Myofunctional therapy: a bibliometric study of the most cited 50 articles

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Aim: The objective of this bibliometric analysis was to provide an overview of the current literature status of myofunctional therapy and to assist practitioners and researchers to make clinically relevant decisions and to foster collaborations by mapping out bibliographic information.
Methods: A literature search was conducted using the Web of Science Core Collection through the electronic library of Ege University by applying the query "(TS = (myofunctional therapy OR dental myofunctional therapy OR myofunctional treatment OR myofunctional appliance))." The 50 most-cited articles were analysed in September 2024 using VOSviewer software to assess parameters associated with authorship, the country of origin, academic institutions, and keywords, so that the interrelationships could be mapped.
Results: The 50 most-cited articles, authored by a total of 227 researchers, were published between 1998 and 2022, and attracted a cumulative total of 2483 citations. According to the Web of Science (WoS) categories, most of the publications were classified under *Dentistry, Oral Surgery & Medicine*, followed by *Clinical Neurology*. The United States was the country with the highest number of citations, while Stanford University emerged as the institution with the greatest number of frequently cited works.
Conclusion: This bibliometric analysis highlights the increasing research interest in myofunctional therapy and its role in addressing a malocclusion, obstructive sleep apnoea, and other orofacial conditions. While international collaboration is growing, limited cross-specialty integration remains, emphasising the need for more interdisciplinary studies and randomised controlled trials to strengthen evidence-based practices.
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Introduction

Myofunctional therapy can enhance the shape, strength, and function of facial and oral muscles while positively influencing the orofacial growth and development of children. Orofacial myofunctional therapy is considered an adjunctive treatment for obstructive sleep apnoea-hypopnoea syndrome and orthodontic interventions.[1] Supporting this, Achmad et al.[2] noted that myofunctional therapy is highly effective when combined with orthodontic appliances or myofunctional devices to correct a child's anterior open bite.

Malocclusions, characterised by abnormal relationships between the upper and lower teeth, arise from hereditary factors, environmental influences, or a combination of both. They are often linked to oral habits such as thumb sucking, pacifier use, tongue thrusting, and mouth breathing.[3] Rogers was the first to introduce

muscle function therapy for malocclusion correction, and Lischer later coined the term "Myofunctional Therapy" to describe this approach.[4]

Managing a malocclusion requires a holistic approach that extends beyond conventional orthodontic treatment. Myofunctional therapy plays a key role by targeting orofacial muscle function and promoting muscle balance.[1] The therapy aims to identify the underlying causes of a malocclusion and promote proper muscle function and oral posture, thereby enhancing the stability of orthodontic treatment outcomes.[2] Stallard first suggested that sleeping position could be a reason for the development of a malocclusion.[5] As pioneers in the field, Truesdell and Truesdell[6] established the relationship between swallowing anomalies and dysmorphosis.

Although there are numerous publications on myofunctional therapy, there remains a lack of systematic bibliometric analyses exploring citation trends, keyword co-occurrence patterns, and interdisciplinary collaborations within the field. While prior bibliometric studies have been conducted in related areas related to orthodontics and sleep medicine, a dedicated analysis of myofunctional therapy is absent. The gap necessitates an examination of the most influential studies to outline research trends, identify underexplored topics, and assess the evolution of collaboration networks. Highly cited papers often shape future research directions and contribute to clinical advancements.[7] To achieve this, bibliometrics, defined as the application of statistical methods to analyse a body of literature, in order to reveal the historical development of subject areas and identify trends in authorship, publication, and usage, is an essential tool for evaluating scientific output.[8]

Therefore, the present bibliometric analysis aims to evaluate the scientific impact of myofunctional therapy by analysing the top 50 most-cited papers, and offer a perspective on the influence of the forthcoming studies. It was expected that this information would help researchers identify knowledge gaps and outline trends for future research, thereby potentially contributing to the multidisciplinary management of current cases.

Material and methods

An electronic search was conducted in September, 2024, to identify relevant publications using the Web of Science (WOS) database through Ege University's electronic library. The search strategy employed was: ((TS = (myofunctional therapy OR dental myofunctional therapy OR myofunctional treatment OR myofunctional appliance)) OR (QMTS = ("myofunctional therapy")) OR (QMTS = ("myofunctional appliance")) OR (QMTS = ("orofacial myofunctional therapy")) OR (QMTS = ("myofunctional appliances")) OR (QMTS = ("myofunctional treatment"))), without a time span restriction. The search entitled "Myofunctional Therapy" and limited to articles and reviews, yielded a total of 388 publications.

The top 50 most-cited articles were identified and independently sorted by two authors and placed in descending order based on their citation counts. The bibliometric information extracted from the selected articles included the title, citation count, year of publication, authors, academic institution, country of origin, and keywords. Subsequently, the data were double-checked by the two authors (ECF, AÇ) and any discrepancies were resolved by a third author (EE). The data were then exported in a comma-separated values (CSV) format. Studies published in languages other than English and topics unrelated to myofunctional therapy were excluded.

The visualisation of similarities was conducted using VOSviewer software (Version 1.6.20; Centre for Science and Technology Studies, Leiden University, Leiden, The Netherlands) alongside Microsoft Excel (Microsoft Corp., Redmond, WA, USA) to analyse the exported data. The VOSviewer software created visual maps in the form of 'bubbles' to represent documents, citation counts, sources, countries and keywords.

Keyword clusters were analysed using density visualisation techniques. The visual analysis for the number of publications was presented as 'bubble' maps, and associations between items were depicted by the distances between bubbles.

The co-occurrence of author keywords was examined by setting a minimum occurrence threshold of four times in the network visualisation. The percentage distribution of documents was calculated by dividing the number of documents by the total number of identified records. Similarly, the average citation score per document was determined by dividing the total number of citations by the number of documents.

Results

Table I presents the top 50 most-cited myofunctional therapy articles published between 1998 and 2022. The most productive year was 2020, as six articles were published during that year. Of the articles, 56% were original research papers and 44% were reviews. The articles were produced by academic institutions from 23 countries, predominantly the United States, Brazil, Italy, Belgium, Germany and the United Kingdom. Spain led in funded studies, contributing 13 articles (26%), followed by the United States with 5 articles (10%).

According to the Web of Science (WoS) categories, the primary research areas represented by more than 10% of the articles were: Dentistry, Oral Surgery and Medicine (23 articles; 46%), Clinical Neurology (10 articles; 20%), Neurosciences (7 articles; 14%), Paediatrics (6 articles; 12%), and Respiratory System (5 articles; 10%).

The articles in WoS-CC received a total of 2483 citations, including 89 self-citations (3%). Citation counts ranged from 24 to 197, with 19 articles receiving at least 50 citations, 6 articles receiving 75 or more, and 2 articles receiving more than 100 citations (Table I).

The most-cited article was *"Myofunctional Therapy to Treat Obstructive Sleep Apnea: A Systematic Review and Meta-analysis"* (Camacho et al., 2015, *Sleep*). The oldest article, titled *"Effects of a Myofunctional Appliance on Orofacial Muscle Activity and Structures"* by Antti Tallgren et al., was published in *The Angle Orthodontist* in 1998. The most recent article was *"Prevalence of Orthodontic Malocclusions in Healthy Children and Adolescents: A Systematic Review"* (De Ridder et al., 2022). Most of the articles (34 out of 50) were published between 2015 and 2021 (Figure 1).

Authors from 104 institutions contributed to the published articles. Leading institutions include Stanford University (USA) and São Paulo University (Brazil), each contributing 7 articles. Stanford University had the highest citation count (518 citations) and total link strength (32). São Paulo University had the highest average citation count per article (111.5), followed by Stanford University (74). Figure 2 presents the co-occurrence map of the institutions.

Eleven countries published at least two articles on myofunctional therapy. The United States led with 18 articles (958 citations), followed by Brazil (10 articles, 433 citations) and Italy (9 articles, 378 citations) (Table II). Germany (79.8) and Taiwan (77.5) had the highest average citation counts per article. Italy, the United Kingdom and France had the strongest collaboration networks, with link strengths of 11, 10, and 10, respectively. The United States collaborated with Germany, the United Kingdom, Brazil, and Australia.

The three most prolific authors in myofunctional therapy were Guilleminault (7 publications), De Felicio (5 publications), and Marzo (4 publications). Guilleminault's most-cited work was *"Critical Role of Myofascial Reeducation in Pediatric Sleep-Disordered Breathing,"* which was published in *Sleep Medicine* in 2013, with contributions from six authors across four institutions in three countries (France, Taiwan, and the U.S.).

The two journals with the highest number of published myotherapy articles were the *European Journal of Orthodontics* (4 articles, 325 citations, 8%) and the *European Journal of Paediatric Dentistry* (4 articles, 136 citations, 8%). Other leading journals included *Sleep and Breathing* (3 articles; 153 citations; 6%), *The Angle Orthodontist* (2 articles; 73 citations; 4%), and *Cranio-The Journal of Craniomandibular & Sleep Practice* (2 articles; 120 citations; 4%) (Figure 3).

From an initial set of 144 unique author keywords, duplicate entries were consolidated into 125 distinct keywords. Nine keywords appeared more than four times, with "myofunctional therapy" (17 occurrences) being the most frequent. Other frequently used terms included "obstructive sleep apnoea" (8 occurrences) and "sleep disordered breathing" (7 occurrences). Figure 4 illustrates the distribution of the most frequently used keywords and their interrelationships.

Discussion

Myofunctional therapy is a treatment modality aimed at correcting anomalies in speech, breathing disorders, and dental and jaw structure by promoting proper function of the oral and facial muscles. These therapies are conducted by professionals from various disciplines, including dentists, physical therapists, speech therapists, and sleep specialists.

Myofunctional therapy is effective in adjusting the occlusion and managing conditions such as

Table I. The top 50 cited articles in myofunctional therapy

	Title	Authors	Journal name	Total citation	Average per year
1	Myofunctional Therapy to Treat Obstructive Sleep Apnea: A Systematic Review and Meta-analysis	Camacho, Macario; Certal, Victor; Abdullatif, Jose; Zaghi, Soroush; Ruoff, Chad M.; Capasso, Robson; Kushida, Clete A.	SLEEP	197	19.7
2	Prevalence of malocclusions in the early mixed dentition and orthodontic treatment need	Tausche, E; Luck, O; Harzer, W	EUROPEAN JOURNAL OF ORTHODONTICS	174	8.29
3	Critical role of myofascial reeducation in pediatric sleep-disordered breathing	Guilleminault, C.; Huang, Y. S.; Monteyrol, P. J.; Sato, R.; Quo, S.; Lin, C. H.	SLEEP MEDICINE	83	6.92
4	European Respiratory Society guideline on non-CPAP therapies for obstructive sleep apnoea	Randerath, Winfried; Verbraecken, Johan; de Raaff, Christel A. L.; Hedner, Jan; Herkenrath, Simon; Hohenhorst, Winfried; Jakob, Tina; Marrone, Oreste; Marklund, Marie; McNicholas, Walter T.; Morgan, Rebecca L.; Pepin, Jean-Louis; Schiza, Sofia; Skoetz, Nicole; Smyth, Dan; Steier, Jorg; Tonia, Thomy; Trzepizur, Wojciech; Van Mechelen, Piet-Heijn; Wijkstra, Peter	EUROPEAN RESPIRATORY REVIEW	81	20.25
5	Relationship between occlusal findings and orofacial myofunctional status in primary and mixed dentition - Part I: Prevalence of malocclusions	Grabowski, Rosemarie; Stahl, Franka; Gaebel, Manja; Kundt, Guenther	JOURNAL OF OROFACIAL ORTHOPEDICS-FORTSCHRITTE DER KIEFERORTHOPADIE	80	4.44

Table I. continued

	Title	Authors	Journal name	Total citation	Average per year
6	Conservative treatment of unilateral condylar fractures in children: a long-term clinical and radiologic follow-up of 55 patients	Strobl, H; Emshoff, R; Röthler, G	INTERNATIONAL JOURNAL OF ORAL AND MAXILLOFACIAL SURGERY	78	3
7	Pediatric obstructive sleep apnea and the critical role of oral-facial growth: evidences	Huang, Yu-Shu; Guilleminault, Christian	FRONTIERS IN NEUROLOGY	72	6
8	Obstructive sleep apnea in patients with Down syndrome: current perspectives	Simpson, Ryne; Oyekan, Anthony A.; Ehsan, Zarmina; Ingram, David G.	NATURE AND SCIENCE OF SLEEP	70	10
9	Relapse of anterior open bites treated with orthodontic appliances with and without orofacial myofunctional therapy	Smithpeter, JoAnn; Covell, David, Jr.	AMERICAN JOURNAL OF ORTHODONTICS AND DENTOFACIAL ORTHOPEDICS	67	4.47
10	The effect of orofacial myofunctional treatment in children with anterior open bite and tongue dysfunction: a pilot study	Van Dyck, Claire; Dekeyser, Aline; Vantricht, Elien; Manders, Eric; Goeleven, Ann; Fieuws, Steffen; Willems, Guy	EUROPEAN JOURNAL OF ORTHODONTICS	65	7.22
11	Otologic symptoms of temporomandibular disorder and effect of orofacial myofunctional therapy	de Felicio, Claudia Maria; Melchior, Melissa de Oliveira; Pimenta Ferreira, Claudia Lucia; Rodrigues Da Silva, Marco Antonio M.	CRANIO-THE JOURNAL OF CRANIOMANDIBULAR & SLEEP PRACTICE	61	3.59
12	Continuous positive airway pressure therapy in obstuctive sleep apnea: benefits and alternatives	Cao, Michelle T.; Sternbach, Joshua M.; Guilleminault, C.	EXPERT REVIEW OF RESPIRATORY MEDICINE	60	7.5
13	Effects of Orofacial Myofunctional Therapy on Temporomandibular Disorders	de Felicio, Claudia Maria; Melchior, Melissa de Oliveira; Moreira Rodrigues da Silva, Marco Antonio	CRANIO-THE JOURNAL OF CRANIOMANDIBULAR & SLEEP PRACTICE	59	3.93

Table I. continued

	Title	Authors	Journal name	Total citation	Average per year
14	Lip and tongue pressure in orthodontic patients	Lambrechts, Heleen; De Baets, Evelyne; Fieuws, Steffen; Willems, Guy	EUROPEAN JOURNAL OF ORTHODONTICS	58	3.87
15	Obstructive sleep apnea: focus on myofunctional therapy	de Felicio, Claudia Maria; da Silva Dias, Franciele Voltarelli; Voi Trawitzki, Luciana Vitaliano	NATURE AND SCIENCE OF SLEEP	57	8.14
16	Oral dysfunction as a cause of malocclusion	D'Onofrio, Linda	ORTHODONTICS & CRANIOFACIAL RESEARCH	56	9.33
17	Assessment of obstructive sleep apnoea (OSA) in children: an update	Savini, S.; Ciorba, A.; Bianchini, C.; Stomeo, F.; Corazzi, V; Vicini, C.; Pelucchi, S.	ACTA OTORHINOLARYNGOLOGICA ITALICA	54	9
18	Can myofunctional therapy increase tongue tone and reduce symptoms in children with sleep-disordered breathing?	Villa, Maria Pia; Evangelisti, Melania; Martella, Susy; Barreto, Mario; Del Pozzo, Marco	SLEEP AND BREATHING	54	6.75
19	Mouth breathing, nasal disuse, and pediatric sleep-disordered breathing	Lee, Seo-Young; Guilleminault, Christian; Chiu, Hsiao-Yean; Sullivan, Shannon S.	SLEEP AND BREATHING	52	5.2
20	Myofunctional therapy improves adherence to continuous positive airway pressure treatment	Diaferia, Giovana; Santos-Silva, Rogerio; Truksinas, Eveli; Haddad, Fernanda L. M.; Santos, Renata; Bommarito, Silvana; Gregorio, Luiz C.; Tufik, Sergio; Bittencourt, Lia	SLEEP AND BREATHING	47	5.88
21	Validity of the 'protocol of oro-facial myofunctional evaluation with scores' for young and adult subjects	De Felicio, C. M.; Medeiros, A. P. M.; De Oliveira Melchior, M.	JOURNAL OF ORAL REHABILITATION	47	3.62
22	Effects of oral motor exercises and laser therapy on chronic temporomandibular disorders: a randomized study with follow-up	Zanandrea Machado, Barbara Cristina; Mazzetto, Marcelo Oliveira; Rodrigues Da Silva, Marco Antonio M.; de Felicio, Claudia Maria	LASERS IN MEDICAL SCIENCE	46	5.11

Table I. continued

	Title	Authors	Journal name	Total citation	Average per year
23	Treatment of Obstructive Sleep Apnea in Children: Handling the Unknown with Precision	Gozal, David; Tan, Hui-Leng; Kheirandish-Gozal, Leila	JOURNAL OF CLINICAL MEDICINE	43	8.6
24	Causal relationship between malocclusion and oral muscles dysfunction: a model of approach	Saccomanno, S.; Antonini, G.; D'Alatri, L.; D'Angelantonio, M.; Fiorita, A.; Deli, R.	EUROPEAN JOURNAL OF PAEDIATRIC DENTISTRY	40	3.08
25	The effects of early preorthodontic trainer treatment on class II, division 1 patients	Usumez, S; Uysal, T; Sari, Z; Basciftci, FA; Karaman, AI; Guray, E	ANGLE ORTHODONTIST	39	1.86
26	Interrelation between occlusion findings and orofacial myofunctional status in primary and mixed dentition - Part III: Interrelation between malocclusions and orofacial dysfunctions	Grabowski, Rosemarie; Kundt, Guenther; Stahl, Franka	JOURNAL OF OROFACIAL ORTHOPEDICS-FORTSCHRITTE DER KIEFERORTHOPADIE	37	2.06
27	Myofunctional Therapy App for Severe Apnea-Hypopnea Sleep Obstructive Syndrome: Pilot Randomized Controlled Trial	O'Connor-Reina, Carlos; Ignacio Garcia, Jose Maria; Rodriguez Ruiz, Elisa; Morillo Dominguez, Maria Del Carmen; Ignacio Barrios, Victoria; Baptista Jardin, Peter; Casado Morente, Juan Carlos; Garcia Iriarte, Maria Teresa; Plaza, Guillermo	JMIR MHEALTH AND UHEALTH	35	7
28	Orofacial motor functions in pediatric obstructive sleep apnea and implications for myofunctional therapy	de Felicio, Claudia Maria; da Silva Dias, Franciele Voltarelli; Folha, Gislaine Aparecida; de Almeida, Leila Azevedo; de Souza, Jaqueline Freitas; Anselmo-Lima, Wilma Terezinha; Voi Trawitzki, Luciana Vitaliano; Pereira Valera, Fabiana Cardoso	INTERNATIONAL JOURNAL OF PEDIATRIC OTORHINOLARYNGOLOGY	34	3.78

Table I. continued

	Title	Authors	Journal name	Total citation	Average per year
29	Effects of a myofunctional appliance on orofacial muscle activity and structures	Tallgren, A; Christiansen, RL; Ash, M; Miller, RL	ANGLE ORTHODONTIST	34	1.26
30	Maldevelopment of the cranio-facial-respiratory complex: A Darwinian perspective	Boyd, K. L.; Saccomanno, S.; Paskay, L. Coceani; Quinzi, V; Marzo, G.	EUROPEAN JOURNAL OF PAEDIATRIC DENTISTRY	33	8.25
31	Myofunctional therapy (oropharyngeal exercises) for obstructive sleep apnoea	Rueda, Jose-Ramon; Mugueta-Aguinaga, Iranzu; Vilaro, Jordi; Rueda-Etxebarria, Mikel	COCHRANE DATABASE OF SYSTEMATIC REVIEWS	33	6.6
32	Obstructive Sleep Apnea: Emerging Treatments Targeting the Genioglossus Muscle	Mediano, Olga; Romero-Peralta, Sofia; Resano, Pilar; Cano-Pumarega, Irene; Sanchez-de-la-Torre, Manuel; Castillo-Garcia, Maria; Belen Martinez-Sanchez, Ana; Ortigado, Ana; Garcia-Rio, Francisco	JOURNAL OF CLINICAL MEDICINE	33	5.5
33	Effect of orthodontic management and orofacial muscle training protocols on the correction of myofunctional and myoskeletal problems in developing dentition. A systematic review and meta-analysis	Koletsi, Despina; Makou, Margarita; Pandis, Nikolaos	ORTHODONTICS & CRANIOFACIAL RESEARCH	33	4.71
34	Myofunctional therapy. Part 1: Culture, industrialisation and the shrinking human face	Boyd, K.; Saccomanno, S.; Lewis, C. J.; Paskay, L. Coceani; Quinzi, V; Marzo, G.	EUROPEAN JOURNAL OF PAEDIATRIC DENTISTRY	32	8
35	Multidisciplinary management of ankyloglossia in childhood. Treatment of 101 cases. A protocol	Ferres-Amat, Elvira; Pastor-Vera, Tomasa; Ferres-Amat, Eduard; Mareque-Bueno, Javier; Prats-Armengol, Jordi; Ferres-Padro, Eduard	MEDICINA ORAL PATOLOGIA ORAL Y CIRUGIA BUCAL	32	3.56

Table I. continued

	Title	Authors	Journal name	Total citation	Average per year
36	Myofunctional therapy Part 2: Prevention of dentofacial disorders	Gelb, M.; Montrose, J.; Paglia, L.; Saccomanno, S.; Quinzi, V; Marzo, G.	EUROPEAN JOURNAL OF PAEDIATRIC DENTISTRY	31	7.75
37	Assessment of the differences in masticatory behavior between male and female adolescents	de Oliveira Scudine, Kelly Guedes; Pedroni-Pereira, Aline; Araujo, Darlle Santos; de Almeida Prado, Daniela Galvao; Rossi, Ana Claudia; Castelo, Paula Midori	PHYSIOLOGY & BEHAVIOR	31	3.44
38	Orofacial Myofunctional Therapy in Obstructive Sleep Apnea Syndrome: A Pathophysiological Perspective	Koka, Venkata; De Vito, Andrea; Roisman, Gabriel; Petitjean, Michel; Pignatelli, Giulio Romano Filograna; Padovani, Davide; Randerath, Winfried	MEDICINA-LITHUANIA	30	7.5
39	Pediatric sleep-disordered breathing: New evidence on its development	Guilleminault, Christian; Akhtar, Farah	SLEEP MEDICINE REVIEWS	29	2.9
40	Soft- and hard-tissue changes following treatment of Class II division 1 malocclusion with Activator versus Trainer: a randomized controlled trial	Idris, Ghassan; Hajeer, Mohammad Y.; Al-Jundi, Azzam	EUROPEAN JOURNAL OF ORTHODONTICS	28	4.67
41	Prevalence of Orthodontic Malocclusions in Healthy Children and Adolescents: A Systematic Review	De Ridder, Lutgart; Aleksieva, Antonia; Willems, Guy; Declerck, Dominique; de Llano-Perula, Maria Cadenas	INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	27	9
42	Manual Therapy in the Treatment of Myofascial Pain Related to Temporomandibular Disorders: A Systematic Review	de Melo, Laercio Almeida; Bezerra de Medeiros, Annie Karoline; Trindade Pinto Campos, Maria De Fatima; Bastos Machado de Resende, Camila Maria; Seabra Barbosa, Gustavo Augusto; de Almeida, Erika Oliveira	JOURNAL OF ORAL & FACIAL PAIN AND HEADACHE	27	5.4

Table I. continued

	Title	Authors	Journal name	Total citation	Average per year
43	Oropharyngeal and tongue exercises (myofunctional therapy) for snoring: a systematic review and meta-analysis	Camacho, Macario; Guilleminault, Christian; Wei, Justin M.; Song, Sungjin A.; Noller, Michael W.; Reckley, Lauren K.; Fernandez-Salvador, Camilo; Zaghi, Soroush	EUROPEAN ARCHIVES OF OTO-RHINO-LARYNGOLOGY	27	3.86
44	Sleep Problems as Predictors in Attention-Deficit Hyperactivity Disorder: Causal Mechanisms, Consequences and Treatment	Urn, Yoo Hyun; Hong, Seung-Chul; Jeong, Jong-Hyun	CLINICAL PSYCHOPHARMACOLOGY AND NEUROSCIENCE	27	3.38
45	Speech adaptation after treatment of full edentulism through immediate-loaded implant protocols	Molly, Liene; Nackaerts, Olivia; Vandewiele, Katrien; Manders, Eric; van Steenberghe, Daniel; Jacobs, Reinhilde	CLINICAL ORAL IMPLANTS RESEARCH	27	1.59
46	Lingual frenuloplasty with myofunctional therapy: Exploring safety and efficacy in 348 cases	Zaghi, Soroush; Valcu-Pinkerton, Sanda; Jabara, Mia; Norouz-Knutsen, Leyli; Govardhan, Chirag; Moeller, Joy; Sinkus, Valerie; Thorsen, Rebecca S.; Downing, Virginia; Camacho, Macario; Yoon, Audrey; Hang, William M.; Hockel, Brian; Guilleminault, Christian; Liu, Stanley Yung-Chuan	LARYNGOSCOPE INVESTIGATIVE OTOLARYNGOLOGY	26	4.33
47	Frenulectomy of the tongue and the influence of rehabilitation exercises on the sEMG activity of masticatory muscles	Tecco, Simona; Baldini, Aberto; Mummolo, Stefano; Marchetti, Enrico; Giuca, Maria Rita; Marzo, Giuseppe; Gherlone, Enrico Felice	JOURNAL OF ELECTROMYOGRAPHY AND KINESIOLOGY	25	2.5

Table I. continued

	Title	Authors	Journal name	Total citation	Average per year
48	Functional Improvements of Speech, Feeding, and Sleep After Lingual Frenectomy Tongue-Tie Release: A Prospective Cohort Study	Baxter, Richard; Merkel-Walsh, Robyn; Baxter, Barbara Stark; Lashley, Ashley; Rendell, Nicholas R.	CLINICAL PEDIATRICS	24	4.8
49	Effects of respiratory muscle therapy on obstructive sleep apnea: a systematic review and meta-analysis	Hsu, Brien; Emperumal, Chitra Priya; Grbach, Vincent X.; Padilla, Mariela; Enciso, Reyes	JOURNAL OF CLINICAL SLEEP MEDICINE	24	4.8
50	Validity and reliability of a protocol of orofacial myofunctional evaluation for patients with obstructive sleep apnea	Folha, Gislaine A.; Valera, Fabiana C. P.; de Felicio, Claudia M.	EUROPEAN JOURNAL OF ORAL SCIENCES	24	2.4

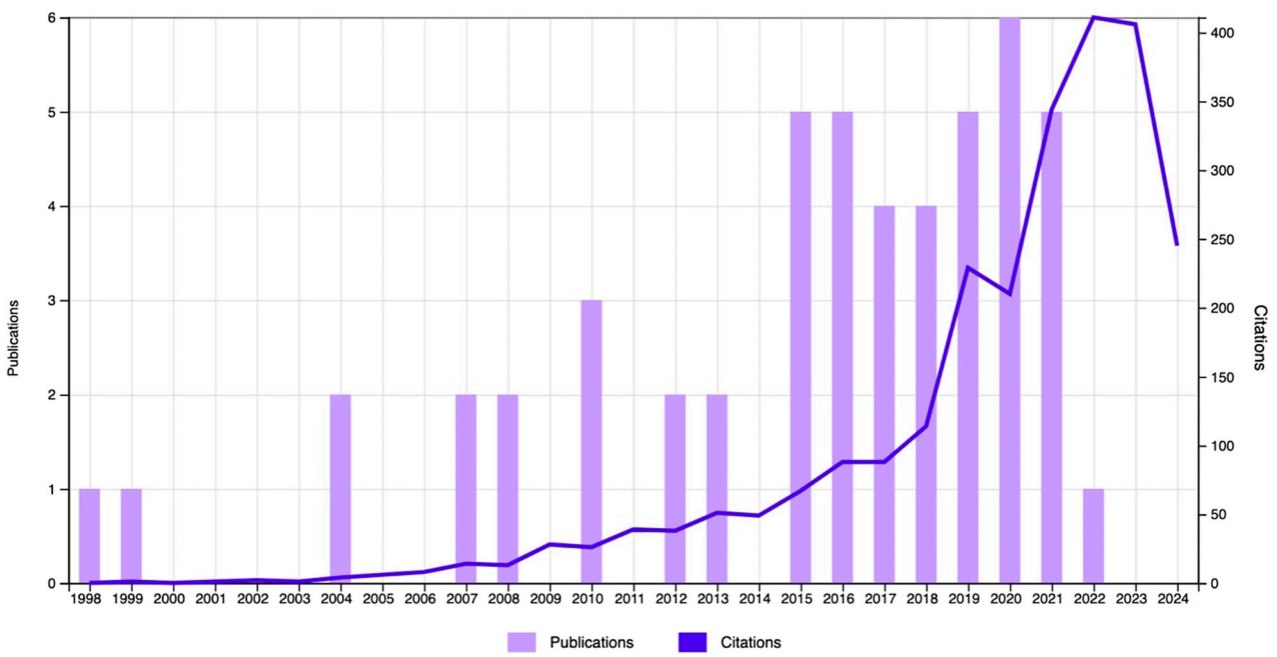

Figure 1. Correlation between the 50 most cited articles (1998–2022) and their citation trends over time.

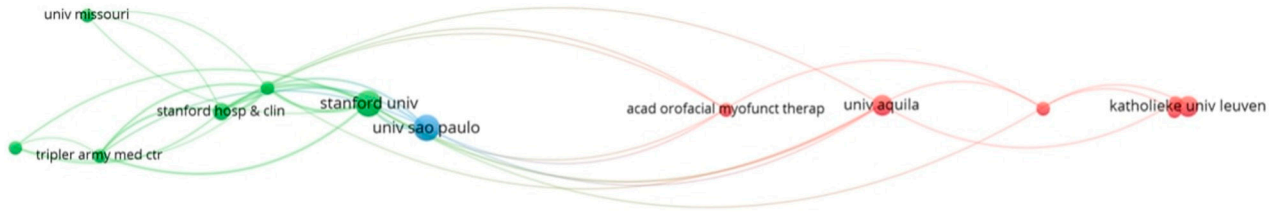

Figure 2. Co-occurrence map of institutions.

sleep-disordered breathing, and speech disorders. Through neuromuscular exercises, myofunctional therapy re-trains and restores the normal function of facial and oral structures. Overall, there is evidence that myofunctional therapy may help treat a malocclusion, speech disorders, tongue thrust, and sleep-disordered breathing, as well as improve masticatory function.[9–11] Bibliometric studies in orthodontics and dentistry have traditionally focused on citation trends across broad topics within their respective fields. However, the present study provides a more specialised analysis by identifying key research trends, institutional contributions, and interdisciplinary collaborations specific to myofunctional therapy. Compared to broader orthodontic bibliometric analyses, it offers a focused perspective on a niche yet rapidly expanding area of research. Unlike previous bibliometric studies, the present work highlights the inherently multidisciplinary nature of myofunctional therapy by demonstrating the interrelationship between healthcare providers. From an orthodontic perspective, the review stresses the importance of evaluating sleep-disordered breathing in all patients undergoing treatment with myofunctional appliances, thereby promoting a more comprehensive and integrative approach to patient care.

Table II. The top countries/regions by link strength

	Citations	Document Number	Link Strength
USA	958	18	51
ITALY	378	9	35
BRAZIL	433	10	34
SPAIN	133	4	23
FRANCE	192	3	21
TAIWAN(CHINA)	155	2	19
GERMANY	399	5	14
BELGIUM	257	5	7
ENGLAND	180	4	4
GREECE	113	2	1
SWITZERLAND	113	2	1

As the topic of the present bibliometric study involves multiple disciplines, it allows for the analysis of interdisciplinary interactions, thereby providing a unique perspective that distinguishes the current from traditional bibliometric studies. The present study was conducted using the WoS-CC database and, for the first time, provided an in-depth examination and mapping of the topic of myofunctional therapy, which aimed to offer an overview of its status with respect to countries, authors, institutions, and journals. Therefore, it provides researchers with a perspective that can help identify trends and gaps in the literature. In the bibliometric field, the Web of Science Core Collection (WoS-CC) is considered a prestigious database for assessing scientific quality and impact, as it is specifically designed for citation analysis. Therefore, bibliometric studies frequently select WoS-CC as the primary database due to its robust citation metrics, stringent indexing criteria, and comprehensive impact assessment tools. Other databases, such as Scopus, have limitations, particularly in citation coverage, as it only tracks citations starting from 1996. Additionally, Google Scholar, although widely used, organises results based on relevance or publication date and includes citations from non-peer-reviewed sources such as books and dissertations, which may not provide the same level of rigor. Given these considerations,[12–15] WoS-CC was selected as the primary database used by numerous bibliometric analyses in dentistry. The importance of the citation count lies in its ability to reveal the actual impact of the published articles;[16,17] therefore, the evaluation of the top 50 most-cited studies in a relatively niche field like myofunctional therapy was deemed appropriate. The observed

Figure 3. Cluster graph of the most cited journals.

increase in the number of publications and citations after 2015 indicates a growing interest in the topic, which is further supported by the cumulative rise in the number of related publications. This increase may be attributed to a heightened awareness of sleep-disordered breathing and the expanding role of myofunctional therapy as a complementary approach in patient management. The publication of influential systematic reviews and meta-analyses around this period, notably the 2015 study by Camacho et al., likely contributed to the growing visibility of myofunctional therapy in clinical practice and research. Additionally, advances in diagnostic tools and treatment protocols may have fueled increased scholarly attention of the subject. This trend suggests that more research in this area may be expected in the coming years.

Since the present study was based on the most-cited articles, the clustering of the top-cited works between 2015 and 2021 suggests that a substantial number of studies have been conducted and are ongoing in this field. As new research continues to be added to the literature, citation rates will cumulatively increase, thereby providing valuable guidance for future research. However, it appears that a large proportion of these studies consist of reviews. Therefore, future randomised controlled trials and multidisciplinary research could help fill the existing gaps in the literature on this topic.

The most cited 50 articles in WoS-CC received a total of 2483 citations, including 89 self-citations (3%) which is a comparatively low rate. Despite this, potential citation biases should be acknowledged. Moreover, the exclusion of non-English publications may limit the representation of myofunctional therapy research conducted in non-English-published journals. Additionally, the reliance on a citation count as a measure of impact does not necessarily reflect the clinical applicability or methodological quality of a study. These factors should be considered when interpreting the findings

The most cited article was authored by Camacho et al. in 2015 and entitled "Myofunctional Therapy to Treat Obstructive Sleep Apnea: A Systematic Review and Meta-analysis." This study involved a

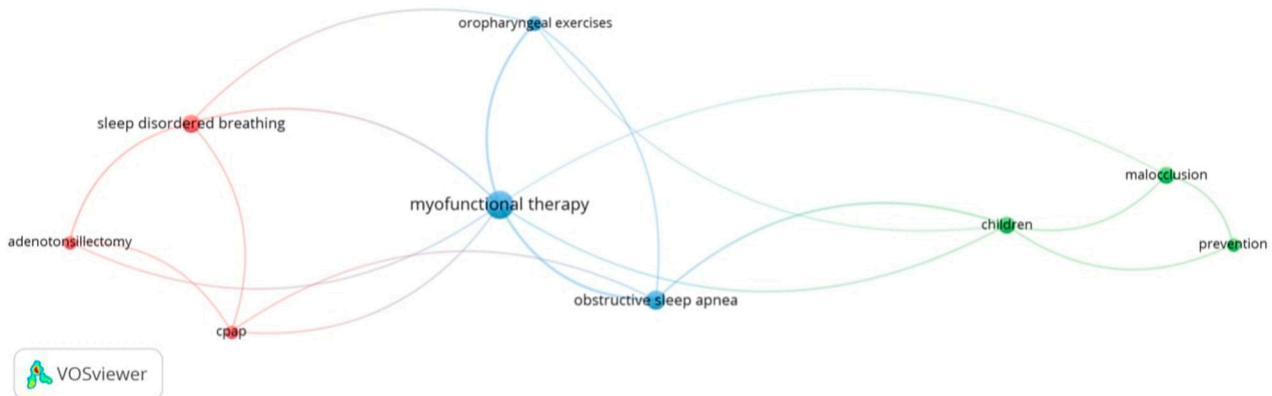

Figure 4. Bibliometric coupling of the most-used author keywords.

meta-analysis of patients treated with myofunctional therapy for obstructive sleep apnoea (OSA) in children and adults, and evaluated related parameters such as polysomnography, snoring, and sleepiness. As a systematic review, it also served as a comprehensive reference for numerous later studies. The second most cited article was by Tausche et al., entitled "Prevalence of Malocclusions in the Early Mixed Dentition and Orthodontic Treatment Need," which used the Index of Orthodontic Treatment Need (IOTN) to assess malocclusion prevalence and identify factors requiring early intervention. The third most cited article was "Critical Role of Myofascial Re-education in Pediatric Sleep-Disordered Breathing," which evaluated paediatric sleep disorders in relation to adenotonsillectomy, orthodontics and myofunctional therapy.

Consistent with the literature,[18] it was found that socioeconomically developed countries contributed more significantly to scientific research. The top three countries with the highest citation counts were the United States, Italy, and Brazil, all of which are among the world's top 10 economies based on nominal Gross Domestic Product in 2024.[19] Stanford University and Leuven University appear twice in the list of institutions that have produced more than two articles due to their representation as distinct entities within the same overarching institution. This reflects the internal structure in which different organisations, such as hospitals or research centres, operate under the same institutional umbrella. However, when the data is analysed at the institutional level, the ranking based on the total number of articles remains unchanged, with Stanford University ranked first and Leuven University ranked third. Therefore, the authors chose to evaluate the institutions separately in order to illustrate the interrelationships during the mapping and listing processes.

The association between keywords clearly demonstrates the interaction between various disciplines and underscores the interdisciplinary nature of myofunctional therapy. The most commonly occurring keyword was "myofunctional therapy", reaffirming its pivotal role in the field. Other frequently appearing terms included "obstructive sleep apnoea and "sleep-disordered breathing", thereby emphasising the link between myofunctional therapy and respiratory health. Around these central terms, distinct groupings emerge, forming two primary conceptual clusters: one related to sleep disorders, CPAP (Continuous Positive Airway Pressure) treatment, and sleep-disordered breathing, and the other associated with orthodontics, malocclusions, and children. The notable co-occurrence of myofunctional therapy and sleep-disordered breathing indicates a growing clinical and academic interest in its applications beyond conventional orthodontic frameworks, extending into respiratory and sleep medicine. In addition, the frequent linkage of malocclusion and orthodontic treatment reinforces the well-established role of myofunctional therapy in dentofacial development in children and malocclusion correction. These observations offer insights into the expanding interdisciplinary nature of myofunctional therapy, possibly shaping future research trajectories. Given that physicians are often the primary healthcare providers who evaluate children, myofunctional therapy serves as a key resource for early referrals to dentists and orthodontists, thereby ensuring that relevant treatment aspects within their scope are effectively managed. This highlights the significance of cross-disciplinary collaboration and the necessity for stronger cohesion between dentistry, sleep medicine, and associated medical fields in myofunctional therapy.

Conclusion

The present bibliometric analysis evaluated the scientific literature on myofunctional therapy and its interdisciplinary connections. It identified increasing research interest, particularly after 2015, and the contributions of key countries, institutions, and authors. The study highlighted the role of myofunctional therapy in addressing malocclusion, obstructive sleep apnoea, and other orofacial conditions. It also identified gaps that require further research. While review articles are common, more randomised controlled trials and interdisciplinary studies are needed. The findings indicate a growing international collaboration but also reveal limited cross-specialty integration. Future research should focus on strengthening interdisciplinary co-operation to advance evidence-based practices.

Conflict of interest

The authors declare that there is no conflict of interest.

Ethics approval and consent to participate

This article does not contain studies of human or animals performed by the authors and for this review study, formal consent was not required.

Authors' contributions

Conceptualisation, methodology: ECF, EE. Data acquisition: ECF, AÇ. Data analysis: ECF, AÇ. Data interpretation: ECF, AÇ. Writing the original manuscript: ECF. Review and editing: ECF, AÇ. The authors read and approved the final manuscript.

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References

1. Liu Y, Zhou JR, Xie SQ, Yang X, Chen JL. The effects of orofacial myofunctional therapy on children with osahs's craniomaxillofacial growth: a systematic review. Children (Basel). 2023;10:670.
2. Achmad H, Wajdiyah U, Damayanti L. Orofacial myofunctional therapy effectivity in child's anterior open bite. J Dent Oral Sci. 2022;4:1-16.
3. Achmad H, Auliya N. Management of malocclusion in children using myobrace appliance: a systematic review. F1000Res. 2024;13:53.
4. Rogers AP. Living orthodontic appliances. Int J Orthod Oral Surg Radiogr. 1929;15:1–14.
5. Stallard H. Influence of pillow habits on the development of the upper jaw. Cal West Med. 1924;22:216–20.
6. Truesdell B, Truesdell F. Deglutition: with special references to normal function and the diagnosis, Analysis and Correction of Abnormalities. Angle Orthod. 1937;2:90–9.
7. Goebel MC, Rocha A de O, Santos PS, Bolan M, Martins-Júnior PA, Santana CM, et al. A bibliometric analysis of the top 100 most-cited papers concerning dental fluorosis. Caries Res. 2023;57:509–15.
8. He M, Lin T, Wu X, Luo J, Peng Y. A systematic literature review of reverse logistics of end-of-life vehicles: bibliometric analysis and research trend. Energies (Basel). 2020;13:5586.
9. Shah SS, Nankar MY, Bendgude VD, Shetty BR. Orofacial myofunctional therapy in tongue thrust habit: a narrative review. Int J Clin Pediatr Dent. 2021;14:298–303.
10. Shortland HAL, Hewat S, Vertigan A, Webb G. Orofacial myofunctional therapy and myofunctional devices used in speech pathology treatment: a systematic quantitative review of the literature. Am J Speech Lang Pathol. 2021;30:301–17.
11. Carrasco-Llatas M, O'Connor-Reina C, Calvo-Henríquez C. The role of myofunctional therapy in treating sleep-disordered breathing: a state-of-the-art review. Int J Environ Res Public Health. 2021;18:14.
12. Rocha A de O, Anjos LM Dos, Vitali FC, Santos PS, Bolan M, Santana CM, et al. Tooth bleaching: a bibliometric analysis of the top 100 most-cited papers. Braz Dent J. 2023;34:41–55.
13. Baldiotti ALP, Amaral-Freitas G, Barcelos JF, Freire-Maia J, Perazzo M de F, Freire-Maia FB, et al. The top 100 most-cited papers in cariology: a bibliometric analysis. Caries Res. 2021;55:32–40.
14. Ionescu S, Madge OL, Robu I, Brătucu E, Daha C. Surgical oncology in romania: an analysis of research and impact based on literature search in PubMed and Web of Science. Biomed Res Int. 2021;2021:1–7.
15. Goebel MC, de Oliveira Rocha A, Santos PS, Bolan M, Martins-Junior PA, Santana CM, et al. A bibliometric analysis of the top 100 most-cited papers concerning dental fluorosis. Caries Research. S. Karger AG 2023; 57:509–15.
16. Garfield E. What is a citation classic? 2013. http://garfield.library.upenn.edu/classics.html.
17. Nightingale JM, Marshall G. Citation analysis as a measure of article quality, journal influence and individual researcher performance. Radiography. 2012;18:60–7.
18. Fatima Alam B, RCSEd M, Arqam Najmi M, Bin Qasim S, Almulhim KS, Ali S, et al. A bibliometric analysis of minimally invasive dentistry: A review of the literature from 1994 to 2021
19. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD