

Effectiveness of treatments for managing affective prosody deficits in adults with acquired brain injury: a systematic review

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Systematic Review

Keywords: affective prosody, intervention, speech-language pathology, emotions, acquired brain injury, systematic review

Posted Date: October 22nd, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11439384/v1>

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Additional Declarations: The authors declare no competing interests.

Abstract

Affective prosody conveys emotional information through variations in the acoustic parameters of speech. Impairments in the production and/or comprehension of affective prosody may occur following acquired brain injury (ABI) and they significantly affect communication and social participation.

Objective: This paper aimed to evaluate the effectiveness of interventions designed to target receptive and expressive affective prosody deficits in adults with ABI. Special attention was given to post-treatment improvement, generalization, maintenance of treatment gains, and transfer to everyday communication.

Methods: A systematic review of the literature was conducted following the PRISMA protocol. Six databases were searched according to predefined eligibility criteria.

Results: Nine studies involving 62 participants met the inclusion criteria. The identified treatments were grouped into four main approaches and analyzed with respect to treatment outcomes and methodological quality. Treatments targeting both expressive and receptive affective prosody deficits showed promising effects, although evidence was stronger for post-treatment improvement than for generalization, maintenance, or transfer to everyday communication.

Conclusions: Current findings suggest that affective prosody deficits following ABI can be treated through rehabilitation. Nevertheless, the evidence base remains limited, highlighting the need for larger and more rigorous studies to establish evidence-based recommendations for clinical practice.

What this paper adds?

What is already known: Affective prosody impairments following acquired brain injury (ABI) can affect communication and social participation. However, evidence for rehabilitation effectiveness remains limited which constrain clinical decision-making.

What this study adds: Six treatments across four approaches showed promising effects, particularly on post-treatments outcomes, but evidence for generalization, maintenance and transfer remains scarce.

Clinical implications: Affective prosody deficits following ABI appear amenable to rehabilitation, supporting their consideration in clinical practice. Treatment selection and parameters should be tailored to individual rehabilitation needs.

Introduction

It's not so much what we say, but how we say it that matters. Beyond the words themselves, a significant part of communicative meaning is transmitted through affective prosody, a key communication skill at the intersection of speech and pragmatics. By conveying paraverbal information about the speaker's emotional state, affective prosody plays a central role in interactional exchanges. It relies on suprasegmental acoustic parameters—specifically the fundamental frequency (f_0), intensity (loudness), and duration (tempo/rhythm)—to express a speaker's underlying emotional state independently of the literal meanings of words (Mitchell.

& Ross, 2013). Regardless of the language spoken, and based solely on vocal characteristics,

each emotion appears to have a specific prosodic pattern (Banse & Scherer, 1996; Pell et al., 2009). This subtle and unconscious skill plays a considerable role in maintaining functional communication and successful social interactions. The importance of affective prosody for successful social communication becomes particularly apparent in ABI. Indeed, affective prosodic impairments in expression and/or comprehension are common post-lesional symptoms and have been reported across 17 neurological conditions (Coulombe et al., 2023). An acquired disorder of affective prosody in expression, called expressive aprosodia, may manifest as an inappropriate use of prosodic cues conveying emotional information, either through excessive prosodic variations or, conversely, through a reduction in these variations. Expressive aprosodia often results in

expressionless, monotonous, or mechanical speech, frequently described as “robotic”: to the extent that emotional meaning is no longer conveyed through prosody and must instead be stated explicitly (Carota et al., 2005; Ross, 2021, in Coulombe et al., 2023). These expressive deficits may occur not only during spontaneous speech but also in tasks requiring imitation or production on cue (Dara et al., 2013).

On the other hand, affective prosody deficits may also manifest at the receptive level, a condition referred to as receptive aprosodia (Ross, 1981). In this case, the deficit lies in the

integration and interpretation of prosodic cues conveying emotional information. As a result, individuals may have difficulty recognizing emotions expressed through speech, despite understanding the semantic content of the message. Consequently, they may fail to infer the speaker's emotional state or communicative intent, leading to misunderstandings during social interactions. Receptive deficits may be observed in tasks requiring the identification, discrimination, or matching of emotions conveyed through speech prosody (Coulombe et al., 2023).

Whether manifested as difficulties in producing or interpreting emotional prosodic cues, affective prosodic impairments can significantly restrict social participation and negatively affect quality of life (Leung et al., 2017). Importantly, individuals with aprosodia do not lack emotions; rather, they experience difficulties conveying or interpreting emotional information through prosodic cues, which may result in communication breakdowns, social distress, and negative interpersonal perceptions (Hawthorne & Fisher, 2020). These consequences also affect relatives and caregivers, who often identify impaired emotional understanding as one of the most striking residual effects of acquired neurological disorders (Hillis & Tippet, 2014; Coulombe et al., 2023). Despite their substantial functional consequences, affective prosodic impairments remain underrecognized in clinical practice, which may partly contribute to the limited attention they receive in speech and language rehabilitation (Fischer, 2018).

Indeed, affective prosody is rarely addressed in speech language therapy. Although clinicians acknowledge the importance of prosody in communication, they tend to view prosodic deficits as secondary manifestations of neurological disorders rather than as rehabilitation targets. Petitpain et al. (2024) conducted surveys among French speech-language pathologists. They reported that affective prosody is not addressed in treatment in 16% of cases and that 52% of clinicians do not feel comfortable providing this type of intervention. These findings

are not limited to France, as other surveys among American speech-language pathologists show the following percentages: 89% reported that they did not know how to assess prosody, and 66% feel they lack experience with these patients (Hawthorne & Fischer, 2020).

While some intervention programs indirectly address prosodic abilities, such as the Lee Silverman Voice Treatment® (LSVT®) for Parkinson's disease (Sapir et al., 2011) and the Melodic and Rhythmic Therapy (TMR), for aphasia rehabilitation (Eeckhout & Allichon, 1978; Sparks & Holland, 1976), Fischer (2018) found that speech-language pathologists primarily rely on informal approaches based on music, rhythm, visual supports, and video modeling. Consequently, there is a need to better document the effectiveness of existing treatments and to raise practitioners' awareness of treatment approaches that have demonstrated promising results in the literature.

Beyond identifying existing intervention approaches to improve affective prosody abilities in people with ABI, it is essential to determine whether they are effective. Contemporary views of treatment effectiveness extend beyond improvement on trained items and include the generalization of gains to untrained stimuli or abilities, maintenance over time, and transfer to everyday communication (Lavoie & Macoir, 2018). In the context of affective prosody rehabilitation, treatment outcomes should therefore be evaluated not only through post-treatment improvements, but also through their generalization across emotions, stimuli, modalities, and real-life communicative situations.

Objective of the study

Given the limited attention devoted to affective prosody rehabilitation in clinical practice (Petitpain et al, 2024; Hawthorne & Fischer 2020) and the need for a better understanding of the existing rehabilitation therapies, the purpose of this study was to evaluate the effectiveness

of treatments targeting receptive and expressive affective prosody deficits following ABI. In addition to post-treatment improvement, particular attention was paid to broader indicators of treatment effectiveness such as the generalization of gains to other emotions, stimuli, and modalities, the maintenance of gains over time, and their transfer to everyday communication. The study will also examine the potential influence of other factors (including treatment intensity, inter-individual variability) on participants’ affective prosody performance.

Methods

This study followed the PRISMA guidelines for systematic reviews (Moher et al., 2009). The literature search was conducted in September 2026.

Literature search

Six databases were searched to identify articles meeting the objective of this study, namely articles describing treatments targeting the rehabilitation of affective prosody deficits in comprehension and/or expression in adults with ABI. In line with this objective, databases in the fields of health and linguistics were selected: EMBASE, MEDLINE (PubMed), Web of Science, PsycInfo (part of PsycNet), LLBA (*Linguistics and Language Behavior Abstracts*), and CINAHL (from EBSCO). In addition to the databases research, articles from the references of certain studies potentially relevant to this review were added manually.

Eligibility criteria

To select relevant articles, inclusion and exclusion criteria were defined, listed in Table 1. The criteria concerned: 1) study’s target population; 2) study type; 3) articles’ accessibility; 4) target of the treatment described.

Table 1
Eligibility criteria.

Population	Inclusion criteria	Exclusion criteria
	Adults (18 + years old) with ABI	Neurodevelopmental pathology
	Expressive and/or receptive aprosodia	
Study type	Peer-reviewed articles Experimental studies with primary data	All other study types (reviews, books, thesis, etc.)
Articles accessibility	Written in English or in French	Full-text not available
Treatment target	Affective prosody expression and/or comprehension Efficacy data reported	Linguistic prosody Pharmacological treatment

Search strategy

To conduct the systematic search, specific keywords consistent with the objective of this review were defined and used to formulate relevant search queries in the databases. Five main concepts were first identified: (1) prosody, (2) intervention, (3) emotions, (4) targeted aspect of communication (expression/comprehension), (5) ABI. For each concept, keywords were derived from both free-form and controlled vocabularies when available. A combination of both types of vocabulary using the Boolean operators “OR” and “AND” enabled the formulation of the search equation. The final search strategies were validated

by a librarian at Laval University (MG), specialized in the development of systematic reviews. The search equations are listed in Appendix 1.

Article selection

The process of article selection was carried out using a software specifically designed for systematic reviews: Covidence Systematic Review Software (Veritas Health Innovation). The four steps suggested by the PRISMA guidelines were followed to do the article selection process: (1) identification of the articles in the databases and removal of the duplicates with Covidence, (2) screening of the articles based on the title and abstract, (3) eligibility of the

articles based on the full-text reading, (4) inclusion of the articles. For each step, two independent reviewers (CT as first reviewer and LM or HB as second reviewers) engaged in the process to ensure its reliability. In case of disagreement, the issue was discussed to reach a consensus on the inclusion of an article.

Data extraction

After the selection process, data extraction was conducted to analyze the specific characteristics of the articles included and the effectiveness of treatments targeting affective prosody. This analysis was conducted by two independent reviewers (CT and LM or HB) to ensure the reliability of the collected information. A data extraction table was created using Excel, with five separate columns: (1) general information about the articles (title, authors, publication date, journal, study type); (2) characteristics of study population (sample size, age, gender, neurological condition, time since injury, type of affective aprosodia); (3) treatment used in the article (name, objective, theoretical basis, procedure, stimuli type, tasks, treatment intensity, treatment procedure, feedback); (4) post-treatment, generalization, maintenance, and transfer results, as well as the factors influencing treatment effectiveness; (5) conclusions, limitations, prospects for future research.

Methodological quality assessment

For each article included, the methodological quality was assessed using the critical appraisal scales of the Joanna Briggs Institute (JBI) (Aromataris, E., & Munn, Z., 2020). These scales gather questions about the methodology of the articles. Answer options were: "yes" (1 point), "no" (0 point), "unclear" (0.5 point) or "not applicable". A score based on the total number of questions was then determined, and a percentage was then calculated representing the methodological quality of the article. Different scales of the JBI were used following the methodology of the article analyzed in this review: the checklist for quasi-experimental studies (Barker et al. 2024), the checklist for case series studies (Munn et al. 2020), and the

checklist for randomized controlled trials (Barker et al. 2023). Thus, in this review, three checklists were used, comprising 9, 10, and 13 items, respectively. The questions generally addressed: the presence of clear demographic information, the presence of inclusion criteria, the reliability of measurements, the clarity of results, and the performance of statistical analyses and follow-up measurements. In addition to these, methodological issues specific to each type of study were addressed. The methodological quality assessment was also performed by two independent reviewers (CM and LM or HB). An inter-rater agreement was calculated. This calculation served to objectively assess any potential subjective biases and to ensure the reliability of the respective scores.

Results

Results of the systematic search

The systematic search of the six selected databases identified 711 records, with six additional references retrieved through manual searching. The number of results per database is specified in Appendix 1. After removing 202 duplicates, 509 records were screened. Thirteen articles underwent full-text review, of which four were excluded because they did not describe interventions specifically

targeting affective prosody ($k = 2$) or were literature reviews ($k = 2$). Consequently, nine articles were included in this systematic review. The selection process is illustrated in the PRISMA flow diagram (Figure 1).

Characteristics of the articles

The nine included studies comprised multiple-case studies ($k = 5$), single-case studies ($k = 2$), and group studies ($k = 2$), including one uncontrolled group study and one randomized controlled trial. Most studies involved small samples, limiting the overall level of evidence (HAS, 2013). All reported primary data, were published in English, and appeared in peer-reviewed journals. Publication dates ranged from 1996 to 2026. Additional study characteristics are presented in Table 2.

Methodological quality of the included articles

The methodological quality of the nine included studies was assessed using the JBI critical appraisal tools described in the Methods section (Aromataris & Munn, 2020; Munn et al., 2020; Barker et al., 2023, 2024). Inter-rater agreement between the two independent reviewers (CT and LM or HB) reached 98.3%. The few discrepancies were resolved through discussion within the research team. Across studies, the mean methodological quality score was 74.2%. The methodological quality scores of the articles' included studies are available in Table 2.

Population characteristics

The nine included studies included a total of 62 adults aged 19 to 89 years. Among them, 72.6% (45/62) were men. All participants had sustained a right-hemisphere acquired brain injury, and time since injury ranged from 4 months to 16 years. Reported etiologies included stroke ($n = 33$), traumatic brain injury ($n = 26$), and lesion following a surgical complication ($n = 1$), while two lesions were unspecified. All participants presented with affective aprosodia. Among them, 74.2% ($n = 46$) exhibited receptive deficits only, 24.2% ($n = 15$) showed expressive deficits associated with receptive impairment and 1.6% ($n = 1$) expressive deficits only.

Characteristics of treatments targeting affective prosody

The included treatments were categorized according to whether they targeted expressive (6/9 studies) or receptive (3/9 studies) affective prosody. Although expressive approaches were more frequently represented, receptive approaches involved most participants (46/62, 74.2%). The distribution of studies by treatment type is presented in Table 2.

Expressive Approaches

Two main intervention approaches were identified: an imitative approach (Stringer, 1996; Rosenbek et al., 2004, 2006; Leon et al., 2005; Jones et al., 2009; Russell et al., 2010) and a cognitive-linguistic approach (Rosenbek et al., 2004, 2006; Leon et al., 2005; Jones et al., 2009).

The imitative approach is grounded in Van der Merwe's (1997) motor control model and aims to improve emotional prosody production by the enhancement of motor planning and programming through implicit learning, modeling, imitation, and feedback.

The cognitive-linguistic approach is based on Bowers et al.'s (1993) hypothesis of a nonverbal emotional lexicon. It focuses on the explicit learning of emotional-prosodic cues, with participants learning to associate acoustic characteristics, emotion labels, and facial expressions with specific emotional intonation patterns before producing them in speech.

Four studies investigated both approaches, administered sequentially in a randomized order (Rosenbek et al., 2004, 2006; Leon et al., 2005; Jones et al., 2009). One study examined the imitative therapy alone (Russell et al., 2010), whereas another described a biofeedback-based intervention combined with prosodic model imitation (Stringer, 1996).

Receptive Approaches

Two main intervention approaches were identified: a multimodal approach (Waid-Ebbs et al., 2025) and an approach based on short-term specific training (McDonald et al., 2013; Durfee et al., 2021).

The multimodal approach was operationalized through the Multi-Modal Affect Recognition Intervention (MMART) (Waid-Ebbs et al., 2025) which combined auditory (prosody) and visual (facial expressions) emotional cues to improve emotion recognition.

The short-term specific training approach focused directly on the processing of emotional prosody without targeting other communicative modalities. McDonald et al. (2013) proposed a brief training program centered on the recognition of emotions conveyed through speech, whereas Durfee et al. (2021) developed an acoustic-prosodic intervention targeting specific underlying deficits in prosodic processing identified through the cognitive integration model of Wright et al. (2018). Depending on the underlying deficit identified, training targeted discrimination, identification, or recognition of acoustic-prosodic features associated with emotional intonation.

Table 2. Number of participants by treatment and assessment of methodological quality by article.

Treatments	Authors, year	Methodological quality	Study type	Number of participants
Expressive approaches				
Imitative approach				
Imitative therapy				15
	Rosenbek et al., 2004	75%	multiple case study	
	Leon et al., 2005	75%		
	Rosenbek et al., 2006	75%		
	Jones et al., 2009	70%		
	Russell et al., 2010	68.9%	single case study	
Biofeedback and modeling therapy				1
	Stringer, 1996	68.9%	single case study	
Cognitive-linguistic approach				
Cognitive-linguistic therapy				14
	Rosenbek et al., 2004	75%	multiple case study	
	Leon et al., 2005	75%		
	Rosenbek et al., 2006	75%		
	Jones et al., 2009	70%		
Receptive approaches				
Multimodal approach				
MMART (Multi-Modal Affect Recognition Intervention)				8
	Waid-Ebbs et al., 2025	80%	multiple case study	
Approach based on short-term specific training				
Short term program extracted from longer multimodal treatment				20
	McDonald et al., 2013	76.9%	randomized controlled trial	
Acoustic-prosodic-emotion training				18
	Durfee et al., 2021	77.8%	group interventional study	
Total				62

Treatments effectiveness for affective prosody rehabilitation

Post-Treatment Improvement

Post-treatment improvement was assessed in all 62 participants. Overall, 42 participants (67.7%) demonstrated significant improvement in affective prosody performance following treatment. When results were grouped by intervention approach, post-

treatment improvement rates were 68.8% for the imitative approach, 85.7% for the cognitive-linguistic approach, 100% for the multimodal approach, and 52.6% for the short-term specific training approach. Detailed results are presented in Table 3.

Generalization

Data on generalization were limited and available for only 22 participants. Results from the combined imitative and cognitive-linguistic therapies showed little evidence of generalization, with gains observed for some untrained stimuli and modalities but not for untreated emotions (Leon et al., 2005; Rosenbek et al., 2006). Conversely, positive cross-task generalization was reported for all participants who received the multimodal intervention ($n = 8$). Detailed results are presented in Table 3.

Maintenance

Maintenance outcomes were reported for only 15 participants who showed post-treatment improvement. Follow-up data indicated maintenance of gains for all participants who received the MMART intervention ($n = 8$) at 1 month (Waid-Ebbs et al., 2025) and for the single participant described by Stringer (1996) at 2 months. Among participants who received the combined imitative and cognitive-linguistic therapies, maintenance at 3 months was demonstrated in four of the six participants assessed (Rosenbek et al., 2006). Detailed maintenance outcomes are presented in Table 3.

Transfer

Transfer outcomes were reported only for the MMART intervention (Waid-Ebbs et al., 2025). All participants reported positive changes in everyday social interactions, including family, marital, and professional relationships, which they attributed to improved recognition of affective prosodic cues. Participants also described greater emotional self-awareness and increased awareness of others' emotions. Transfer outcomes are summarized in Table 3.

Table 3. Number of participants who demonstrated significant post-treatment improvement, generalization, maintenance, and/or transfer according to treatment group.

Approaches	Treatments	Post-treatment improvement	Generalization			Maintenance	Transfer
			Inter-stimuli	Cross-tasks	Intermodal		
Expressive approaches							
Imitative	Biofeedback and modeling therapy	1/1	–	–	–	1/1	–
	Imitative therapy	10/15					
			0/14	–	3/3	4/6	–
Cognitive-linguistic	Cognitive-linguistic therapy	12/14*	3/3				
Receptive approaches							
Multimodal	MMART	8/8	–	8/8	–	8/8	8/8
	Short term program						
Based on short-term specific training	extracted from longer multimodal treatment	7/20	–	–	–	–	–
		13/18	–	–	–	–	–
	Acoustic-prosodic-emotion training						
Total		42/62	3/14	8/8	3/3	13/15	8/8
			11/22				

Legend:

– No assessment was conducted and therefore no data is available

* These 14 participants were in both the imitative and cognitive-linguistic therapies, seven of whom showed a common response to both therapies.

Discussion

The present systematic review examined the effectiveness of interventions targeting receptive and expressive affective prosody deficits following acquired brain injury (ABI). Across the nine included studies, six treatments were identified and grouped into four main approaches: imitative, cognitive-linguistic, multimodal and based on short-term specific training. Although most of them yielded positive post-treatment outcomes, important differences emerged regarding the evidence available for generalization, maintenance, and transfer of gains. The findings are discussed below, considering treatments characteristics and other factors that may have contributed to the variability in the treatment outcomes.

For treatments targeting expressive aprosodia, both the imitative and cognitive-linguistic approaches (Stringer, 1996; Rosenbek et al., 2004, 2006; Leon et al., 2005; Jones et al., 2009; Russell et al., 2010) were associated with positive post-treatment outcomes and showed some evidence of generalization and maintenance (Stringer, 1996 ; Rosenbek et al., 2006). However, the effectiveness of the cognitive-linguistic approach should be interpreted with caution, as it was consistently administered alongside the imitative approach in the studies reviewed. Consequently, the independent contribution of each approach

remains difficult to determine. Nevertheless, considering the mechanisms underlying each approach may help explaining the positive outcome observed. Rosenbek et al. (2006) proposed that the imitative and cognitive-linguistic approaches can be understood from the perspective of two complementary memory systems: implicit and explicit memory. Implicit memory is linked to motor processes, whereas explicit memory involves facts and ideas (Boyd & Winstein, 2001). This distinction suggests that the relative emphasis placed on each approach should be adjusted according to the individual's profile and specific impairments. Beyond therapeutic mechanisms underlying these approaches, patient-related factors may also influence treatment outcomes. Indeed, the strongest responders described by Rosenbek et al. (2006) were

motivated, aware of changes in their voice, and presented with mild-to-moderate expressive aprosodia. These observations suggest that treatment effectiveness may depend not only on the intervention itself, but also on the patient's residual abilities and engagement in therapy. Finally, the authors highlighted that implicitly modelling a slower speech rate may be inappropriate for emotions associated with faster speech, such as joy or anger (Russell et al., 2010). This suggests that modelling should be carefully adapted by the clinicians to the specific prosodic pattern of each target emotion.

Regarding treatments targeting receptive affective prosody, the multimodal MMART intervention (Waid-Ebbs et al., 2025) yielded the most comprehensive evidence of effectiveness, demonstrating positive outcomes in post-treatment performance, generalization, maintenance, and transfer to everyday life. The supportive therapeutic environment may have contributed to the observed outcomes, as positive reinforcement and individualized progression may have facilitated participants' engagement with emotionally demanding tasks (Waid-Ebbs et al., 2025). In contrast, short-term specific training approaches, focused on the recognition of emotions from prosodic cues alone through tasks such as categorization, discrimination or identification. These approaches produced more variable results and have not yet demonstrated transfer beyond the clinical setting. This may be due to the very short (or even unique) nature of the training as well as the specificity of the task, which isolates receptive affective prosody from other aspects of communication. Nevertheless, these findings should be interpreted cautiously, as the latter approach was evaluated in larger samples, which may have led to greater inter-individual variability.

The variability in treatment outcomes observed across studies may reflect the heterogeneity in the mechanisms underlying affective prosodic impairments. As a result, treatments may target distinct components of affective prosody processing. Based on the theoretical assumptions underlying the different intervention approaches, treatment selection may need to consider the

nature of the underlying deficit. As highlighted in the theoretical models that informed the treatments reviewed, affective prosody deficits may arise from impairments in different levels of processing. These include motor planning and programming deficits affecting emotional expression (Van der Merwe, 1997), impairments of the nonverbal affective lexicon (Bowers et al., 1993), or deficits in the perceptual and conceptual processing of emotional prosodic cues (Wright et al., 2018). Consequently, there may currently be no treatment that can be considered the treatment of choice for all individuals with affective aprosodia following ABI. Rather, the findings suggest that treatment selection should be guided by the nature of the underlying impairment and the affected modality (expression or comprehension). This perspective is consistent with contemporary models of affective prosody functioning, which view verbal emotional communication as a multidimensional process relying on the integration of multiple cognitive and neural mechanisms (Wright et al, 2018, Sheppard et al., 2021).

While treatment selection should be guided by the nature of the underlying impairment, several intervention characteristics also appear to be associated with more favorable outcomes. Across the studies reviewed, treatments incorporating multimodal stimulation, explicit and/or implicit learning strategies, and performance feedback generally produced encouraging results (Durfee et al., 2021; Rosenbek et al., 2006; Waid-Ebbs et al., 2025). Similarly, longer interventions delivered over multiple sessions appeared to yield better outcomes than brief treatment programs (Bouvier et al., 2019), although the limited number of studies prevents firm conclusions.

The findings also highlight the potential value of individualized and ecologically valid interventions. In particular, the MMART program used dynamic stimuli and personally meaningful communicative situations, which may have contributed to the transfer of gains observed in everyday life (Waid-Ebbs et al., 2025). Although preliminary, these results

support the importance of designing interventions that resemble real-world social interactions, are tailored to individual needs and that are delivered within a supportive therapeutic environment. This perspective aligns with recommendation that rehabilitation should extend beyond traditional cognitive training by taking social cognition into account to facilitate the transfer of skills to real-life situations (Bocoyran & Joyeux, 2016).

Limitations and perspectives

Several limitations should be considered when interpreting the findings of this systematic review. First, all included studies were conducted with English-speaking participants and involved treatments developed in English. This limits the direct transferability of the findings to other linguistic and cultural contexts. However, the studies stay relevant because, while the recognition of emotions based on prosodic cues remains influenced by culture and knowledge of one's native language, each emotion appears to have a specific prosodic pattern independently of the spoken language (Pell et al., 2009).

Second, important methodological limitations were identified across the included studies. These included the absence of control groups in some studies (Durfee et al., 2021), small sample sizes, and relatively short follow-up periods. In addition, Rosenbek et al. (2004, 2006) and Leon et al. (2005) investigated imitative and cognitive-linguistic approaches in combination, making it difficult to determine the specific contribution of each approach to treatment outcomes.

Finally, only nine studies met the inclusion criteria, reflecting the limited body of literature currently available on affective prosody rehabilitation. Further research involving larger samples, controlled study designs, and systematic measures of generalization, maintenance, and transfer is needed before strong clinical recommendations can be formulated. To better

tailor rehabilitation to patients' needs, future studies should also explore how treatment efficacy may vary across the acute and chronic stages of acquired brain injury and across other types of brain injuries not represented in the articles of this review but known as causes of aprosodia (Coulombe et al., 2023).

Conclusion

Affective prosody impairments are a frequent consequence of acquired brain injury (ABI) and can substantially affect communication, social participation, and quality of life. This systematic review identified six treatments grouped into four main approaches targeting either receptive or expressive affective prosody. Overall, the available evidence suggests that these treatments can improve affective prosodic abilities following ABI, although the strength of the evidence remains limited by small samples and a lack of data regarding generalization, maintenance, and transfer to everyday communication.

Despite these limitations, the findings provide promising directions for clinical practice and research. In addition to identifying existing intervention approaches, this review highlights several factors that may contribute to treatment efficacy, including individualized intervention, multimodal stimulation, appropriate feedback, treatment intensity, and ecologically valid therapeutic activities. The findings also suggest that no single intervention is likely to be optimal for all individuals with affective prosody impairments, and that treatment selection may need to be guided by the nature of the underlying impairment and the affected modality (expression or comprehension). Further studies using larger samples and more rigorous designs are needed to establish evidence-based recommendations for the rehabilitation of affective prosody.

Declarations

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by the Social Sciences and Humanities Research Council under grant [No. 435-2022-1042] (2022–2025). Also, Quebec research fund (Fonds de recherche du Québec) granted a PhD funding: [<https://doi.org/10.69777/363728>].

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46. Appendix 1. Search strategies

Figures

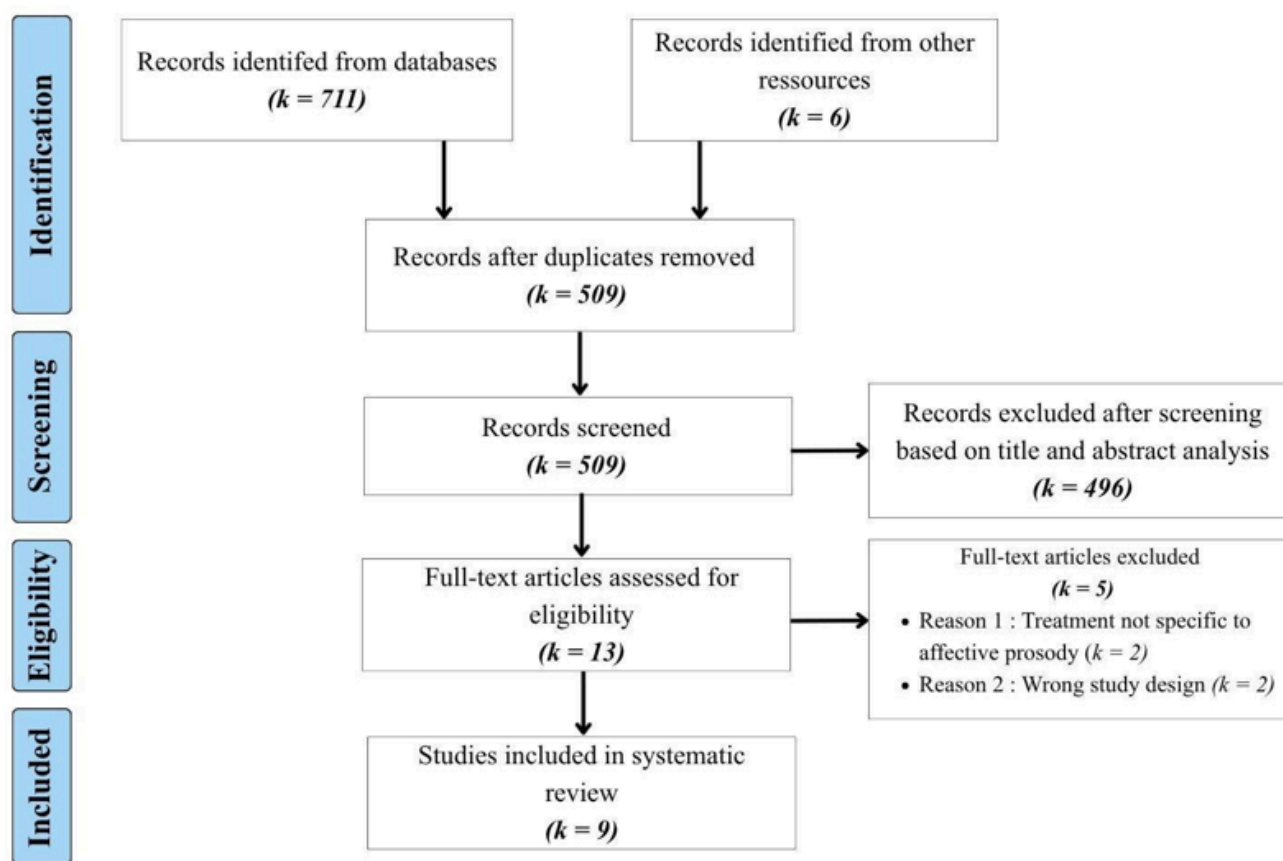


Figure 1

PRISMA Flowchart (Moher et al., 2009)

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