scores, IBS victim scale and stuttering severity rating for the total sample (n=35) and by sex.*
 411

	Anxiety subscale		Anxiety T-score		Depression subscale		Depression T-score		IBS victim scale		Stuttering severity	
	M (range)	SD	M (range)	SD	M (range)	SD	M (range)	SD	M (range)	SD	M (range)	SD
Total sample (n = 35)	9.74 (1 – 23)	5.93	44.07 (29.99 – 73.36)	9.39	5.8 (0 – 16)	3.92	43.84 (29.92 – 62.72)	8.86	2.69 (0 – 12)	3.25	6.06 (3 – 10)	1.95
Female (n = 9)	9.89 (1 – 23)	7.82	45.29 (29.99 – 73.36)	14.50	4.44 (0 – 10)	3.13	40.57 (29.92 – 56.51)	8.67	2.78 (0 – 12)	3.83	4.67 (3 – 7)	1.66
Male (n = 25)	9.68 (3 – 23)	5.43	43.63 (34.26 – 62.48)	7.09	6.4 (1 – 16)	4.14	45.02 (32.54 – 62.72)	8.80	2.68 (0 – 12)	3.17	6.56 (3 – 10)	1.87
Undisclosed (n = 1)	10.0	-	-	-	3.0	-	-	-	2.0	-	6.0	-

412 Note. RCADS-25 subscale score ranges: anxiety (0 – 45) and depression (0 – 30). RCADS-25 T-scores above
 413 70 indicate clinical levels. Data unavailable to calculate T-score for participant who did not disclose sex. IBS
 414 Victim subscale score range (0 – 16)

415

416

417 **Variables associated with anxiety or depression scores**

418 Child-reported symptom scores were examined in relation to sex, socio-economic
419 status, age, bullying frequency, stuttering severity and family history variables.

420 *Associations between continuous variables*

421 The correlation matrix (Table 3) reports Pearson’s product moment correlation
422 coefficients for pairwise comparisons to estimate the strength of association (*r*) between
423 RCADS-25-C total score, child-reported anxiety, child-reported depression, IBS victim
424 scores, stuttering severity, age and socio-economic status. R-values can be interpreted as
425 effect sizes (Funder & Ozer, 2019), and r-values > 0.20 are likely to be clinically important.
426 Correlation coefficients that remained ‘statistically’ significant ($p < .05$) after applying the
427 more conservative Holm adjustment for multiple tests are indicated in bold in the table.

428 *Correlation Matrix showing Pearson’s Correlation Coefficients (r) unadjusted for multiple comparisons. Values*
429 *in bold indicate that correlation coefficient remained significant after applying Holm’s correction for pairwise*
430 *associations.*

431

	1	2	3	4	5	6	7
1. RCADS-25 Total	-						
2. Anxiety	.93**	-					
3. Depression	.84**	.59**	-				
4. IBS victim scale	.46*	.52*	.25	-			
5. Stuttering Severity	.32	.36*	.18	.38*	-		
6. SES (IDACI)	-.17	-.13	-.18	.14	-.08	-	
7. Age (months)	.41*	.36*	.40*	.29	.20	.11	-

432 Note: ** $p < .01$, * $p < .05$. Correlation coefficients based on total sample size ($n = 35$) for all variables, except
433 IDACI ($n = 30$) due to missing data. IBS = Illinois Bullying Scale; SES = socio-economic status; IDACI =
434 Income Deprivation Affecting Children Index rank

435

436 **Anxiety subscale scores.** A moderate, positive correlation was found between anxiety
437 scores and IBS victim scores ($r = 0.52$, 95% CI [0.23, 0.73], $p < .01$, $n = 35$), suggesting that
438 the more bullying a child reported, the higher their anxiety score. This effect remained
439 statistically significant following application of Holm's adjustment. Positive correlations
440 were also found between anxiety scores and self-perceived stuttering severity, ($r = 0.36$,
441 95%CI[0.03, 0.62], $p = .04$, $n = 35$) as well as anxiety symptoms and age ($r = 0.36$, 95%CI
442 [0.02, 0.62], $p = .04$, $n = 35$).

443 **Depression subscale scores.** There was a moderate positive correlation between
444 depression and age ($r = 0.40$, 95%CI [0.07, 0.64], $p = .02$, $n = 35$) indicating that depression
445 symptoms increased as children got older. Weak correlations were obtained between
446 depression scores and stuttering severity ($r = 0.18$, 95%CI [-0.17, 0.48], $p = .31$, $n = 35$) and
447 IBS victim scores ($r = 0.25$, 95%CI [-0.09, 0.54], $p = .15$, $n = 35$). Here we also see very
448 wide confidence intervals that include zero.

449 **Bullying and stuttering severity.** Two thirds of children (65.7%) reported that they
450 had experienced bullying over the past month, although scores indicated frequency of
451 victimization varied considerably. A moderate, positive correlation was found between
452 bullying score and stuttering severity ($r = 0.38$, 95%CI [0.06, 0.63], $p = .02$, $n = 35$), such
453 that higher self-perceived stuttering severity was associated with more bullying.

454 ***Relationship between family history variables and RCADS-25 symptom scores***

455 Mean scores by family history group are presented in Table 4. Two sample t-tests
456 were performed to compare subscale scores in children who reported a positive ($n = 18$) or
457 negative ($n = 16$) family history of stuttering.

458 *Table 4: RCADS-25-C subscale scores for family history variables (categorical variables)*

RCADS-25 subscales	Anxiety subscale score		Depression subscale score	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Negative family history of stuttering (n=16)	9.25	5.16	6.19	4.34
Positive family history of stuttering (n=18)	10.56	6.58	5.67	3.63
Negative family history of mental health (n=17)	7.35	4.29	4.0	3.26
Positive family history of mental health (n=18)	12.0	6.48	7.5	3.81

459

460 There was no significant difference in anxiety scores between children who reported a
 461 family history of stuttering and those who did not ($t(31.54) = -0.65, p = .52, 95\%CI [-5.42,$
 462 $2.81]$). Similarly, groups did not differ in depression scores ($t(29.42) = 0.38, p = .71, 95\%CI[-$
 463 $2.30, 3.34]$).

464 **Regression Analyses**

465 Due to the small sample size, it was not possible to include all hypothetical predictors
 466 in the regression models. When pre-registering this study, we stated that independent
 467 variables that significantly correlated ($r = 0.40$) with the outcome variable would be included
 468 in the regression model. As indicated in the amended pre-registration, four variables (family
 469 history of mental health, IBS score, stuttering severity and age) had been identified as priority
 470 variables for inclusion, based on theoretical rationale, should the sample size fall below the
 471 anticipated 100 participants. Additionally, the continuous variables were significantly
 472 associated with at least one of the outcome variables (anxiety or depression subscale score).
 473 We therefore included these four variables in our statistical model.

474 There was a moderate positive correlation between child anxiety and depression
 475 subscale scores ($r = 0.59, 95\% CI [0.32, 0.77], p < .01, n = 35$), which would suggest that
 476 children who reported high anxiety symptoms also tended to report high depression

477 symptoms. This finding is consistent with the broader mental health literature, which has
478 indicated anxiety and depression are highly correlated in adolescents and adults (Brady &
479 Kendall, 1992; Lewinsohn et al., 1997). As these variables were only moderately correlated,
480 the outcome variables for the regression analyses were the anxiety and depression subscale
481 scores, rather than the total RCADS-25-C score. Table 5 presents the results of the multiple
482 regression models for anxiety and depression scores.

483 *Anxiety scores*

484 The multiple regression model, which included all four predictors (model 1), was a
485 significant fit to the data ($F(4, 30) = 5.92, p = .001, \text{adj. } R^2 = 0.37$), accounting for
486 approximately 37% of the variance in anxiety scores. Family history of mental health was
487 found to significantly predict anxiety scores ($\beta = 3.87, t = 2.32, p = .03$), suggesting that a
488 positive family history of adverse mental health is associated with a 3.87 point increase in
489 anxiety scores. Observation of the standardized regression coefficients indicates that bullying
490 is also an important factor when considering risk for anxiety in this population ($\beta = 1.82, t =$
491 $1.95, p = .06$). Removing age from the model indicated that only IBS scores significantly
492 predicted anxiety scores in this model ($\beta = 2.27, t = 2.43, p = .02$). This model (model 2) was
493 also a significant fit to the data ($F(3,31) = 6.34, p = .002, \text{adj. } R^2 = 0.32$), accounting for 32%
494 of the variance in anxiety scores. Comparison of these two models indicated that the simpler
495 model (model 2) was a better fit to the data ($p=.08$)

496 *Depression scores*

497 The multiple regression model with depression as the outcome variable and family
498 history of mental health and age entered as predictor variables, was a significant fit to the
499 data ($F(2, 32) = 10.44, p < .001, \text{adj. } R^2 = 0.36$), accounting for 36% of the variance in
500 depression symptom scores. Both family history of mental health ($\beta = 3.79, t = 3.54, p < .01$)
501 and age ($\beta = 1.72, t=3.17, p < .01$) significantly predicted depression scores, with a positive

502 family history of adverse mental health and a one month increase in age each associated with
 503 a 3.79 point and 1.72 point increase in subscale scores, respectively.

504 Table 5: *Multiple regression models for anxiety and depression symptom scores (RCADS-25-C).*
 505 *Standardized coefficients for continuous predictors are mean-centred and scaled by 1 standard*
 506 *deviation.*

Model	Effect	Standardized coefficients			
		β	SE	<i>t</i> -value	<i>p</i>
Anxiety Models					
Model 1	(Constant)	7.75	1.17	6.61	< .01
	Family history of mental health	3.87	1.67	2.32	.03
	Stuttering severity	0.93	0.88	1.05	.30
	IBS score	1.82	0.93	1.95	.06
	Age (months)	1.56	0.86	1.81	.08
Model 2	(Constant)	8.01	1.21	6.65	< .01
	Family history of mental health	3.37	1.71	1.97	.06
	Stuttering severity	1.10	0.91	1.21	.24
	IBS score	2.27	0.93	2.43	.02
Depression Model					
Model 1	(Constant)	3.85	0.76	5.04	< .01
	Family history of mental health	3.79	1.07	3.54	< .01
	Age (months)	1.72	0.54	3.17	< .01

507

508

Discussion

509 The aim of the present study was to investigate the extent to which contextual, child,
 510 and family factors may be associated with self-reported anxiety and depression symptoms in
 511 children and adolescents who stutter.

512 We first asked whether family history of mental health conditions was associated with
513 increased child-reported symptoms of anxiety or depression. In line with our hypotheses,
514 participants with a family history of mental health difficulties had significantly higher anxiety
515 and depression scores. This is an important finding highlighting the need for future studies
516 comparing anxiety in children who do and do not stutter to account for such familial factors.
517 This would help to tease apart the extent to which the experience of stuttering contributes to
518 anxiety symptoms relative to other putative risk factors for adverse mental health. Another
519 consideration is whether parent-reported anxiety relates to the child's communication
520 challenges or is a pre-existing, longer term problem. For example, it may be that heightened
521 anxiety symptoms may be explained by the genetic risk for anxiety and stuttering per se is not
522 a contributing factor. Alternatively, having a child with communication difficulties may
523 increase parent anxiety, which could have an impact on the child.

524 Next we asked whether family history of stuttering acted as a protective factor,
525 attenuating child-reported symptoms of anxiety and depression. Contrary to our predictions,
526 child-reported symptom scores on anxiety and depression subscales did not differ according
527 to family history of stuttering. Finally, we asked about the role of bullying in symptom
528 severity of anxiety and depression for young people who stutter. Anxiety symptom scores
529 were moderately correlated with IBS scores; this association was statistically significant even
530 after adjustment for multiple comparisons. Anxiety symptom scores were also moderately
531 correlated with stuttering severity and age. Although the p-value did not reach conventional
532 levels of statistical significance after adjustment for multiple comparisons, they still represent
533 a medium effect size (Cohen 1988, 1992). The small sample size and heterogeneous profiles
534 in this study likely affected our ability to detect significant effects, and therefore there is need
535 for replication in a larger sample. It was not possible to conduct the proposed mediation

536 analysis as our sample size was too small, and therefore this remains a question for future
537 research.

538 In sum, the main finding from this study is that family history of adverse mental
539 health is an important factor when assessing risk for internalizing problems in this population.
540 The anxiety model accounted for 37% of the variance in scores. Although, when age was
541 removed from the model, the bullying score was found to be the only significant predictor of
542 anxiety scores. This may suggest an interaction between these variables, and that effects may
543 differ across age. The present study design does not permit examination of these interactions,
544 but there is a need for future studies that employ larger samples and wider age ranges to
545 explore how these contextual, child, and family factors interact at different ages.

546 The depression model accounted for 36% of the variance in scores and indicated that
547 both family history of mental health and age significantly predicted scores. As evidenced in
548 the literature, prevalence of depression increases with age in the general population, and
549 therefore both of these putative risk factors for depression in the non-stuttering population are
550 also reflected in our sample.

551 These findings have both theoretical and clinical implications. First, future research
552 comparing anxiety in children who do and do not stutter should account for the influence of
553 family and contextual factors that may moderate the association between anxiety, depression,
554 and stuttering. This would help to enhance our understanding of the relationship between
555 stuttering and internalizing problems, and the extent to which the experience of stuttering
556 contributes to risk for elevated anxiety and depression relative to putative risk factors
557 associated with internalizing problems. Second, our findings point to the need for clinicians
558 to be alert to both child- and broader familial factors associated with adverse mental health
559 when examining risk for poor psychosocial outcomes in children who stutter, to inform
560 ongoing management.

561 **Family history of mental health and stuttering**

562 In the present study, children who had a family history of mental health problems
563 reported significantly higher anxiety and depression symptom scores compared to children
564 who did not disclose a family history of adverse mental health. This is not particularly
565 surprising given that family history of both anxiety and depression are acknowledged risk
566 factors for development of both in children (van Santvoort et al., 2015). Parental anxiety and
567 depression are associated with development of internalizing symptoms and disorders in
568 children as a result of both genetic and environmental factors that can have both a direct and
569 indirect impact on children's emotional development (Bayer et al., 2006; Smith, 2004;
570 Thapar et al., 2012). Nonetheless, in the present sample all but one child reported symptoms
571 that did not reach clinical threshold, perhaps indicating that at this age, there is not an
572 association between family history of adverse mental health and clinical levels of
573 internalizing symptoms.

574 There were no significant differences in mean scores of participants who reported a
575 family history of stuttering and those who did not. We hypothesized that increased experience
576 of the condition would facilitate greater understanding and parental support, which may help
577 to offset any adverse effect on mental health. The current findings do not support the
578 hypothesis that having a parent who stutters acts as a protective factor in the psychosocial
579 impact of stuttering on young people. However, it must be borne in mind that positive family
580 history could include immediate and extended family members, affecting the extent to which
581 children may have had direct experience of stuttering. Our data cannot tell us anything about
582 self-perceptions of parents who stutter.

583 **Bullying victimization**

584 The mean IBS score indicated reasonably low frequency of bullying victimization in
585 this sample, which seems to contrast with previous studies that found increased risk of

586 bullying in children and adolescents who stutter (e.g. Blood & Blood, 2004; Blood & Blood,
587 2007; Langevin et al., 1998). This may relate to the bullying tool used in the present study,
588 which was not designed to tap the unique experiences of children who stutter. Another
589 possibility is that the pandemic disrupted school attendance and therefore perhaps asking
590 children to reflect on bullying experiences over the past month did not capture typical peer
591 experiences as they were not attending school. Nevertheless, two thirds of children reported
592 that they had experienced bullying behavior over the last month, with varying frequency.

593 A significant, moderate correlation was observed between self-reported anxiety scores
594 and IBS scores, which is consistent with findings of previous research in the stuttering
595 population (Blood & Blood, 2007; Cook & Howell, 2014). It is well documented that
596 individuals who experience bullying are at heightened risk of adverse mental health,
597 particularly elevated anxiety and depression, in the general population (Moore et al., 2017;
598 Reijntjes, et al., 2010; Scholer et al., 2018). However in the present study, depression
599 symptom scores were not correlated with bullying scores.

600 It seems reasonable that one may expect there to be an association between risk of
601 bullying and stuttering severity given previous studies showing peer perceptions become
602 more negative as stuttering severity increases (Bloodstein et al., 2021) and the fact that the
603 overt speech characteristics may be more noticeable. On the other hand, Langevin et al.
604 (1998) found that frequency of bullying was not causally related to stuttering severity using a
605 tool designed to examine teasing and bullying experienced by children who stutter
606 specifically. We found a moderate correlation between self-reported stuttering severity and
607 victim subscale scores, although this finding requires replication in larger scale studies.

608 **Stuttering severity**

609 Participants varied considerably in ratings of self-perceived severity. Stuttering
610 severity was correlated with anxiety, but not depression, symptom scores. However,

611 following adjustment for multiple comparisons, this was no longer significant, which is
612 consistent with many published studies that have similarly reported no significant association
613 between stuttering severity and anxiety in children and adolescents (see Bernard et al., 2022).
614 For example, previous investigation of anxiety in a larger sample ($n = 96$) of similarly aged
615 children who stutter (9 – 14 years), did not find a significant association between %SS and
616 state ($r = 0.115$) or trait ($r = 0.045$) anxiety (Craig & Hancock, 1996).

617 Nevertheless, the size of the effect is still clinically important, which leads us to
618 tentatively suggest that, based on the present sample, the more severe a child perceived their
619 stutter to be, the more anxiety symptoms they reported. Further examination of the
620 association between stuttering severity and anxiety, involving a larger sample and different
621 measures of stuttering severity, is needed.

622 Stuttering frequency is not the only factor associated with severity, although it often is
623 a significant contributor (Manning & DiLollo, 2018). Manning and Beck (2013) argued that
624 measures of the overt features of stuttering, such as frequency, do not account for the broader
625 experience of stuttering, and suggested this may explain the lack of association between
626 stuttering and anxiety reported in studies. In their study, they found that stuttering severity
627 measured by %SS and the SSI was not associated with anxiety in adults who stutter ($n = 50$),
628 but scores on the Overall Assessment of the Speaker's Experience of Stuttering (OASES)
629 were associated with anxiety (Manning & Beck, 2013). The OASES is an alternative measure
630 of stuttering severity in that it assesses the broader impact of stuttering. Interestingly,
631 Manning and Beck (2013) found no significant association between depression and any
632 measure of stuttering severity (%SS, SSI, OASES), which is consistent with our findings.

633 In the present study, we utilized a self-report rating scale of stuttering severity guided
634 by the rationale that it might offer greater insight into the child's perceptions of their own
635 speech. While this is not an objective measure of frequency, the extent to which a child

636 perceives their speech to be dysfluent may be associated with self-reported experience of
637 anxiety symptoms. Nonetheless, inclusion of the OASES would have been a valuable
638 addition to the present study, and permitted comparison of the association between anxiety
639 and stuttering severity measured in two different ways. Limitations associated with data
640 collection during the pandemic meant that we opted for a shorter, simpler measure to
641 minimize missing participant data.

642 Results of the regression analyses indicated that stuttering severity did not
643 significantly predict anxiety subscale scores. These findings contrast with a larger study ($n =$
644 102) involving adolescents seeking treatment for stuttering, which found that higher self-
645 rated stuttering severity predicted higher anxiety and internalizing problems (Iverach et al.,
646 2017b). One possible reason for our divergent findings may relate to sample selection. The
647 fact that participants were seeking treatment may suggest that their stutter had a greater
648 functional impact, influencing perceived severity and self-reported anxiety. It should also be
649 borne in mind that the study by Iverach and colleagues (2017b) comprised an older sample
650 (11 – 17 years). The length of time one has lived with a stutter may influence the association
651 between stuttering severity and internalizing symptoms. Therefore, future studies involving
652 community samples may provide further insight into factors that predict internalizing
653 symptoms.

654 **Stuttering severity, bullying and internalizing symptoms**

655 This study also aimed to address the question of whether bullying mediates any
656 relationship between stuttering severity and anxiety and/or depression symptoms. This
657 question could not be investigated as we did not reach a sufficient sample size, and our study
658 design lacked the necessary temporal elements to reliably estimate a mediation effect.
659 Instead, larger, and preferably longitudinal, studies are needed to adequately address this
660 research question. The present results do suggest that bullying victimization likely contributes

661 to heightened anxiety symptoms, although there is a need for future research to consider how
662 these contextual and child factors interact over time. Previous research has indicated that
663 bullying reported in this population is often related to an individuals' stutter (Erikson &
664 Block, 2013; Langevin et al., 1998). Furthermore, population studies of non-stuttering
665 cohorts have shown bullying victimization to be associated with anxiety and depression,
666 therefore these findings highlight the need for families, teachers and clinicians to be aware of
667 the elevated risk for adverse mental health in children who stutter who are subjected to
668 bullying.

669 **Clinical implications**

670 The present findings indicate there is a need for clinicians to take into account family
671 and contextual factors in assessment and management of children who stutter, as well as child
672 factors. In particular, clinicians need to be aware of the elevated risks for internalizing
673 problems associated with family history of adverse mental health, and possibly bullying
674 victimization, when planning ongoing management. Mental health screening may indicate
675 need for multidisciplinary involvement, such as referral to Psychology Services, or indicate a
676 need to incorporate psychological therapies to help offset development of anxiety in children
677 identified as at risk. Consideration of risk for internalizing problems may be particularly
678 pertinent among adolescents given that prevalence of anxiety and depression increases with
679 age in non-stuttering adolescents, and age was a significant predictor of depression in the
680 present study. However, longitudinal community studies are needed to improve our
681 understanding of how these child, family, and contextual factors interact with each other
682 across development.

683 While appropriate clinical management may help to offset risk for internalizing
684 problems associated with familial factors, initiatives which address contextual factors found
685 to detrimentally effect emotional well-being are also worthy of consideration. In particular,

686 our findings underscore the role of schools, health services and charities in alleviating risk of
687 bullying in young people who stutter. This could involve, for example, anti-bullying
688 initiatives, increasing awareness and understanding about stuttering in society and efforts to
689 tackle stigma. Programs focused on stuttering education and bullying awareness have shown
690 potential for facilitating positive changes in peer attitudes towards children who stutter and
691 bullying (e.g. Langevin et al., 2012).

692 **Limitations**

693 Most participants in this study completed the questionnaire during the global
694 coronavirus pandemic (from March 2020), which must be taken into consideration when
695 interpreting the findings. Research examining the impact of the pandemic on child and
696 adolescent mental health has reported a mixture of negative and positive experiences, which
697 are likely associated with a number of risk and protective factors (Panchal et al., 2021). For
698 example, a recent systematic review has shown female sex and adolescence (13 – 15 years)
699 were significantly associated with elevated anxiety and depression during lockdown (Panchal
700 et al., 2021). Social stresses and adverse events are known risk factors for development of
701 anxiety and depression in young people. It should be recognised that some of these
702 environmental risk factors will have been experienced by an unprecedented number of
703 families during the pandemic, for example bereavement, family discord, financial pressures
704 and broader social stressors. In spite of the impact of the pandemic on everyday life, our
705 sample did not show clinical levels of anxiety or depression. Nevertheless, symptom scores
706 reported in the present analyses are likely confounded by the experiences of the global
707 coronavirus pandemic, and as such are not comparable with population norms.

708 We had intended to recruit 100 participants to this study, which should have permitted
709 robust analysis of the original seven predictors. However, recruitment was challenging given
710 the pandemic context and the final sample size was comparatively smaller, resulting in

711 reduced statistical power. It is important to note the wide confidence intervals associated with
712 many of the correlation coefficients in our analyses, suggesting a reasonable amount of
713 variation within the group. The small sample size may have resulted in overestimation of the
714 effect size (Funder & Ozer, 2019), and therefore there is need for replication in larger studies.
715 The present sample may also be affected by selection bias relating to participant treatment
716 status and accessibility of an online study. First, we recruited through word of mouth and
717 digital advertisement of the study, predominantly through the charity's social media channels.
718 All of the children had accessed previous Speech and Language Therapy and therefore may
719 have been more aware of the psychosocial impact of stuttering on children's mental health
720 and well-being, and this may also have been the focus of therapy. Second, an online
721 questionnaire requires access to a computer and stable internet connection preferably at
722 home. The study therefore automatically excluded those participants who could not access an
723 online study. Third, families who were experiencing unprecedented stresses due to the novel
724 pressures of the pandemic may have been less likely to participate, skewing our sample.

725 Finally, recent studies have found that children and adolescents who stutter who have
726 co-occurring neurodevelopmental conditions present with elevated anxiety and emotional
727 difficulties compared to those who stutter without additional difficulties (Blood et al., 2007;
728 Briley et al., 2019; Smith et al., 2017). A limitation of the present study is that presence of
729 co-existing diagnoses amongst participants is unknown. This will be an important variable to
730 include in future studies that employ community samples of children and adolescents who
731 stutter as this can inform our understanding of factors that influence anxiety and possibly
732 depression in this population.

733 **Conclusion**

734 The present study aimed to evaluate the association between anxiety and depression
735 symptoms and several child, familial, and contextual factors in a cohort of children who

736 stutter. Family history of adverse mental health was a significant predictor of anxiety and
737 depression symptoms. Age was also found to significantly predict depression scores. In spite
738 of the limitations, particularly the confound of the COVID-19 pandemic on population
739 mental health, these findings contribute further evidence that there is a need for clinicians to
740 consider a number of family, child, and contextual factors in risk for anxiety in school-age
741 children who stutter. This finding offers an opportunity for schools and clinicians to
742 champion anti-bullying initiatives that could help prevent the negative psychosocial impact of
743 bullying victimization in stuttering. Future research is needed to explore further factors
744 associated with elevated anxiety and depression in children and adolescents who stutter, and
745 how these factors may interact across development, using longitudinal population studies.

746

747 **Acknowledgements**

748 We gratefully acknowledge the support provided by Action for Stammering Children
749 Charity and the families who participated in this study.

750 **Data availability statement:**

751 The datasets generated and analyzed during the current study are available from the
752 corresponding author on reasonable request. Information about this study, including analysis
753 scripts, will be made available on the OSF pre-registration page: <https://osf.io/cr392/>

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