



Physiotherapy management of adults with breathing pattern disorders: a scoping review

Abby Stewart, Richard Ellis & Sarah Mooney

To cite this article: Abby Stewart, Richard Ellis & Sarah Mooney (09 May 2026): Physiotherapy management of adults with breathing pattern disorders: a scoping review, Physical Therapy Reviews, DOI: [10.1080/10833196.2026.2668305](https://doi.org/10.1080/10833196.2026.2668305)

To link to this article: <https://doi.org/10.1080/10833196.2026.2668305>



© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



View supplementary material [↗](#)



Published online: 09 May 2026.



Submit your article to this journal [↗](#)



Article views: 860



View related articles [↗](#)



View Crossmark data [↗](#)

Physiotherapy management of adults with breathing pattern disorders: a scoping review

Abby Stewart^a , Richard Ellis^{a,b}  and Sarah Mooney^{a,b} 

^aDepartment of Physiotherapy, School of Allied Health, Auckland University of Technology (AUT), Auckland, New Zealand; ^bAUT Active Living and Rehabilitation Research Centre, Faculty of Health and Environmental Sciences, Auckland University of Technology, Auckland, New Zealand

ABSTRACT

Introduction: Breathing pattern disorders (BrPD) are recognised as prevalent and debilitating, often occurring secondary to conditions such as asthma and anxiety. Physiotherapy, particularly breathing retraining, is a core treatment for BrPD, however, physiotherapy management remains poorly defined. This scoping review aimed to map and summarise literature on physiotherapy management in adults with BrPD.

Methods: The Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews and Joanna Briggs Institute methodology framed this review. Sources published in English from 1975 onwards including adults with BrPD and physiotherapy management approaches were eligible, without restriction on source of evidence. Comprehensive searches were conducted across eight databases and grey literature.

Results: A total of 137 sources were included. Physiotherapy BrPD management commonly involved breathing retraining (99%), with frequent inclusion of relaxation (49%) and education (47%). Delivery was predominantly face-to-face and one-on-one, with growing use of self-directed delivery formats.

Discussion: Physiotherapy management of BrPD is multifaceted and anchored by breathing retraining, supported by adjunctive education, relaxation, and self-management. Considerable variability was found in treatment components and delivery models. Physiotherapists are well placed to lead BrPD management. Future research should focus on robust intervention and outcome reporting for this challenging and costly condition.

ARTICLE HISTORY

Received 19 December 2025
Accepted 27 April 2026

KEYWORDS



Breathing pattern disorder; physiotherapy; management; scoping review


Introduction

Breathing pattern disorders (BrPD) are increasingly recognised as a complex, heterogeneous condition that impose substantial physical, psychological, and economic burden on individuals and healthcare systems [1–3]. BrPD are currently defined as multi-dimensional disturbances of breathing that deviate from allostatic (respiratory or metabolic) needs, arising from dysregulation across interacting biochemical, biomechanical, and psychophysiological mechanisms, with or without underlying pathology [4–6]. Clinically, BrPD often manifest as chronic maladaptive breathing such as over-breathing, preferential upper chest or mouth breathing, and frequent sighing or yawning, resulting in multi-system symptoms including breathlessness, chest tightness, dizziness, and paraesthesia [7,8]. Importantly, BrPD is treatable, and with appropriate physiotherapy

management, optimal breathing patterns can be restored, resulting in substantial symptom resolution [7].

Terminology in this field has historically been inconsistent, with terms such as ‘dysfunctional breathing’ and ‘breathing pattern disorder’ often used interchangeably [3–7]. The term dysfunctional breathing has been used to describe specific breathing pattern presentations observed within BrPD [7–9]. Barker et al. [9] describes dysfunctional breathing as occurring in two forms—thoracic and extra-thoracic—whereas Boulding et al. [7] proposed a five-category classification system for dysfunctional breathing (hyperventilation syndrome, periodic deep sighing, thoracic dominant breathing, forced abdominal expiration, and thoraco-abdominal asynchrony). Recent consensus efforts have sought to standardise nomenclature [5,10,11]. More recently, ‘breathing pattern disorder’ has been

CONTACT Abby Stewart  abby.stewart@aut.ac.nz  Department of Physiotherapy, School of Allied Health, Auckland University of Technology, Auckland, New Zealand.

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/10833196.2026.2668305>.

© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

endorsed by consensus agreement of nomenclature by Association of Chartered Physiotherapists in Respiratory Care (ACPRC) [5]. Accordingly, BrPD is used throughout the current review in line with contemporary consensus.

BrPD has also been distinguished as primary (occurring in the absence of underlying disease) or secondary (occurring in response to a comorbid condition such as asthma) [12]. Primary BrPD are estimated to affect around 10% of primary care populations [13], though this prevalence is likely underestimated as data was derived solely from one semi-rural United Kingdom (UK) cohort. Secondary BrPD are reported across a range of comorbidities, including approximately 47% of adults with difficult-to-treat asthma [14] and 30%–45% of those with anxiety or depression [15]. However, when co-existing with other conditions, BrPD is frequently under-recognised, leading to symptom misattribution and suboptimal management [14]. To date, the literature has largely conceptualised BrPD as either primary or secondary, with limited recognition of more nuanced BrPD presentations that do not fit clearly within this dichotomy. In the current review, we introduce ‘mixed BrPD’ as a novel conceptual category to describe presentations in which intrinsic disturbances in breathing control interact with comorbidity-related factors to sustain dysfunctional breathing patterns. It is therefore unsurprising that contemporary physiotherapy-led frameworks advocate for multidimensional assessment and management approaches to address the full continuum of BrPD presentation [10,11].

Physiotherapy has emerged as a pivotal and cost-effective management approach for BrPD, with studies demonstrating improvements in symptoms and reductions in healthcare utilisation [2,16]. Breathing retraining - sometimes used interchangeably with terms such as ‘breathing exercises’, ‘breathing re-education’ and ‘breathing training’ - forms the cornerstone of physiotherapy management, aiming to restore efficient respiratory patterns, improve diaphragmatic function, and reduce upper chest dominance [17–19]. Alongside breathing retraining, other components such as education and relaxation strategies [19,20], biofeedback [21,22], manual therapy [12], inspiratory muscle training [23,24], and exercise therapy [25] are variably integrated into physiotherapy care. Structured frameworks such as Buteyko, Papworth, and BradCliff[®] methods further exemplify discipline-specific approaches to breathing retraining [20,26].

Despite recent advancements in terminology and assessment consensus for BrPD [5,11], substantial variability persists in how physiotherapy

management for BrPD is described and implemented, with the existing evidence base remaining diverse and largely composed of small, observational, or methodologically limited studies [20,27,28]. More recently, Bondarenko et al. [17] synthesised 68 trials evaluating non-pharmacological management for dysfunctional breathing, identifying breathing retraining as the most frequently used intervention and highlighting the role of physiotherapists in its delivery. However, their review was not exclusively focused on physiotherapy-led management of BrPD, nor did it seek to map the full breadth of available evidence, including narrative reviews and grey literature. As such, physiotherapy-specific management components and delivery characteristics have not yet been systematically mapped.

In response to this knowledge gap, a scoping review was undertaken to address the following question: what is the current physiotherapy management for adults with BrPD? The review objective was to provide a comprehensive synthesis of physiotherapy-led management of BrPD, with specific aims relating to the clarification of physiotherapy management approaches for BrPD, intervention design and delivery modes. This mapping allowed identification of research gaps and recommendations, thereby extending the current knowledge base regarding physiotherapy-led management of BrPD.

Methods

Scoping reviews are appropriate when evidence is emerging and variable; enabling mapping of breadth, clarification of conceptual boundaries, and identification of knowledge gaps [29]. A scoping review was therefore relevant to answer the research question. The Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines [30] and updated Joanna Briggs Institute (JBI) methodology [31] informed this scoping review. The protocol was registered with the Open Science Framework database (<https://osf.io/uhj3p>).

The methods for this scoping review were grounded in Arksey and O’Malley [32] framework with subsequent refinements [31,33–35]. Knowledge user engagement, recommended to enhance relevance and applicability [33,36,37] was undertaken. Three Aotearoa New Zealand respiratory physiotherapists (academic and clinical BrPD experts) were consulted at the outset of the review, providing feedback on scope, search strategy, and dissemination plans. Dissemination recommendations emphasised achieving international reach through peer-reviewed publication, conference presentations,

and targeted knowledge translation across non-respiratory sectors, multidisciplinary teams, and primary care networks to increase recognition and engagement in the care of adults with BrPD.

Eligibility criteria

Eligibility criteria for sources were guided by the Population, Concept and Context (PCC) framework, a method advocated for use in defining eligibility criteria in scoping reviews [31,38].

Population: Adults (≥ 18 years) with primary, secondary, or mixed BrPD. Studies specifically on sleep-related breathing disorders (e.g. sleep apnoea) or neurologically driven breathing disturbances (e.g. after brain injury) were excluded because their pathophysiology and management differ substantially [39–41].

Concept: Physiotherapy management approaches for BrPD. Multidisciplinary sources were included only when physiotherapy management was clearly identifiable.

Context: All settings and countries were eligible. Studies published before 1975 were excluded; with 1975 selected because it corresponds to Lum's seminal description of hyperventilation syndrome [42]. Non-English publications were excluded.

Information sources

The final search was completed in February 2025. Eligible sources of evidence encompassed: empirical evidence (e.g. randomised controlled trials (RCT), observational studies, etc.), evidence-informed literature (e.g. narrative reviews, book chapters etc.), and grey literature (e.g. websites etc.). Grey literature was included deliberately to capture practice-relevant insights often excluded from traditional academic publications, thereby ensuring a wide-reaching review [37].

Search strategy

The search strategy aligned with the updated JBI methodology specific to scoping reviews and involved: (1) an initial limited search to identify key terms, (2) a comprehensive database search, (3) manual searching of reference lists and grey literature [31]. Grey literature was searched using keywords in Google, Google Scholar, and ProQuest Dissertations & Theses Global [43]. To ensure consistency, final grey literature searches were conducted in Google Chrome incognito mode, with relevancy sorting enabled, and performed on the same day using the same Internet Protocol address in Auckland, Aotearoa New Zealand [44]. Results were screened up to the first ten pages (approximately 100 results) per search, with relevant sources

bookmarked and organised by platform and terms used [43,45,46].

Collaboration with both an academic librarian and knowledge users was essential in refining the search strategy [29,37]. The full search strategy, including identified keywords tailored for each database, is presented in [Supplementary Material 1](#).

Source selection

Database sources were imported into EndNote 20 (Clarivate, Philadelphia, PA) [47] for de-duplication and then uploaded into JBI System for the Unified Management, Assessment, and Review of Information (JBI SUMARI; JBI, Adelaide, Australia) [48], along with grey literature, for screening and data management [49]. Pilot testing in line with recommendations by Peters et al. [31], whereby two reviewers (AS, SM) independently screened 25 titles and abstracts, and full screening commenced once acceptable agreement ($>75\%$) was achieved.

Titles and abstract screening was completed by one reviewer (AS), with full-text screening completed independently by two reviewers (AS, SM). Only three sources required discussion and were resolved in consultation with a third reviewer (RE). Three consensus meetings were held, and a structured triage process was applied to exclude sources lacking explicit physiotherapy involvement and intervention detail.

Data extraction

Data were charted in Microsoft Word, version 16.98 (Microsoft Corporation, Redmond, WA, USA) using an adapted JBI Data Extraction Tool [31]. The Template for Intervention Description and Replication (TIDieR) framework [50] was used to guide extraction of physiotherapy management content, ensuring consistent reporting and systematic organisation of intervention components. The full TIDieR checklist was not applied, as the current review aimed to map the breadth and nature of physiotherapy management for BrPD rather than critique the completeness or quality of intervention reporting. Extracted data items included author, year of publication, source type, BrPD presentation, population characteristics and comorbidities, physiotherapy management components, healthcare professionals involved, delivery format, source context, management dosage, tailoring and modification, fidelity and key findings.

Data were organised by BrPD classification (primary, secondary or mixed) and then evidence type, generating eight distinct tables ([Supplementary Material 2](#)). Two reviewers (AS, SM) independently piloted extraction on ten sources, resolving queries through discussion. Full extraction was completed

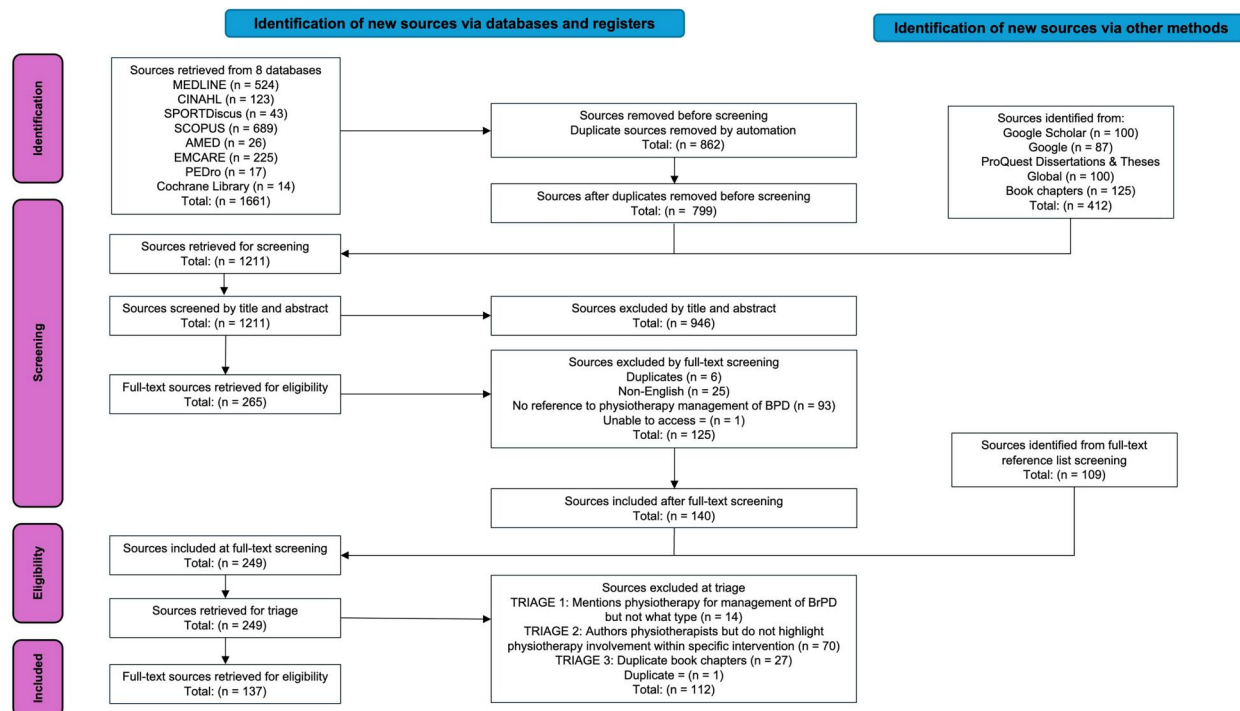


Figure 1. Flow diagram of source selection according to PRISMA-ScR.

by one reviewer (AS) with consultation from the second reviewer (SM) as needed, and oversight from a third reviewer (RE).

Data analysis and presentation

Data were analysed descriptively using frequency counts and percentages to summarise record characteristics, management components, and delivery features [31,37]. Given the large scope of this review (>100 included sources), findings were presented using tables and bar graphs [36].

Results

In total, 2073 sources were initially identified (1661 from electronic databases and 412 from grey literature) relevant to the research question. Following source screening and selection, 137 sources were included as outlined using the PRISMA-ScR flow diagram (Figure 1).

Characteristics of included sources

The 137 included sources were published between 1975 and 2025, with the majority (67%) appearing after 2010 (Table 1). Over half were evidence-informed sources (52%), primarily narrative reviews and book chapters; while 38% were empirical studies, most commonly observational designs and RCTs. A smaller proportion (10%) comprised grey literature such as websites. Over half of all sources originated from the UK (55%). Most sources addressed secondary (49%) or mixed BrPD (44%).

Comorbidities and contributing factors

Comorbid and contributing conditions were common and multi-system, with BrPD presentations described either as secondary to comorbid conditions or as co-existing with comorbidities in more overlapping patterns consistent with mixed BrPD. Reported comorbidities included respiratory conditions (e.g. asthma 67%, nasal conditions 20%), psychological conditions (e.g. anxiety 59%, panic 21%, depression 21%), extra-thoracic breathing conditions e.g. (e.g. inducible laryngeal obstruction/vocal cord dysfunction 14%) and musculoskeletal conditions (e.g. neck pain 7%) (Supplementary Material 2).

Terminology for breathing retraining

Terminology used to describe breathing retraining varied considerably (Supplementary Material 2). The most frequently used labels were 'breathing retraining' (65%), 'breathing exercises' (15%), and 'breathing re-education' (6%). Other terms, including 'breathing control' or 'breathing pattern retraining' were also reported.

Physiotherapy management approaches

Across the 137 included sources, physiotherapy management of BrPD (Figure 2) was predominantly centred on breathing retraining (99%), practised in resting (65%), positional (2%), and functional contexts (31%). Relaxation techniques (49%) and education (47%) were widely incorporated across sources. Education focused on BrPD mechanisms, triggers

Table 1. Source characteristics ($n = 137$).

Characteristic	Category	Count (%)
Year of publication	1975–1999	14 (10%)
	2000–2010	28 (20%)
	2011–2020	56 (41%)
	2021–2025	36 (26%)
Country of origin	Unclear	3 (2%)
	United Kingdom	76 (55%)
	New Zealand	16 (12%)
	Australia	12 (9%)
	United States of America	10 (7%)
	Denmark	7 (5%)
	Sweden	4 (3%)
	Other individual countries ^a	26 (19%)
	Multiple countries (global)	16 (12%)
Source type	Evidence-informed	71 (52%)
	Narrative review	22 (16%)
	Book chapter	19 (14%)
	Thesis/PhD	7 (5%)
	Commentary	6 (4%)
	Other evidence-informed ^b	17 (12%)
	Empirical evidence	52 (38%)
	RCTs	17 (12%)
	Observational study	19 (14%)
	Systematic review/meta-analysis	7 (5%)
	Other empirical evidence ^c	9 (7%)
	Grey literature	14 (10%)
	Website (clinical/patient information)	7 (5%)
	Book chapter	5 (4%)
Other grey literature ^d	2 (1%)	
BrPD presentation	Primary BrPD	10 (7%)
	Secondary BrPD	67 (49%)
	Mixed BrPD	60 (44%)

^aOther single-country sources: Brazil (2%), France (2%), Pakistan (2%), Greece (2%), Belgium (1%), Canada (1%), Germany (1%), India (1%), Iran (1%), Ireland (1%), Malaysia (1%), Netherlands (1%), Scotland (1%), Switzerland (1%), Thailand (1%).

^bOther evidence-informed sources: Discussion papers (3%), randomised controlled trial protocols (3%), clinical practice guidelines (1%), clinical review (1%), clinical statement (1%), comparative effectiveness review (1%), conference proceedings (1%), debate article (1%).

^cOther empirical evidence: Case reports (2%), letter to the editor (1%), non-randomised controlled trial (1%), pilot studies (1%), qualitative studies (1%).

^dOther grey literature: Patient brochure (1%) and clinician manual (1%).
Key: BrPD: Breathing Pattern Disorders, PhD: Doctor of Philosophy.

and reassurance (30%), as well as broader lifestyle influences such as stress and posture (17%). Self-management, including prescribed home regimens, also featured prominently (44%). Several named breathing methods appeared, including Buteyko (12%), Papworth (8%), and BradCliff[®] (5%). Complementary interventions addressed musculoskeletal contributors such as postural adjustment (17%) and manual therapy (8%), integrated adjunct strategies such as biofeedback (24%) and acupuncture (4%), and employed specific breathing techniques such as controlled breath-holds (12%) and pursed-lip breathing (4%). Symptom-relief strategies, including rescue breathing (7%) and breathlessness relief positions (5%) were also noted.

Physiotherapy management delivery formats

Across included sources, the delivery of physiotherapy management for BrPD (Table 2) was commonly

within outpatient settings (83%), followed by home-based contexts (40%). Management was primarily provided face-to-face (53%), however, self-directed delivery formats, including digital platforms (e.g. videos) or printed materials (e.g. booklets), were also frequently included (42%).

Session frequencies ranged from two to three sessions per week (18%) of 30–60 min' duration (35%), with programmes typically extending over five to ten weeks (15%). Where home-based regimens were described, practice frequency most often ranged from one to three times per day (34%) for approximately 10–15 min (18%).

Healthcare professionals involved

Physiotherapists were involved in all sources (100%), most frequently described as general physiotherapists without a specified specialty (84%), while respiratory physiotherapists were the main health profession explicitly identified (15%). Multidisciplinary involvement was also common (44%), with patients most frequently managed alongside physicians (28%), psychologists (22%), speech-language therapists (12%), and nurses (12%). Occasional contributions were noted from otorhinolaryngology specialists (6%), dietitians (4%), and osteopaths or yoga therapists ($\leq 3\%$) (Supplementary Material 2).

Discussion

This scoping review provides the first comprehensive synthesis of physiotherapy-led management for primary, secondary and mixed BrPD, integrating 137 sources, spanning five decades, 21 countries, and diverse empirical, evidence-informed, and grey literature. Over half of the sources were evidence-informed, including narrative reviews, and nearly half originated from the UK, with most published post-2010. This pattern highlights the emerging and evolving nature of BrPD research. Overall, physiotherapy management for BrPD was multi-dimensional; centred on breathing retraining, supported by education, relaxation, and self-management; and delivered across varied comorbid contexts in progressive and increasingly short durations (e.g. independent home practice *via* printed or digital resources).

Inconsistent terminology of breathing retraining

Although breathing retraining was the most consistently reported management approach, terminology varied widely. Terms such as 'breathing exercises' and 'breathing re-education' were often used interchangeably with 'breathing retraining' [18,28]. For

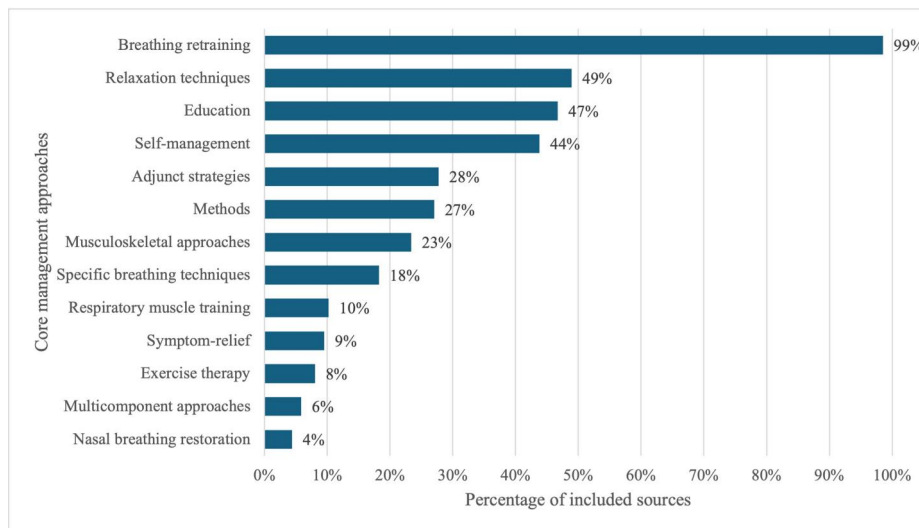


Figure 2. Core BrPD physiotherapy management approaches reported across included sources.

Table 2. Delivery format of BrPD physiotherapy management ($n = 137$).

Characteristic	Category	Count (%)	
Where – Context ^a	Outpatient	113 (83%)	
	Home-based	55 (40%)	
	Private practice	28 (20%)	
	Other e.g. community, inpatient, university research facility	43 (31%)	
	Mixed settings	81 (59%)	
How – Delivery format ^a	Face-to-face	72 (53%)	
	Telehealth	11 (8%)	
	Hybrid (face-to-face + telehealth)	9 (7%)	
	One-on-one	73 (53%)	
	One-on-one + group-based	15 (11%)	
When/How Much ^{a,b}	Self-directed	58 (42%)	
	Session frequency (per week)	Low (1)	6 (4%)
		Moderate (2–3)	24 (18%)
		High (4–10)	25 (18%)
	Session duration (minutes)	Extended (>10)	6 (4%)
Short (<30)		6 (4%)	
Moderate (30–45)		27 (20%)	
Programme duration (weeks)	Long (60)	21 (15%)	
	Extended (>60)	3 (2%)	
	Short (1–4)	14 (10%)	
	Moderate (5–10)	21 (15%)	
Home Regimen ^a	Long (11–15)	19 (14%)	
	Extended (>15)	8 (6%)	
	Frequency (per day)	Low (1)	26 (19%)
	Moderate (2–3)	20 (15%)	
Duration (minutes)	High (4–10)	6 (4%)	
	Short (<10)	4 (3%)	
	Moderate (10–15)	25 (18%)	
	Extended (≥ 20)	8 (6%)	

^aSome sources reported multiple delivery categories or omitted categories, explaining why the counts and percentages do not total the full number of included records. Unspecified details were excluded from this table.

^bDosage categories were adapted from Bondarenko et al. [17].

example, one RCT in an asthma population described their intervention as breathing exercises [51], despite using therapeutic components similar to those labelled as breathing retraining elsewhere [25,27]. This fragmented nomenclature largely reflects different labels for the same underlying approach rather than genuinely distinct interventions. Given its centrality across sources, adopting ‘breathing retraining’ as a unifying term may enhance conceptual coherence across research and clinical practice.

Multi-dimensional BrPD physiotherapy management

This review confirmed that breathing retraining remains the cornerstone of physiotherapy management for BrPD. This finding echoes prior studies describing breathing retraining as the most established intervention for BrPD, with common core principles of restoring nasal-diaphragmatic breathing, reducing respiratory rate and tidal volume, and employing yawn and sigh suppression techniques to curb habitual over-breathing [17,19,52]. While some

sources described breathing retraining in isolation [53,54], most positioned it alongside complementary components such as relaxation, biofeedback, and controlled-breath holds [55,56]. This multidimensional integration likely reflects the interrelated biomechanical, biochemical, and psychophysiological dimensions of BrPD, with management directed toward the primary dimension of concern [57,58]. For instance, biofeedback targets mechanical breathing control, controlled breath-holds supports biochemical regulation, and relaxation addresses psychophysiological modulation, aligning with, but extending earlier conceptual models proposed by Courtney [8] into a physiotherapy-specific context.

Breathing retraining was frequently conceptualised as a transferable skill, practised progressively from supported or resting postures (lying or sitting) to more dynamic, real-world contexts such as standing, walking, speaking, and exercising [22,59]. This functional progression distinguishes physiotherapy breathing retraining approaches from ‘breathwork’, which is typically confined to resting states or mindfulness-based contexts, anchoring breathing retraining in both rested and dynamic, movement-integrated practice [60]. Named methods; Buteyko, Papworth, and BradCliff[®], identified within the current review, embodied this multifaceted, functionally progressive philosophy of breathing pattern rehabilitation [20,26]. Additionally, one source distinguished between generic and breathing pattern-specific management approaches for BrPD, emphasising the need to tailor interventions to the individual’s breathing pattern and clinical presentation [55]. Collectively, this suggests that optimal BrPD management may rely less on pursuing unified or standardised models of care, and more on embracing the diversity of BrPD - promoting nuanced, person-centred physiotherapy that flexibly adapts to individual presentations inherent in people with BrPD.

Education as an integral but underdeveloped component of BrPD management

Education commonly accompanied breathing retraining; however, there was considerable ambiguity regarding whether education was embedded within breathing retraining or provided as a separate component, and descriptions of the educational content itself were variable and often insufficient [56,61,62]. This ambiguity likely reflects inconsistent reporting, as breathing retraining inherently requires some level of embedded education to support skill acquisition, symptom interpretation, and behaviour change [25]. Across sources, educational content itself ranged from focused explanations of BrPD

mechanisms, triggers, and breathing awareness [12,63]; to broader biopsychosocial explanations situating breathing education within wider behavioural and contextual influences such as stress, sleep, cognition, and lifestyle [19,20,59]. This broader framing is particularly relevant given that breathing vigilance and associated fear, misinterpretation of sensations, and avoidance behaviours are recognised traits within individuals with BrPD [25,64]. It remains unclear how the educational content should be framed to most effectively address the perceptual, behavioural, and physiological traits characteristic of people with BrPD.

Evolving self-directed delivery formats

Delivery of BrPD physiotherapy management varied widely but was most often provided in outpatient or home-based settings, typically face-to-face and one-to-one. Typical dosage involved two to three supervised sessions supported by daily home practice of 10–15 min, a pattern consistent with pragmatic, behaviourally anchored service design across multiple studies [61,65,66]. Interestingly, nearly half of included sources incorporated self-directed delivery formats, reflecting a growing shift toward home-based self-management. Specifically, digital resources (guided audio, videos, apps) have become increasingly common [19,55], a trend likely accelerated by the post-2020 shift toward telehealth [67]. Even prior to COVID-19, Thomas et al. [19] and Bruton et al. [16] demonstrated that self-guided breathing retraining, delivered *via* DVD or booklet, demonstrated comparable effectiveness and cost-effectiveness to face-to-face physiotherapy in asthma populations, with similar hybrid approaches now reported in long-COVID cohorts [23,68]. This evolution towards digital delivery reflects not only practical necessity but therapeutic logic: breathing retraining relies on frequent, low-complexity repetition within daily life, making telehealth and self-directed delivery formats inherently suitable for skill consolidation [69–71]. This places increased emphasis on physiotherapists’ role in equipping people with BrPD with the skills and confidence required for effective self-management. However, optimal physiotherapy-led delivery models that harness technological innovation in accessible, supportive, and scalable ways remain unclear.

Managing complexity and comorbid BrPD presentations

The complexity of BrPD mirrors patterns described in asthma where multiple interacting traits commonly coexist within individuals [72]. Similarly, this

review found that BrPD rarely occurs in isolation, with nearly half of included sources describing BrPD as secondary to other conditions. However, the term secondary BrPD, first introduced by Jones et al. [12], implies a one-directional relationship in which the comorbid condition gives rise to the breathing pattern disturbance. This does not adequately capture the more bi-directional, interacting presentations observed in this review as mixed BrPD, where BrPD appeared to both influence and be influenced by co-existing conditions. BrPD most frequently co-existed with asthma [16,51], psychological conditions [73,74], extra-thoracic airway disorders such as inducible laryngeal obstruction [9,56], and musculoskeletal conditions [75,76]. Given the diversity of the physiotherapy profession, spanning various disciplines including cardiorespiratory and musculoskeletal - physiotherapists are uniquely positioned to address the scope of comorbid contexts in which BrPD presents [77,78]. While sources described care delivered by respiratory physiotherapists [51,68], most referred to physiotherapists more generally without specifying subspecialty [9,79,80]. Limited access to respiratory physiotherapists [81,82] reinforces the need for BrPD management across multiple physiotherapy subdisciplines.

Building on BrPD physiotherapy management and related comorbidity considerations, several authors within respiratory care have positioned BrPD as an extrapulmonary ‘treatable trait’, most commonly in asthma populations - meaning that when BrPD is identified and specifically targeted, it can guide more individualised treatment for people with both asthma and BrPD [82,83]. BrPD also appears within other multidisciplinary contexts, such as inducible laryngeal obstruction, postural orthostatic tachycardia syndrome, and post COVID-19 condition, where physiotherapists are consistently recognised as the key providers of BrPD management due to their unique expertise in breathing retraining and rehabilitation [59,84]. However, how physiotherapists explicitly account for comorbidities and clinically complex presentations within their clinical reasoning and management remains unclear from the reviewed literature. Clarifying this is essential for reinforcing the profession’s role within diverse multidisciplinary BrPD care.

Strengths and limitations

This review has several notable strengths. Based on the available literature, this review represents the most comprehensive synthesis of physiotherapy-led management for BrPD to date. Inclusion of evidence-informed and grey literature sources provided valuable insight into applied physiotherapy practice

and clinical application, capturing how BrPD is managed outside of formal empirical research settings. Although 38% of sources were empirical, a scoping review was imperative, as over half comprised evidence-informed literature, often authored by experienced clinicians who described detailed therapeutic nuances not yet well represented within the fragmented empirical evidence base. A systematic review would have excluded much of this clinically relevant insight. Nonetheless, inclusion of evidence-informed and grey literature introduces inherent limitations, particularly due to variability in methodological rigour and reporting quality. No formal critical appraisal of included sources was undertaken, as the aim of this scoping review was to map the breadth of physiotherapy management rather than evaluate the quality of the evidence or overall intervention effectiveness.

Terminological inconsistency also presented a challenge, with BrPD described using overlapping terms (e.g. dysfunctional breathing, breathing pattern dysfunction) [10]. This variability may have influenced search retrieval and the number of included sources. To mitigate this, the search strategy was designed to capture all relevant terminology, supported by clinician review of commonly used terms, alongside reference list screening and cross-checking to minimise omissions. Nonetheless, the exclusion of non-English sources may have resulted in the omission of relevant findings and introduced potential language bias.

Implications for future research

This review highlights considerable heterogeneity across BrPD terminology, management components, delivery formats and comorbidities, reflecting gaps in both intervention reporting and understanding of physiotherapy clinical practice. Cross-sectional and mixed-methods surveys are needed to determine how closely reported management approaches within this review align with clinical practice, and how physiotherapists tailor care across comorbidities. Improved intervention reporting will also enhance insight into feasibility and acceptability of BrPD management.

The current evidence base remains largely descriptive, underscoring the need for high-quality research evaluating the effectiveness of breathing retraining and complementary approaches across heterogeneous BrPD populations and diverse delivery models. As this review mapped management components rather than treatment effects, outcomes were not examined. Robust RCTs with appropriate comparators and standardised outcome measures are required to establish treatment effectiveness and

compare physiotherapy-led, hybrid, and remote models of care.

Given the growing recognition of BrPD in recent literature, particularly in the post-COVID era, there is renewed clinical and research interest in BrPD. This recognition, alongside the emerging conceptualisation of BrPD as a treatable trait within broader comorbid contexts, reinforces the relevance and viability of advancing physiotherapy-led research in this field. Future studies should update BrPD prevalence estimates, including within Aotearoa New Zealand, and examine the distribution of BrPD across comorbid and demographic subgroups to better understand population needs. Co-creating BrPD interventions with patients and multidisciplinary teams will also be critical for enabling coordinated, patient-centred care, and for understanding the qualitative factors that influence management, engagement, and long-term outcomes for people with BrPD.

Conclusion

Physiotherapy-led management of BrPD is multidimensional and evolving. This scoping review demonstrated that physiotherapy management is anchored by breathing retraining, often complemented by education, relaxation, and self-management that address biomechanical, biochemical, and psychophysiological factors across various comorbid contexts. Considerable variability in management terminology, components, and delivery formats reflects a field still defining its clinical application and theoretical foundations. Physiotherapists are ideally positioned to lead BrPD management and address its multifactorial nature through patient-centred and collaborative care. Future research should prioritise clearer intervention and outcome reporting. Rigorous empirical evaluation across diverse populations and delivery models is also needed to ensure the evidence base evolves alongside the nuanced, biopsychosocial nature of contemporary BrPD physiotherapy care.

Acknowledgements

The authors would like to thank AUT library research support team, particularly the librarians, for their valuable assistance. We also acknowledge SP, SC and CG, three Aotearoa New Zealand respiratory physiotherapists, who provided valuable clinical insight during the review planning stage.

Ethical approval

Ethical approval was not required for this scoping review as it synthesised publicly available literature.

Authors contributions

CRedit: **Abby Stewart**: Conceptualization, Formal analysis, Funding acquisition, Methodology, Project administration, Resources, Software, Visualisation, Writing – original draft, Writing – review & editing; **Richard Ellis**: Conceptualization, Methodology, Project administration, Resources, Supervision, Visualisation, Writing – review & editing; **Sarah Mooney**: Conceptualization, Funding acquisition, Methodology, Project administration, Supervision, Visualisation, Writing – review & editing.

Disclosure statement

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

Disclaimers

The views expressed are solely those of the authors and not of any affiliated institution or funder.

Funding

This research received a scholarship grant from the Cardio-Respiratory Special Interest Group, of Physiotherapy New Zealand.

ORCID

Abby Stewart  <http://orcid.org/0009-0001-8120-3947>
Richard Ellis  <http://orcid.org/0000-0001-6848-6842>
Sarah Mooney  <http://orcid.org/0000-0001-8080-935X>

Data availability statement

All data relevant to this review are included within the manuscript and supplementary materials.

References

- Chenivesse C, Similowski T, Bautin N, et al. Severely impaired health-related quality of life in chronic hyperventilation patients: exploratory data. *Respir Med.* 2014;108(3):517–523. doi: [10.1016/j.rmed.2013.10.024](https://doi.org/10.1016/j.rmed.2013.10.024).
- Mooney S, Candy S. The real cost of effective treatment: a single case study of a patient with hyperventilation syndrome. *N Z J Physiother.* 2008;36(2):88.
- Ruane LE, Denton E, Bardin PG, et al. Dysfunctional breathing or breathing pattern disorder: new perspectives on a common but clandestine cause of breathlessness. *Respirology.* 2024;29(10):863–866. doi: [10.1111/resp.14807](https://doi.org/10.1111/resp.14807).
- Courtney R. The functions of breathing and its dysfunctions and their relationship to breathing therapy. *Int J Osteopath Med.* 2009;12(3):78–85. doi: [10.1016/j.ijosm.2009.04.002](https://doi.org/10.1016/j.ijosm.2009.04.002).
- Easton I, Schreuder F, Grillo L, et al. The nomenclature and assessment of breathing pattern disorder (BrPD): an association of chartered physiotherapists in respiratory care (ACPRC) position statement. *ACPRC J.* 2025;57(1):34–38. doi: [10.56792/SUGT5265](https://doi.org/10.56792/SUGT5265).

6. Vlemincx E. Dysfunctional breathing: a dimensional, transdiagnostic perspective. *Eur Respir J*. 2023;61(6):2300629. doi: [10.1183/13993003.00629-2023](https://doi.org/10.1183/13993003.00629-2023).
7. Boulding R, Stacey R, Niven R, et al. Dysfunctional breathing: a review of the literature and proposal for classification. *Eur Respir Rev*. 2016;25(141):287–294. doi: [10.1183/16000617.0088-2015](https://doi.org/10.1183/16000617.0088-2015).
8. Courtney R. Dysfunctional breathing: its parameters, measurement and relevance. Melbourne: Royal Melbourne Institute of Technology; 2011.
9. Barker N, Everard ML. Getting to grips with ‘dysfunctional breathing’. *Paediatr Respir Rev*. 2015;16(1):53–61. doi: [10.1016/j.prrv.2014.10.001](https://doi.org/10.1016/j.prrv.2014.10.001).
10. Grillo L, Russell A-M, Shannon H, et al. Physiotherapy assessment of breathing pattern disorder: a qualitative evaluation. *BMJ Open Respir Res*. 2023;10(1):e001395. doi: [10.1136/bmjresp-2022-001395](https://doi.org/10.1136/bmjresp-2022-001395).
11. Grillo LJ, Easton I, Schreuder FM, et al. Physiotherapy assessment of breathlessness and disordered patterns of breathing: defining a consensus on terminology and assessment. *Chron Respir Dis*. 2025;22:14799731251315483. doi: [10.1177/14799731251315483](https://doi.org/10.1177/14799731251315483).
12. Jones M, Troup F, Nugus J, et al. Does manual therapy provide additional benefit to breathing retraining in the management of dysfunctional breathing? A randomised controlled trial. *Disabil Rehabil*. 2015;37(9):763–770. doi: [10.3109/09638288.2014.941020](https://doi.org/10.3109/09638288.2014.941020).
13. Thomas M, McKinley RK, Freeman E, et al. The prevalence of dysfunctional breathing in adults in the community with and without asthma. *Prim Care Respir J*. 2005;14(2):78–82. doi: [10.1016/j.pcrj.2004.10.007](https://doi.org/10.1016/j.pcrj.2004.10.007).
14. Denton E, Bondarenko J, Tay T, et al. Factors associated with dysfunctional breathing in patients with difficult to treat asthma. *J Allergy Clin Immunol Pract*. 2019;7(5):1471–1476. doi: [10.1016/j.jaip.2018.11.037](https://doi.org/10.1016/j.jaip.2018.11.037).
15. Naylor S, Haines J, Vyas A, et al. M3 anxiety and depression in patients with breathing pattern disorders or chronic respiratory disease. *Thorax*. 2015;70(Suppl 3):A227–A228. doi: [10.1136/thoraxjnl-2015-207770.430](https://doi.org/10.1136/thoraxjnl-2015-207770.430).
16. Bruton A, Lee A, Yardley L, et al. Physiotherapy breathing retraining for asthma: a randomised controlled trial. *Lancet Respir Med*. 2018;6(1):19–28. doi: [10.1016/S2213-2600\(17\)30474-5](https://doi.org/10.1016/S2213-2600(17)30474-5).
17. Bondarenko J, Burge AT, Bremner J, et al. Nonpharmacological interventions for dysfunctional breathing in adults: a systematic review. *J Allergy Clin Immunol Pract*. 2025;13(8):2062–2074. doi: [10.1016/j.jaip.2025.04.053](https://doi.org/10.1016/j.jaip.2025.04.053).
18. Bruton A, Garrod R, Thomas M. Respiratory physiotherapy: towards a clearer definition of terminology. *Physiotherapy*. 2011;97(4):345–349. doi: [10.1016/j.physio.2010.12.005](https://doi.org/10.1016/j.physio.2010.12.005).
19. Thomas M, Bruton A, Little P, et al. A randomised controlled study of the effectiveness of breathing retraining exercises taught by a physiotherapist either by instructional DVD or in face-to-face sessions in the management of asthma in adults. *Health Technol Assess*. 2017;21(53):1–162. doi: [10.3310/hta21530](https://doi.org/10.3310/hta21530).
20. Holloway EA, West RJ. Integrated breathing and relaxation training (the Papworth method) for adults with asthma in primary care: a randomised controlled trial. *Thorax*. 2007;62(12):1039–1042. doi: [10.1136/thx.2006.076430](https://doi.org/10.1136/thx.2006.076430).
21. Chaitow L, Bradley D, Gilbert C. Recognizing and treating breathing disorders: a multidisciplinary approach. 2nd ed. London: Churchill Livingstone; 2014.
22. Thomas M, Bruton A. Breathing exercises for asthma. *Breathe*. 2014;10(4):312–322. doi: [10.1183/20734735.008414](https://doi.org/10.1183/20734735.008414).
23. Fagevik Olsén M, Lannefors L, Johansson E-L, et al. ‘The complexity of what to do’-clinical perspectives of tailored physiotherapy interventions in patients with respiratory symptoms in post-COVID condition. *Eur J Physiother*. 2025;27(5):293–299. doi: [10.1080/21679169.2024.2419051](https://doi.org/10.1080/21679169.2024.2419051).
24. O’Connor E, Patnode CD, Burda BU, et al. Breathing exercises and/or retraining techniques in the treatment of asthma: comparative effectiveness; 2012. <https://www.ncbi.nlm.nih.gov/books/NBK109355/>.
25. Bradley D. Physiotherapy in rehabilitation of breathing pattern disorders. In: Chaitow L, Bradley D, Gilbert C, editors. Recognizing and treating breathing disorders. 2nd ed. London: Elsevier Health Sciences; 2014. 185–202.
26. Godfrey K. The Buteyko technique in asthma management. *J Pract Nurs*. 2010;21(5):238–242. doi: [10.12968/pnur.2010.21.5.47919](https://doi.org/10.12968/pnur.2010.21.5.47919).
27. Hagman C, Janson C, Emtner M. Breathing retraining—a five-year follow-up of patients with dysfunctional breathing. *Respir Med*. 2011;105(8):1153–1159. doi: [10.1016/j.rmed.2011.03.006](https://doi.org/10.1016/j.rmed.2011.03.006).
28. Jones M, Harvey A, Marston L, et al. Breathing exercises for dysfunctional breathing/hyperventilation syndrome in adults. *Cochrane Database Syst Rev*. 2013;2013(5):CD009041. doi: [10.1002/14651858.CD009041.pub2](https://doi.org/10.1002/14651858.CD009041.pub2).
29. Peters MDJ, Marnie C, Colquhoun H, et al. Scoping reviews: reinforcing and advancing the methodology and application. *Syst Rev*. 2021;10(1):263. doi: [10.1186/s13643-021-01821-3](https://doi.org/10.1186/s13643-021-01821-3).
30. Tricco AC, Lillie E, Zarin W, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169(7):467–473. doi: [10.7326/M18-0850](https://doi.org/10.7326/M18-0850).
31. Peters M, Godfrey C, McInerney P, et al. Scoping reviews. In: Aromataris E, Lockwood C, Porritt K, editors. Joanna Briggs Institute manual for evidence synthesis. Adelaide: The Joanna Briggs Institute; 2020.
32. Arksey H, O’Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol*. 2005;8(1):19–32. doi: [10.1080/1364557032000119616](https://doi.org/10.1080/1364557032000119616).
33. Levac D, Colquhoun H, O’Brien KK. Scoping studies: advancing the methodology. *Implement Sci*. 2010;5(1):69. doi: [10.1186/1748-5908-5-69](https://doi.org/10.1186/1748-5908-5-69).
34. Peters M, Godfrey C, McInerney P, et al. Scoping reviews. In: Aromataris E, Munn Z, editors. Joanna Briggs institute reviewer’s manual. Adelaide: The Joanna Briggs Institute; 2017.
35. Peters MDJ, Godfrey CM, Khalil H, et al. Guidance for conducting systematic scoping reviews. *Int J Evid Based Healthc*. 2015;13(3):141–146. doi: [10.1097/XEB.0000000000000050](https://doi.org/10.1097/XEB.0000000000000050).
36. Alexander L, Cooper K, Peters MDJ, et al. Large scoping reviews: managing volume and potential chaos in a pool of evidence sources. *J Clin Epidemiol*. 2024;170:111343. doi: [10.1016/j.jclinepi.2024.111343](https://doi.org/10.1016/j.jclinepi.2024.111343).
37. Pollock D, Davies EL, Peters MDJ, et al. Undertaking a scoping review: a practical guide for nursing and midwifery students, clinicians, researchers, and

- academics. *J Adv Nurs*. 2021;77(4):2102–2113. doi: [10.1111/jan.14743](https://doi.org/10.1111/jan.14743).
38. Westphaln KK, Regoeczi W, Masotya M, et al. From Arksey and O'Malley and Beyond: customizations to enhance a team-based, mixed approach to scoping review methodology. *MethodsX*. 2021;8:101375. doi: [10.1016/j.mex.2021.101375](https://doi.org/10.1016/j.mex.2021.101375).
 39. Mustafa N, Moxham J. Respiratory muscle assessment in motor neurone disease. *QJM*. 2001;94(9):497–502. doi: [10.1093/qjmed/94.9.497](https://doi.org/10.1093/qjmed/94.9.497).
 40. Schmutzhard E. Central breathing disturbances. *J Neurol Sci*. 2019;405:9–10. doi: [10.1016/j.jns.2019.10.023](https://doi.org/10.1016/j.jns.2019.10.023).
 41. Tsara V, Amfilochiou A, Papagrigrakis MJ, et al. Guidelines for diagnosis and treatment of sleep-related breathing disorders in adults and children. Definition and classification of sleep related breathing disorders in adults: different types and indications for sleep studies (Part 1). *Hippokratia*. 2009;13(3):187–191.
 42. Lum LC. Hyperventilation: the tip and the iceberg. *J Psychosom Res*. 1975;19(5-6):375–383. doi: [10.1016/0022-3999\(75\)90017-3](https://doi.org/10.1016/0022-3999(75)90017-3).
 43. Turin TC, Vaska M, Chowdhury MZ, et al. Exploring all that is grey in the health sciences: what is grey literature and how to use it for comprehensive knowledge synthesis. doi: [10.11575/PRISM/48393;2019](https://doi.org/10.11575/PRISM/48393;2019).
 44. Towersey NCM, Sasse K, Stavric V, et al. Freely available, online videos to support neurological physiotherapists and students in task-specific training skill acquisition: a scoping review. *BMC Med Educ*. 2024;24(1):603. doi: [10.1186/s12909-024-05545-5](https://doi.org/10.1186/s12909-024-05545-5).
 45. Godin K, Stapleton J, Kirkpatrick SI, et al. Applying systematic review search methods to the grey literature: a case study examining guidelines for school-based breakfast programs in Canada. *Syst Rev*. 2015;4(1):138. doi: [10.1186/s13643-015-0125-0](https://doi.org/10.1186/s13643-015-0125-0).
 46. Pham MT, Rajić A, Greig JD, et al. A scoping review of scoping reviews: advancing the approach and enhancing the consistency. *Res Synth Methods*. 2014;5(4):371–385. doi: [10.1002/jrsm.1123](https://doi.org/10.1002/jrsm.1123).
 47. The EndNote Team. EndNote. (Version EndNote 20). Philadelphia, PA: Clarivate; 2013.
 48. Munn Z, Aromataris E, Tufanaru C, et al. The development of software to support multiple systematic review types: the Joanna Briggs Institute System for the Unified Management, Assessment and Review of Information (JBI SUMARI). *Int J Evid Based Healthc*. 2019;17(1):36–43. doi: [10.1097/XEB.0000000000000152](https://doi.org/10.1097/XEB.0000000000000152).
 49. Piper C. System for the unified management, assessment, and review of information (SUMARI). *jmla*. 2019;107(4):634. doi: [10.5195/jmla.2019.790](https://doi.org/10.5195/jmla.2019.790).
 50. Hoffmann TC, Glasziou PP, Boutron I, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ*. 2014;348(3):g1687–g1687. doi: [10.1136/bmj.g1687](https://doi.org/10.1136/bmj.g1687).
 51. Andreasson KH, Skou ST, Ulrik CS, et al. Breathing exercises for patients with asthma in specialist care: a multicenter randomized clinical trial. *Ann Am Thorac Soc*. 2022;19(9):1498–1506. doi: [10.1513/AnnalsATS.202111-1228OC](https://doi.org/10.1513/AnnalsATS.202111-1228OC).
 52. Bott J, Blumenthal S, Buxton M, et al. Guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient. *Thorax*. 2009;64(Suppl 1):i1–51. doi: [10.1136/thx.2008.110726](https://doi.org/10.1136/thx.2008.110726).
 53. Lee J, Denton E, Hoy R, et al. Paradoxical vocal fold motion in difficult asthma is associated with dysfunctional breathing and preserved lung function. *J Allergy Clin Immunol Pract*. 2020;8(7):2256–2262. doi: [10.1016/j.jaip.2020.02.037](https://doi.org/10.1016/j.jaip.2020.02.037).
 54. Wong M, Gardner L, Denton E, et al. Investigation of exertional dyspnoea by cardiopulmonary exercise testing with continuous laryngoscopy. *J Sci Med Sport*. 2025;28(2):95–100. doi: [10.1016/j.jsams.2024.09.006](https://doi.org/10.1016/j.jsams.2024.09.006).
 55. Denton E, Bondarenko, J, M. Breathing pattern disorder. In: Hull H, Haines, JH, editors. *Complex breathlessness*. Sheffield: European Respiratory Society; 2022. p. 109–122.
 56. Ludlow S, Daly R, Elsey L, et al. Multidisciplinary management of inducible laryngeal obstruction and breathing pattern disorder. *Breathe*. 2023;19(3):230088. doi: [10.1183/20734735.0088-2023](https://doi.org/10.1183/20734735.0088-2023).
 57. Courtney R, Greenwood KM, Cohen M. Relationships between measures of dysfunctional breathing in a population with concerns about their breathing. *J Bodyw Mov Ther*. 2011;15(1):24–34. doi: [10.1016/j.jbmt.2010.06.004](https://doi.org/10.1016/j.jbmt.2010.06.004).
 58. Pinder T, Jones A, Jacob I, et al. A critical review of dysfunctional breathing. *J Bodyw Mov Ther*. 2025;44:770–774. doi: [10.1016/j.jbmt.2025.07.009](https://doi.org/10.1016/j.jbmt.2025.07.009).
 59. Reilly CC, Floyd SV, Lee K, et al. Breathlessness and dysfunctional breathing in patients with postural orthostatic tachycardia syndrome (POTS): the impact of a physiotherapy intervention. *Auton Neurosci*. 2020;223:102601. doi: [10.1016/j.autneu.2019.102601](https://doi.org/10.1016/j.autneu.2019.102601).
 60. Bentley TKG, D'Andrea-Penna G, Rakic M, et al. Breathing practices for stress and anxiety reduction: conceptual framework of implementation guidelines based on a systematic review of the published literature. *Brain Sci*. 2023;13(12):1612. doi: [10.3390/brainsci13121612](https://doi.org/10.3390/brainsci13121612).
 61. Andreasson KH, Skou ST, Ulrik CS, et al. Protocol for a multicentre randomised controlled trial to investigate the effect on asthma-related quality of life from breathing retraining in patients with incomplete asthma control attending specialist care in Denmark. *BMJ Open*. 2019;9(12):e032984. doi: [10.1136/bmjopen-2019-032984](https://doi.org/10.1136/bmjopen-2019-032984).
 62. Motiejunaite J, Balagny P, Arnoult F, et al. Hyperventilation as one of the mechanisms of persistent dyspnoea in SARS-CoV-2 survivors. *Eur Respir J*. 2021;58(2):2101578. doi: [10.1183/13993003.01578-2021](https://doi.org/10.1183/13993003.01578-2021).
 63. Nijs J, Adriaens J, Schuermans D, et al. Breathing retraining in patients with chronic fatigue syndrome: a pilot study. *Physiother Theory Pract*. 2008;24(2):83–94. doi: [10.1080/09593980701429406](https://doi.org/10.1080/09593980701429406).
 64. Steinmann J, Lewis A, Ellmers TJ, et al. Validating the breathing vigilance questionnaire for use in dysfunctional breathing. *Eur Respir J*. 2023;61(6):2300031. doi: [10.1183/13993003.00031-2023](https://doi.org/10.1183/13993003.00031-2023).
 65. Stanton AE, Vaughn P, Carter R, et al. An observational investigation of dysfunctional breathing and breathing control therapy in a problem asthma clinic. *J Asthma*. 2008;45(9):758–765. doi: [10.1080/02770900802252093](https://doi.org/10.1080/02770900802252093).
 66. Thomas M, McKinley RK, Mellor S, et al. Breathing exercises for asthma: a randomised controlled trial. *Thorax*. 2009;64(1):55–61. doi: [10.1136/thx.2008.100867](https://doi.org/10.1136/thx.2008.100867).
 67. Smith A, Innes S. Patient and clinician perceptions of telehealth in musculoskeletal physiotherapy services – A systematic review of the evidence-base. *PLOS Digit Health*. 2025;4(3):e0000789. doi: [10.1371/journal.pdig.0000789](https://doi.org/10.1371/journal.pdig.0000789).

68. Evans R, Pick A, Lardner R, et al. Breathing difficulties after Covid-19: a guide for primary care. *BMJ*. 2023;381:e074937. doi: [10.1136/bmj-2023-074937](https://doi.org/10.1136/bmj-2023-074937).
69. Ainsworth B, Bruton A, Thomas M, et al. One year later: highlighting the challenges and opportunities in disseminating a breathing-retraining digital behaviour change intervention. *Digit Health*. 2020;6:2055207620936441. doi: [10.1177/2055207620936441](https://doi.org/10.1177/2055207620936441).
70. Bussa-Carlson A, Morrison H, Taylor-Piliae R, et al. Feasibility of a telehealth breathing intervention for patients with idiopathic pulmonary fibrosis. *Appl Nurs Res*. 2024;79:151827. doi: [10.1016/j.apnr.2024.151827](https://doi.org/10.1016/j.apnr.2024.151827).
71. Wells C, Cross JL, Saglani S. Experience-based co-design to develop innovative telehealth physiotherapy interventions and resources for children and young people with asthma and dysfunctional breathing. *Des Health*. 2024;8(2):274–293. doi: [10.1080/24735132.2024.2401726](https://doi.org/10.1080/24735132.2024.2401726).
72. Gibson PG, McDonald VM. Integrating hot topics and implementation of treatable traits in asthma. *Eur Respir J*. 2024;64(6):2400861. doi: [10.1183/13993003.00861-2024](https://doi.org/10.1183/13993003.00861-2024).
73. Gibson D, Bruton A, Lewith GT, et al. Effects of acupuncture as a treatment for hyperventilation syndrome: a pilot, randomized crossover trial. *J Altern Complement Med*. 2007;13(1):39–46. doi: [10.1089/acm.2006.5283](https://doi.org/10.1089/acm.2006.5283).
74. Han JN, Stegen K, De Valck C, et al. Influence of breathing therapy on complaints, anxiety and breathing pattern in patients with hyperventilation syndrome and anxiety disorders. *J Psychosom Res*. 1996;41(5):481–493. doi: [10.1016/S0022-3999\(96\)00220-6](https://doi.org/10.1016/S0022-3999(96)00220-6).
75. Anwar S, Arsalan SA, Zafar H, et al. Effects of breathing re-education on endurance, strength of deep neck flexors and pulmonary function in patients with chronic neck pain: a randomised controlled trial. *S Afr J Physiother*. 2022;78(1):1611. doi: [10.4102/sajp.v78i1.1611](https://doi.org/10.4102/sajp.v78i1.1611).
76. Dimitriadis Z, Kapreli E, Strimpakos N, et al. Respiratory dysfunction in patients with chronic neck pain: what is the current evidence? *J Bodyw Mov Ther*. 2016;20(4):704–714. doi: [10.1016/j.jbmt.2016.02.001](https://doi.org/10.1016/j.jbmt.2016.02.001).
77. (a) Clifton-Smith T, Bartley J. Breathing pattern disorders in physical therapy: a musculoskeletal perspective. In: Bennett J, editor. *Physical therapy: theory, practices and benefits*. Clifton: Nova Publishers Science Publishers; 2011. p. 83–108. (b) Smith, T., & Rowley, J. (2011). Breathing pattern disorders and physiotherapy: inspiration for our profession. *Phys Ther Rev*. 16(1), 75–86. doi: [10.1179/1743288X10Y.0000000025](https://doi.org/10.1179/1743288X10Y.0000000025).
78. Duignan N, Ridge P, Leonard S, et al. Expanded central role of the respiratory physiotherapists in the community setting. *Ir J Med Sci*. 2023;192(4):1581–1588. doi: [10.1007/s11845-022-03213-5](https://doi.org/10.1007/s11845-022-03213-5).
79. Gibson PG, McDonald VM, Granchelli A, et al. Asthma and comorbid conditions – pulmonary comorbidity. *J Allergy Clin Immunol Pract*. 2021;9(11):3868–3875. doi: [10.1016/j.jaip.2021.08.028](https://doi.org/10.1016/j.jaip.2021.08.028).
80. Hull JH, Burns P, Carre J, et al. BTS clinical statement for the assessment and management of respiratory problems in athletic individuals. *Thorax*. 2022;77(6):540–551. doi: [10.1136/thoraxjnl-2021-217904](https://doi.org/10.1136/thoraxjnl-2021-217904).
81. Buhler M, Shah T, Perry M, et al. Geographic accessibility to physiotherapy care in Aotearoa New Zealand. *Spat Spatiotemporal Epidemiol*. 2024;49:100656. doi: [10.1016/j.sste.2024.100656](https://doi.org/10.1016/j.sste.2024.100656).
82. Pfeffer PE, Rupani H, De Simoni A. Bringing the treatable traits approach to primary care asthma management. *Front Allergy*. 2023;4:1240375. doi: [10.3389/falgy.2023.1240375](https://doi.org/10.3389/falgy.2023.1240375).
83. McDonald VM, Fingleton J, Agusti A, et al. Treatable traits: a new paradigm for 21st century management of chronic airway diseases: treatable traits down under international workshop report. *Eur Respir J*. 2019;53(5):1802058. doi: [10.1183/13993003.02058-2018](https://doi.org/10.1183/13993003.02058-2018).
84. Henry H, Wells C. Identification and management of dysfunctional breathing in primary care. *J Pract Nurs*. 2021;32(12):474–479. doi: [10.12968/pnur.2021.32.12.474](https://doi.org/10.12968/pnur.2021.32.12.474).