Received: 21 March 2022 | Accepted: 3 April 2023

DOI: 10.1111/1460-6984.12887

International Journal of Language & Communication Disorders

REVIEW

Psychosocial features of stuttering for school-age children: A systematic review

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Funding information
Australian Government Research Training Program Scholarship

Abstract

Background: Contemporary clinical and empirical perspectives indicate that management of the psychosocial features of stuttering is fundamental for effective treatment. Interventions that improve psychosocial outcomes for school-age children who stutter are, therefore, needed.

Aims: This systematic review identifies what psychosocial outcomes have been explored in existing school-age clinical research, the measures used and the potential treatment effects. This will provide guidance for developing interventions that reflect contemporary perspectives of stuttering management.

Methods & Procedures: A total of 14 databases and three conference proceedings were searched for clinical reports of psychosocial outcomes of children aged 6–12 years. The review did not include pharmacological interventions. Psychosocial measures and outcomes were analysed in each study based on data recorded pre-treatment, immediately post-treatment and for any follow-up assessments.

Main Contributions: Of the 4051 studies identified from the databases, a total of 22 studies met criteria for inclusion in the review. From these 22 studies, the review identified four prominent psychosocial domains that have been explored in school-age clinical research to date: Impact of stuttering, communication attitude, anxiety and speech satisfaction. These domains vary in measurement and effect sizes. Two behavioural treatments were associated with anxiety reduction, even though they did not contain anxiolytic procedures. No evidence of potential treatment effects emerged for communication attitudes. Quality of life—an important psychosocial domain pertinent to health economics—did not feature in school-age clinical reports.

Conclusions & Implications: The psychosocial features of stuttering need to be managed during the school years. Three psychosocial domains—impact of stuttering, anxiety and speech satisfaction—show evidence of potential treatment effects. This review provides direction for future clinical research so that

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speech–language pathologists can effectively and holistically manage school-age children who stutter.

KEYWORDS
psychosocial outcomes, school-age, systematic review

What this paper adds

What is already known on the subject

- Elevated levels of anxiety are apparent for children and adolescents who stutter. Therefore, the need to assess and manage psychosocial features of stuttering are expertly regarded as clinical priorities. Clinical trials of such psychosocial features of stuttering for children aged 6–12 years are not well advanced and, therefore, do not reflect current best practice management of this disorder.

What this study adds to existing knowledge

- This systematic review identifies four different psychosocial domains measured and reported in the literature for school-age stuttering management. For three psychosocial domains, some evidence of potential treatment effects emerged with participant numbers greater than 10: Impact of stuttering, anxiety and speech satisfaction. Though treatment effect sizes varied, there is a suggestion that cognitive behaviour therapy can improve anxiety of school-age children who stutter. There is also suggestion that two other behavioural treatments can improve anxiety of school-age children who stutter.

What are the potential or actual clinical implications of this work?

- Given the essential need for school-age children who stutter to receive management of any speech-related anxiety they may experience, it would be productive to discover in future clinical research what interventions could contribute to that goal—behavioural or psychosocial, or both. This review reveals that cognitive behaviour therapy, and other behavioural treatments, are associated with anxiety reductions. Such approaches should be considered for future clinical trial research to help advance the evidence base for managing school-age stuttering.

BACKGROUND AND AIMS

The psychosocial impact of stuttering

Stuttering involves speech disruptions, including repeated movements, fixed postures and superfluous behaviours. Because of these disruptions, adults who stutter generally have reduced verbal output of approximately a third less than their peers (Johnson, 1961; Spencer et al., 2009) and restricted use of grammar (Lee et al., 2015; Spencer et al., 2005, 2009). There is some evidence that these grammatical limitations are present in 7-year-olds (Weiss & Zebrowski, 1994).

The psychosocial impact of the disorder includes psychological issues, which are predominantly anxiety related. Social anxiety disorder affects approximately 60%

of adolescents and adults seeking stuttering treatment (Blumgart et al., 2010; Gunn et al., 2014; Iverach, O'Brian, et al., 2009; Menzies et al., 2008). One report indicated that 24% of children aged 7–12 years who presented at clinics were diagnosed with social anxiety disorder (Iverach et al., 2016). A recent systematic review and meta-analysis concluded that children and adolescents who stutter have elevated anxiety symptoms compared with controls (Bernard et al., 2022). Given this association between stuttering and anxiety, it is unsurprising that people who stutter also report experiences of reduced quality of life based on standard medically oriented instruments (Craig et al., 2009; Koedoot et al., 2011).

Consistent with this body of literature, children who stutter have heightened negative attitudes about their communication by 7 years of age, compared with non-stuttering peers (Vanryckeghem et al., 2001), and this pattern continues to worsen with age (Guttormsen et al., 2015). Adolescents who stutter are more likely to report depressive symptoms and suicide ideation than their peers (Briley et al., 2019, 2021), although, this effect was not reported in a meta-analysis by Connery et al. (2021). Considering the clinical importance of this matter, it seems essential for an attempt to replicate Briley et al.'s (2021) findings. School-age children who stutter are socially rejected more often than non-stuttering children and are less likely to be chosen as leaders (Davis et al., 2002). They are also teased more often than peers (Hugh-Jones & Smith, 1999; Langevin & Bortnick, 1998; Langevin & Hagler, 2004), and more than 60% will experience bullying at school (Blood & Blood, 2004, 2007; Langevin, 2000, 2015; Nippold, 2012). Such negative peer reactions can lead to social exclusion (Davis et al., 2002; Hayhow et al., 2002; Hugh-Jones & Smith, 1999).

Clinical management and psychosocial features of stuttering

Adults who stutter may require clinical assistance with either the behavioural or psychosocial features of the disorder, or both (Connery et al., 2021; Salvo & Seery, 2021; Yaruss et al., 2002). Procedures for behavioural control of stuttering have been developed and evaluated with clinical trials since the early 1970s. For adults, this body of literature on behavioural interventions has produced more than 30 clinical trials. These trials deal with variants of speech restructuring for behavioural control of stuttering, with one systematic review reporting that the evidence for this style of treatment is stronger than any other (Brignell et al., 2020). For children, eight randomized controlled trials found the Lidcombe Program to be effective at reducing stuttering in pre-school children (Brignell et al., 2021). One of those trials compared the Lidcombe Program with RESTART-DCM treatment, and concluded non-inferiority (de Sonneville-Koedoot et al., 2015).

A general awareness of the clinical need to manage one of the key psychosocial features of stuttering—anxiety—developed more recently, though, with scholars in the 1980s failing even to recognize any connection between anxiety and stuttering (for a review, see Menzies et al., 1999). Some decades later, that situation had changed, with emerging evidence of such a connection (Iverach et al., 2011) culminating in the recent systematic review (Bernard et al., 2022) showing elevated anxiety levels for children and adolescents who stutter. Reflecting this field development, another recent survey (Connery et al., 2021) of 35 clients and 13 speech pathologists indicated, for adults, a priority for 'management of communication-related anxiety' (9) above 'working on speech directly to reduce the amount of stuttering' (10). This preference might reflect the well-known limitations of speech restructuring, which include unnatural sounding speech and constant vigilance over speech production, and high risk of post-treatment relapse (for an overview, see Onslow, 2022). Arguably, this is a justifiable priority, considering that the presence of a mental health disorder has been shown to impair speech treatment outcomes (Craig & Hancock, 1995; Iverach, Jones et al., 2009).

During the period in the 1970s in which behavioural treatments were being developed and evaluated, there was limited progress in developing psychological interventions for the disorder, although it was common practice to incorporate components of cognitive behaviour therapy within speech structuring treatments (Blood, 1995; Boberg & Kully, 1994; Craig et al., 1987; Fry et al., 2009; Nielson, 1999). To date, there are signs of progress with one experimental report of exposure therapy (Scheurich et al., 2019), two conference reports (Ezrati-Vinacour et al., 2007; McColl et al., 2001), and five clinical trials of an entire cognitive behaviour therapy treatment for stuttering (Gunn et al., 2019; Helgadóttir et al., 2014; Menzies et al., 2008, 2009, 2019).

Existing reviews of the psychosocial impact of stuttering during childhood

Given the consistent evidence of psychosocial impacts early in life for children who stutter shortly after the pre-school years, a foreseeable direction for the field is the development of psychosocial interventions for school-age children. Such interventions would provide the best chance to prevent further development of such problems later in life. Some systematic reviews have explored psychosocial treatment outcomes for that age group. Sidavi

and Fabus (2010) reviewed treatment approaches for preschool and school-age children, which included studies that evaluated attitudes and emotions of participants. However, studies were discussed in terms of the outcome measures used and not the treatment effects. A systematic review by Bothe et al. (2006) examined studies measuring changes in stuttering frequency, as well as a range of social, emotional and cognitive outcomes. Of the 39 studies included in that review, 11 reported social, emotional or cognitive measures, but only two of these studies involved school-age participants (Craig et al., 1996; Hancock et al., 1998). Those two studies investigated short- and long-term effects of a smooth speech programme and electromyography feedback to treat stuttering with participants aged 9–14 years. Although robust data were reported about short- and long-term outcomes of state and trait anxiety, school-age children were not differentiated from adolescent participants.

In a more contemporary meta-analysis, Baxter et al. (2015, 2016) reviewed a range of stuttering interventions across the lifespan. Of the 112 studies that met criteria for inclusion, 40 featured school-age children; and of these, only one (Laiho & Klippi, 2007) involved a measure of psychosocial treatment outcomes. This study assessed avoidance behaviours, but no post-treatment data were recorded. More recently, Mallick et al. (2021) conducted a scoping review of the intervention literature for school-age children for the period 1982–2016, which included 10 studies. They reported psychosocial outcome data for one treatment study (Andrews et al., 2016) for which there was no discussion of post-treatment changes. It is not clear from this review whether other studies included psychosocial measures.

The present review

The psychosocial features of stuttering require clinical management during the school-age years, particularly for social anxiety. Systematic reviews of the topic are useful guides for the planning of such research in the field. However, reviews available at present are limited for this purpose: They have not focused exclusively on school-age children, many do not address psychosocial assessment or management, and hence the pre- to post-treatment outcomes for psychosocial domains are not well documented. Consequently, the present systematic review answers the following questions about psychosocial outcomes for school-age children who stutter to provide some guidance for future clinical research with this age group:

- What are the broad categories of psychosocial outcome domains reported?
- How are the outcome domains measured?
- What evidence is there for any potential treatment effects?
- What treatments are associated with potential effects?

METHODS

Protocol registration

A review protocol was registered with PROSPERO on 6 November 2020 (reference ID CRD42020206573).

Study inclusion

The present review did not limit the search-by date or study design. The studies included met the following criteria:

- The studies were written in English.
- The studies focused on developmental stuttering.
- The studies reported on non-pharmacological interventions.
- Participants were aged between 6 and 12 years at the time of recruitment.
- If other age groups were reported, studies were only included if data for participants aged between 6 and 12 years could be extracted.
- A change in at least one psychosocial domain was measured with an outcome.
- Pre- and post-treatment data were reported.
- Data were reported numerically, not graphically.

We included participants with comorbid conditions provided that the diagnosis of stuttering was developmental and not acquired from a secondary illness or injury.

Search methods

The search methods reported here capture clinical reports of school-age children who stutter that measure behavioural outcomes, psychosocial outcomes, or both. The search methods are therefore the same as those detailed in Johnson et al. (2022), a companion review of interventions designed to reduce stuttering severity for school-age children. The present review used these search methods to investigate the psychosocial measures included in past clinical reports. Reported treatment effects on psychosocial domains measured were also reviewed. Searches were conducted on 28 August 2020 and 1 August 2021 using the following databases: Medline, PsychINFO, EMBASE, Scopus, Web of Science, ERIC, PubMed, CINAHL EBSCOhost, Cochrane Database of Systematic Reviews, SpeechBITE, Google Scholar, ProQuest

Dissertation and Theses, and OpenGrey. The search strategy also incorporated screening of conference proceedings from international stuttering-specific conferences: The Oxford Dysfluency Conference, the International Association of Logopedics and Phoniatrics, and the American Speech–Language–Hearing Association. The reference lists of a number of relevant reviews were also screened to ensure further available studies were captured in the present review (Baxter et al., 2015, 2016; Bothe et al., 2006; Nippold, 2012; Nye et al., 2013). The following search string was used to search the databases: (stutter* or stammer* or dysfluen* or disfluen* or nonfluen* or non-fluen*) AND (child* or 'school-age') AND (interven* or treat* or therapy* or program* or trial* or manage* or outcome*). Citations retrieved from each database were uploaded to Covidence, which is an online software program designed to screen and synthesize healthcare evidence. After 5019 duplicate studies were removed and additional studies added from conference proceedings and other reference list searching, 4051 study titles and abstracts were double screened independently by three of the authors. Two of the authors pilot-tested the search strategy and screening method on 16 studies as recommended by Li et al. (2019) in Cochrane's systematic review handbook. Any conflicts about the inclusion or exclusion of a study were discussed and resolved between reviewing authors. Full texts were then retrieved for all eligible studies that either met inclusion criteria or did not provide sufficient title and abstract information to definitively be excluded at that screening level. Reasons for exclusion at the full text screening stage were documented. The number of studies included at each level of the screening process are shown in Figure 1.

Data extraction

Two of the authors extracted data from the included studies using a protocol informed by the Consort Statement Checklist (Schulz et al., 2010). Data were collected for the following variables: authors; year of publication; study design and control conditions; total sample size and number of school-age participants; age range of school-age participants; intervention description; and outcome measures for pre-treatment, post-treatment and any follow-up assessments.

MAIN CONTRIBUTIONS

Search results

The database searches identified 4051 individual records after duplicate studies were removed. Figure 1 presents a PRISMA flowchart of the screening process as well as the number of studies excluded at each screening level. A total of 3208 studies were excluded at the title and abstract screening stage. At the full text screening stage, 843 full texts were screened, resulting in 22 studies meeting eligibility criteria for data extraction for this review. A large proportion of full texts were excluded for not reporting any empirical data ($n = 231$), or not involving a stuttering intervention ($n = 139$). Studies were also excluded if participants were not between 6 and 12 years ($n = 90$), or if the data could not be extracted exclusively for school-age children ($n = 74$). For a summary of the 22 included studies, see Appendix A.

A summary of psychosocial domains and how they were measured in the studies is presented in Appendix B. However, note that the 22 studies were not necessarily designed to modify the psychosocial domains measured by the instruments listed in Appendix B. Some studies measured several psychosocial domains. A summary of the short- and long-term outcomes of the psychosocial domains post-treatment are presented in Appendix C. We defined short-term outcomes as the change in outcomes before to immediately after treatment. For long-term outcomes, we documented the mean change of outcomes in each study between pre-treatment and follow-up, as well as the mean difference between post-treatment outcomes and follow-up. There was considerable variation in the included studies for what constitutes long-term: the period between post-treatment and follow-up assessments is indicated in Appendix C. This period ranges from 1 to 12 months post-treatment. Of the 22 included studies, three reported outcomes 12 months post-treatment. Four studies reported no treatment effects for psychosocial domains after treatment, and 18 studies did demonstrate improvements, ranging from 1.3% to 100.0% mean reduction in a psychosocial outcome.

What are the broad categories of psychosocial domains reported? How are the domains measured?

What evidence is there for any potential treatment effects? What treatments are associated with potential effects?

Of the 4051 papers that were originally screened, 65 clinical reports were discovered in the existing literature for treating this age group. This figure includes studies that either reported stuttering reductions, psychosocial domains or both. Of these 65 studies, only 22 studies measured psychosocial outcomes. This means that 43 clinical reports did not evaluate any psychosocial domains.

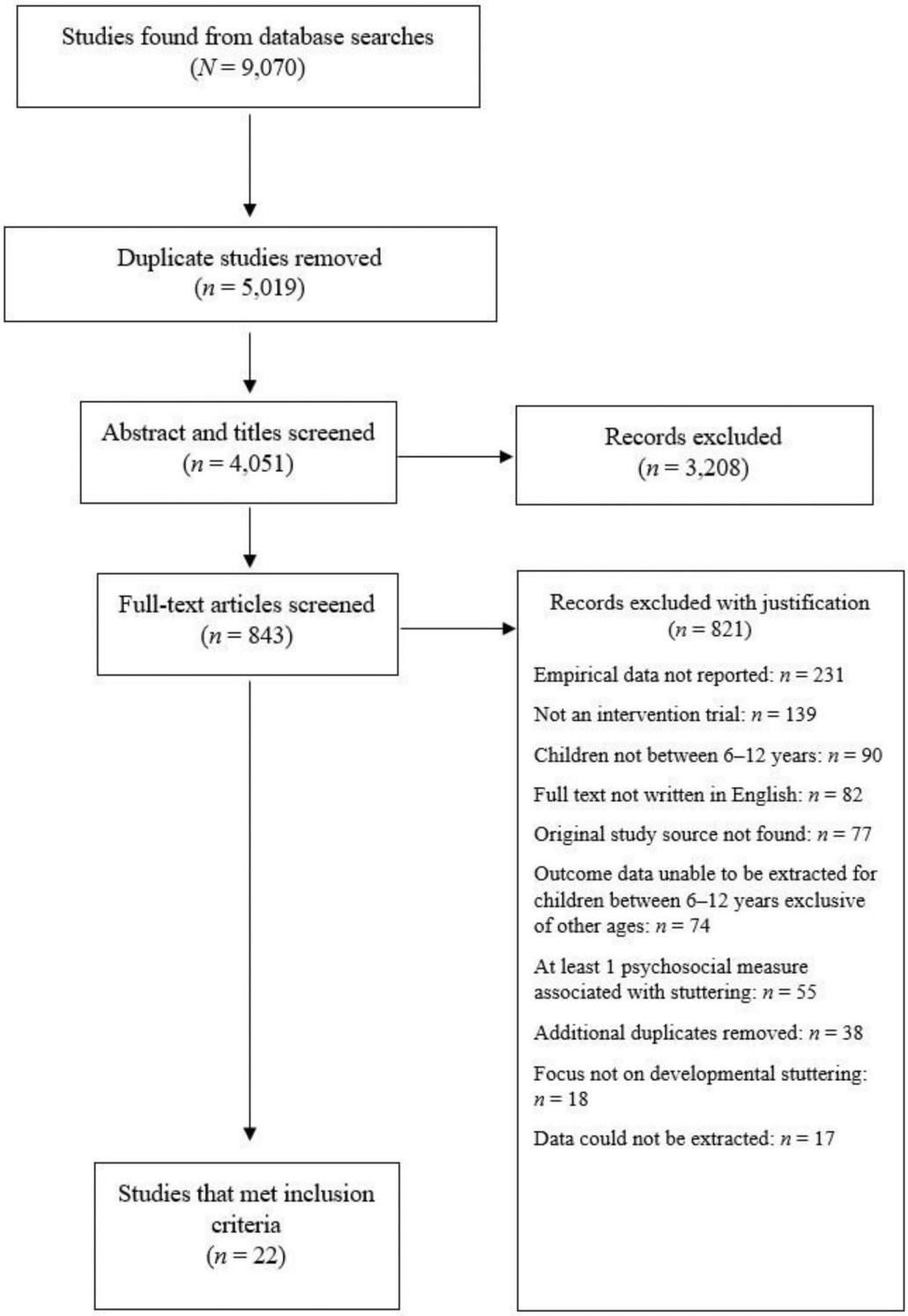


FIGURE 1 Study screening process

The treatment approaches reported in the present review varied. A total of 12 studies included a stuttering treatment with cognitive behaviour therapy components, four studies included speech restructuring in isolation, three studies did not target stuttering, two studies combined syllable-timed speech with parent verbal contingencies, and one study involved a machine-driven treatment. Of these treatment approaches, substantiative participant numbers greater than 10 were considered for potential treatment effect. Appendix C shows four studies with more than 10 children that measured impacts of stuttering using the OASES, with substantial treatment effects

reported in the range of around 20–25% improvement post-treatment, and the one follow-up reported showing an improvement of 33%. The Tomaiuoli et al. (2021) intervention was associated with positive change for the domain of stuttering impact. However, beyond that, little can be said about any individual procedures that may have contributed to that effect because it was a hybrid treatment, which involved 'principles and strategies from both the stuttering modification and fluency shaping approaches' including procedures 'to reduce fear, anxiety, and other negative emotions and thoughts about stuttering' (2). Additionally, the generalizability of the treatment process may be limited because it involved a 'theatrical path with final performance, dubbing, and radio' (2–3). However, the Andrews et al. (2012, 2016) syllable-timed speech treatment appeared to be associated with substantive reported effects on the impact of stuttering for the children. The earlier study found a mean reduction of 25.6% post-treatment for 10 participants, and the later study found a mean reduction of 33.0% at 12 months follow-up for 22 participants.

Although appearing in many studies, the domain of communication attitude appeared in only one study with a substantive number, 10 children, showing what appears to be a clinically significant worsening of communication attitude that was sustained at follow-up (Zamani et al., 2021). Worsening of communication attitude also occurred with a report involving eight children (Jelčić-Jakšić & Lasan, 2003). Both these treatment approaches incorporated speech restructuring with either operant methods or cognitive behaviour therapy components.

The psychosocial domain of anxiety also featured in many studies and showed the greatest number of test instruments of all domains. A study of 10 children using the Perceptions of Stuttering Inventory reported a 100% improvement immediately post-treatment using Precision Fluency Shaping (Webster, 1972). The appearance in one study of the Severity Measure for Generalised Anxiety Disorder for Children is striking. For a sample of 178 children, a 50% reduction in scores was reported at 3 months follow-up (Obiweluozo et al., 2021). In the same study, the Liebowitz Social Anxiety Scale for Children and Adolescents showed a similar reduction at the same follow-up. Obiweluozo et al. (2021) describe the intervention used in this clinical trial as a 'cognitive behaviour play therapy', which consisted of 12 weekly one-hour sessions. This variant of cognitive behaviour therapy for older clients produced what appear to be clinically important reductions, measured with standard anxiety psychometrics.

Syllable-timed speech is another treatment approach of interest for reducing avoidance—an aspect of anxiety. A three-point scale measuring avoidance featured in two syllable-timed speech studies. In one of these studies, 22 children reported a substantive reduction of greater than 60% at 12 months follow-up (Andrews et al., 2016) and, in the other study, 10 children reported more than 50% reduction immediately post-treatment (Andrews et al., 2012). The Andrews et al. (2016) study with 22 children also suggested this treatment approach to have a clinically important effect on speech satisfaction, measured with a simple nine-point scale. A substantiative reduction of greater than 65% at 12 months of follow-up was reported in this study, and the Andrews et al. (2012) study with 10 children also reported around a 20% reduction immediately post-treatment.

The present review, therefore, indicates three treatment approaches with substantiative participant numbers that reported improvements in psychosocial domains: speech restructuring, cognitive behaviour therapy variants and syllable-timed speech.

DISCUSSION AND CONCLUSIONS

From empirical and clinical perspectives, there is a contemporary need to develop interventions for school-age children who stutter which improve psychosocial outcomes. The purpose of this systematic review was to provide guidance for such development. A total of 22 studies were identified in the review, establishing what psychosocial domains have been investigated in clinical research for this age group, the way they were measured and potential treatment effects. For three psychosocial domains—impact of stuttering, anxiety and speech satisfaction—some evidence of potential treatment effects emerged with participant numbers greater than 10. No evidence of potential treatment effects emerged for the domain of communication attitude.

Perhaps the most informative feature of the present review is not so much what emerged but what did not emerge from the review. Given the evident need for managing psychosocial impacts of stuttering during the school years, the existing literature does not reflect this contemporary perspective. Only 22 clinical reports, to date, have measured and documented any psychosocial outcomes after treatment. Clearly, therefore, future clinical research is required to advance the evidence base for managing stuttering during the school years.

Evidence pertaining to health-related quality of life also did not emerge from the review. This domain has been featured in reports of pre-school children (de Sonneville-Koedoot et al., 2014; Reilly et al., 2013) and adults (Craig et al., 2009; Koedoot et al., 2011), measured with standard quality of life measures. Yet, no such measures appeared in the current review of treatment literature about school-age children. Related measures of speech impact and speech

satisfaction did appear and showed potential promise with treatment effects, so they are recommendable inclusions in future research. However, they are not health-related quality of life measures that are pertinent to health economics.[1] Such measures assess utility on a scale between 0 and 1, spanning perfect health and death (Drummond et al., 2015). Such analyses enable comparisons, in health economics terms, of different health interventions. Such data are useful for convincing governments of the health benefits of various interventions they may choose to fund. For future clinical research with school-age children who stutter, we recommend inclusion of such measures with standard instruments.

The domain of anxiety is obviously pertinent to school-age children who stutter, with possibly a quarter of such children diagnosable with social anxiety disorder (Iverach et al., 2016). A simple scale of situation avoidance appeared in two studies from this review, with a suggestion of its capacity to document a treatment effect (Andrews et al., 2012, 2016). As such, this psychosocial domain is recommendable for future research. However, only two standard clinical psychology measures—the Severity Measure for Generalized Anxiety Disorder for Children, and the Liebowitz Social Anxiety Scale for Children and Adolescents—featured in reports with any substantive participant numbers, suggesting treatment effects. The absence of other standard measures was notable and suggests that such measures should be considered for future research. Examples of clinical psychology measures that have featured in reports about the psychological status of school-age children who stutter include the Spence Children's Anxiety Scale (Nauta et al., 2004; Spence, 1998), the Strengths and Difficulties Questionnaire, Parent Report (Goodman, 1997, 2001), the Revised Children's Manifest Anxiety Scale (Reynolds & Richmond, 2008), and the State-Trait Anxiety Inventory for Children (Spielberg et al., 1983).

There was some suggestion in the reviewed literature—albeit scant—that cognitive behaviour therapy alone will improve the anxiety of children who stutter. That result, of course, is not surprising, and, naturally, that line of research requires continuation. But, perhaps, the most suggestive result of this review is the finding that two behavioural treatments were associated with anxiety reductions: Precision Fluency Shaping (Webster, 1972) and syllable-timed speech (Andrews et al., 2012, 2016). These suggestions emerged, in the former report, with the Perception of Stuttering Inventory, and, in the latter reports, with situation avoidance. Yet neither treatment process appears to involve any sign of anxiolytic procedures; both seem to be exclusively speech oriented. This is an unexpected and particularly encouraging result of this review. Given the essential need for school-age children to receive management of any speech-related anxiety they may experience, it would be productive to discover in future clinical research whether behavioural treatments could contribute to that goal while reducing the behavioural features of the disorder.

The results of this systematic review need to be considered in light of its limitations. Results pertain to English language publications, and it is unknown whether they can be generalized to results reported in non-English sources. Additionally, results may have been impacted by the limited coverage of the databases searched. While 13 databases were searched and were supplemented by manual searches of pertinent conference proceedings and the reference lists of pertinent review publications, it is possible that some relevant publications were not captured in the present review. It is also of note that, because the report focused on group effect sizes, we arbitrarily determined that substantive evidence of such effects could be obtained from studies with more than 10 participants.

It is essential that the psychosocial features of stuttering are managed during the school years, and this review establishes what psychosocial outcomes have been reported in research to date. Three psychosocial domains—impact of stuttering, anxiety, and speech satisfaction—show evidence of potential treatment effects. This review provides direction for future clinical research so that speech–language pathologists can effectively and holistically manage school-age children who stutter.

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ENDNOTE

[1] The OASES has a section 'Quality of Life', but 'the primary goal of the OASES test is to provide speech-language pathologists with a measure of the overall impact of stuttering on a person's life' (Yaruss & Quesal, 2016: 1). The overall OASES scores are five categories of 'Impact Score' with a corresponding 'Impact Rating' (12).

ACKNOWLEDGEMENTS

The authors would like to thank Damien Liu-Brennan for his scientific copyediting contribution to this paper.

Open access publishing facilitated by The University of Melbourne, as part of the Wiley - The University of Melbourne agreement via the Council of Australian University Librarians.

CONFLICT OF INTEREST STATEMENT

All authors certify the absence of any conflicts of interest, including specific financial interests and relationships and affiliations relevant to the subject of this paper.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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How to cite this article: Johnson, G., Onslow, M., Horton, S. & Kefalianos, E. (2023) Psychosocial features of stuttering for school-age children: A systematic review. *International Journal of Language & Communication Disorders*, 58, 1829–1845. https://doi.org/10.1111/1460-6984.12887

APPENDIX A

TABLE A1 Summary of included studies

Study design	Intervention	*N*[a]	Age range (years; months)[b]	Inclusion criteria
N = 1 data-based case study				
Harasym and Langevin (2012)	Comprehensive stuttering programme	1	8;10	None
Ryer and Poll (2020)	Hybrid smooth speech and CBT	1	8;0	None
Daniels (2012)	Stuttering modification and psychosocial targets	1	10;7	None
Murphy et al. (2007)	Modification and desensitization to stuttering, and cognitive restructuring	1	8;0	None
N > 1 data-based case study				
Northrup (2013)[c]	Self-modelling	3	7;0–12;0	Stuttering diagnosis
Fourlas and Marousos (2015)	Lexipontix program	2	9;7 and 10;11	None
Jelcic Jaksic and Lasan (2003)	Integrated group therapy programme	8	7;0–11;0	None
Valentine (2014)	Stuttering modification across direct, hybrid, and telepractice delivery	2	11;2 and 11;3	None
Single-participant pre- to post-treatment				
Gerlach et al. (2019)	FRIENDS convention	1	12;0	Participation in all conference days
Rodgers et al. (2020)	Solution-focused brief therapy	1	11;9	None
Group pre- to post-assessment				
Webster (1972)	Operant response shaping programme	10	8;0–12;0	None
Andrews et al. (2012)	Syllable timed speech	10	6;0–11;0	Age range, stuttering diagnosis, proficient English, no stuttering treatment in previous 6 months
Andrews et al. (2016)	Syllabled timed speech with verbal contingencies	22	6;00–11;0	Age range, stuttering diagnosis, proficient English, no stuttering treatment within 6 months
Zamani et al. (2021)	Syllable speech technique	10	8;2–10;11	Stuttering > 12 months, no stuttering treatment within 6 months, typical IQ, monolingual Persian speaking
Carey et al. (2014)	Camperdown program	1	12;0	Age range, and > 2 %SS
Kordell (2015)[c]	Fluency shaping	5	9;0–11;0	Stuttering > 5 %SW pre-treatment, absence of psychopathology or physical disability, and stuttering > 12 months

(Continues)

TABLE A1 (Continued)

Study design	Intervention	*N*[a]	Age range (years; months)[b]	Inclusion criteria
Abo Ras et al. (2015)	Speak freely program	Unknown	7;0–12;0	Stuttering diagnosis, neurotypical, and absence of hearing or vision loss
Berkowitz et al. (1994)	Non-traditional fluency programme focusing on changing attitudes as well as speech	5	6;2–11;7	None
Hughes and Mahanna-Boden (2017)	Intensive programme targeting education, psychosocial aspects and speech modification	3	10;0–11;0	None
Craft and Gregg (2019)	Resilience programme	3	10;6–11;8	Stuttering diagnosis by parent and SSI-4, stuttering > 3 SLD per 100 syllables, and no neurological disease
Non-randomized controlled				
Tomaiuoli et al. (2021)	MIDA-SP	22	7;1–12;0	Stuttering diagnosis, age range, stuttering rate > 4% words spoken, absence of comorbid disorder, social anxiety disorder present, no psychological treatment
Randomized controlled				
Obiweluozo et al. (2021)	Cognitive behavioural play therapy	178	6;0–12;0	Stuttering diagnosis based on ICD-10, age range, speech deficiency since childhood, stuttering rate < 4% WS, social anxiety disorder present in the last 5 years, psychotherapist engaged, no intensive care needs, and no other comorbid conditions

Notes: *N = 1 data-based case study* design refers to reports on a single treated participant.
N > 1 data-based case study design refers to reports that report a number of case studies without any group mean analysis.
Single-participant pre- to post-treatment design refers to any repeated-measures studies to understand individual variability.
Group pre- to post-treatment refers to any study that reports mean outcomes for a group before and after the intervention.
Non-randomized controlled studies reported using a control group who received no treatment.
CBT, cognitive behavioural therapy; ICD-10, International Classification of Diseases Tenth Revision; MIDA-SP, Multidimensional Integrated Differentiated Art-Mediated Stuttering Program; SLD, stuttering like disfluencies; WS, words spoken.
[a]Total number of school age participants included in the study.
[b]Age range of school age participants included in the study.
[c]Doctoral dissertation.

APPENDIX B

TABLE B1 Psychosocial domains and their assessment measures

Source	Outcome measure
Impact of stuttering	
Yaruss and Quesal (2006); Yaruss et al. (2010a)	Overall Assessment of the Speaker's Experience of Stuttering (OASES)
Yaruss et al. (2010b)	Overall Assessment of the Speaker's Experience of Stuttering—School-Age (OASES-S)
Yaruss et al. (2010c)	Overall Assessment of the Speaker's Experience of Stuttering—Teenage (OASES-T)
Yaruss et al. (2006)	Assessment of the Child's Experience of Stuttering (ACES)
Langevin and Kully (1997)	Self-rating of Effects of Stuttering—Children (SRES-C)
Communication attitude	
Brutten and Dunham (1989)	Communication Attitudes Test—Revised (CAT-R)
Brutten (1985)	Communication Attitudes Test—Croatian Version (CAT-C)
Anxiety	
Reynolds and Richmond (2008)	Revised Children's Manifest Anxiety Scale—2 (RCMAS-2)
Abdel-Khalek (1993); Abdel-Khalek and El-Nayal (1991)	Children's Anxiety Scale (CAS) & Children's Depressive Scale (CDS)
Craske et al. (2013)	Severity Measure for Generalized Anxiety Disorder—Child Aged 11–17 (SMGAD)
Masia-Warner et al. (2003)	Liebowitz Social Anxiety Scale for Children and Adolescents (LSAS)
Gullone and Taffe (2012)	Emotional Regulation Questionnaire for Children and Adolescents—Cognitive Appraisal (ERQ-CA)
Gullone and Taffe (2012)	Emotional Regulation Questionnaire for Children and Adolescents—Emotional Expression (ERQ-E)
Berkowitz et al. (1994)	Situational avoidance scale
Andrews et al. (2012, 2016); Carey et al. (2014)	Avoidance scale
Woolf (1967)	Perceptions of Stuttering Inventory (PSI)
Speech satisfaction	
Andrews et al. (2012, 2016); Carey et al. (2014)	Speech satisfaction scale
Other	
De Shazer (1985)	Solution-Focused Brief Therapy (SFBT)
Liebenberg et al. (2012)	Child and Youth Resilience Measure (CYRM-28)
Cooper and Cooper (1985)	Cooper Personalized Fluency Control Therapy Revised Assessment Digest (CPFCT-R)
Greco et al. (2011)	Child and Adolescent Mindfulness Measure (CAMM)

APPENDIX C

TABLE C1 Summary of short- and long-term psychosocial outcomes of included studies

Included studies	*n*[a]	Outcome measure	Mean % change pre- to post-treatment	Mean % change pre-treatment to follow-up	Mean difference in % change post-treatment to follow-up	Follow-up period
Impact of stuttering						
Fourlas and Marousos (2015)	2	OASES	−33.2	–	–	–
Tomaiuoli et al. (2021)[d]	11	OASES	−20.0	–	–	–
Tomaiuoli et al. (2021)[e]	11	OASES	−22.5	–	–	–
Hughes and Mahanna-Boden (2017)	3	OASES	−27.7	–	–	–
Daniels (2012)	1	OASES	−19.1	–	–	–
Ryer and Poll (2020)	1	OASES	−54.8	–	–	–
Craft and Gregg (2019)	3	OASES-T	−4.9	–	–	–
Gerlach et al. (2019)	1	OASES	4.5	–	–	–
Andrews et al. (2012)	10	ACES	−25.6	–	–	–
Andrews et al. (2016)[b]	22	ACES	–	−33.0	–	12 months
Carey et al. (2014)	1	ACES	−23.8	−40.5	−16.7	12 months
Harasym and Langevin (2012)	1	SRES-C	–	−83.3	–	4 months
Communication attitude						
Fourlas and Marousos (2015)	2	CAT-R	−67.6	–	–	–
Valentine (2014)	2	CAT-R	−60.6	–	–	–
Murphy et al. (2007)	1	CAT-R	−52.4	–	–	–
Kordell (2015)[f]	5	CAT-R	−10.1	–	–	–
Jelčić-Jakšić and Lasan (2003)	8	CAT-C	7.0	–	–	–
Zamani et al. (2021)	10	CAT	27.2	26.6	−0.6	1 month
Anxiety						
Kordell (2015)[f]	5	ERQ-CA	55.6[c]	–	–	–
		ERQ-ES	−4.95	–	–	–
Obiweluozo et al. (2021)	178	SMGAD	−34.3	−51.0	−16.7	3 months
		LSAS	−19.3	−49.2	−29.9	3 months
Abo Ras et al. (2015)[b]	Unkn	CAS	−34.2	–	–	–
		CDS	−32.3	–	–	–
Carey et al. (2014)	1	RCMAS-2	5.7	0.0	−5.7	12 months
Andrews et al. (2012)	10	Avoidance scale	−18.6	–	–	–
Andrews et al. (2016)[b]	22	Avoidance scale	–	−63.2	–	12 months

(Continues)

TABLE C1 (Continued)

Included studies	*n*[a]	Outcome measure	Mean % change pre- to post-treatment	Mean % change pre-treatment to follow-up	Mean difference in % change post-treatment to follow-up	Follow-up period
Berkowitz et al. (1994)	5	Situational avoidance	−35.0	−57.8	−11.1	Unknown
Webster (1972)	10	PSI—Struggle	−100.0	–	–	–
		PSI—Avoidance	−100.0	–	–	–
		PSI—Expectancy	−100.0	–	–	–
Northrup (2013)[f]	3	PSI Total	−22.6	–	–	–
Speech satisfaction						
Andrews et al. (2012)	10	Speech satisfaction scale	−53.6	–	–	–
Andrews et al. (2016)[b]	22	Speech satisfaction scale	–	−64.9	–	12 months
Carey et al. (2014)	1	Speech satisfaction scale	−60.0	−80.0	−20.0	12 months
Other						
Berkowitz et al. (1994)	5	CPFCT-R	−69.8	−78.5	−6.3	Unknown
Kordell (2015)[f]	5	CAMM	1.3[c]	–	–	–
Rodgers et al. (2020)	1	Child's SFBT Best Hopes Rating Scale	–	48.8[c]	–	12 months
Craft and Gregg (2019)	3	CYRM-28	11.5[c]	–	–	–

Notes: ACES, Assessment of the Child's Experience of Stuttering; CAMM, Child and Adolescent Mindfulness Measure; CAS, Children's Anxiety Scale; CAT, Communication Attitudes Test; CAT-C, Communication Attitudes Test—Croatian Version; CAT-R, Communication Attitudes Test—Revised; CDS, Children's Depressive Scale; CPFCT-R, Cooper Personalized Fluency Control Therapy Revised Assessment Digest; CYRM-28, Child and Youth Resilience Measure; ERQ-CA, Emotional Regulation Questionnaire for Children and Adolescents—Cognitive Appraisal; ERQ-ES, Emotional Regulation Questionnaire for Children and Adolescents—Emotional Expression; LSAS, Liebowitz Social Anxiety Scale for Children and Adolescents; OASES-S, Overall Assessment of the Speaker's Experience of Stuttering—School-Age; OASES-T, Overall Assessment of the Speaker's Experience of Stuttering—Teenage; PSI, Perception of Stuttering Inventory; RCMAS-2, Revised Children's Manifest Anxiety Scale; SBFT, Solution-focused Brief Therapy; SMGAD Severity Measure for Generalized Anxiety Disorder—Child Aged 11–17; SRES-C, Self-rating of effects of stuttering—Children.

[a]Number of school-age children included in the analyses.

[b]Studies that only reported group mean data as above therefore show the percentage change in stuttering as a percentage change of the average instead of the average percentage change.

[c]Positive change indicates improvement in attribute.

[d]Participants in this group were treated using telepractice.

[e]Participants in this group were treated in-clinic.

[f]Doctoral dissertation.