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Economic value of physiotherapy interventions in headache management: a scoping review

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Abstract

Background Headache disorders impose a substantial economic burden. Health economic evaluations are vital for informing healthcare decisions by assessing the costs and benefits of interventions, including physiotherapy. Evaluating the cost–benefit impact of integrating physiotherapy into headache management is therefore essential.

Objective To map studies including economic evaluations of physiotherapy interventions for headache management, defined as systematic comparisons of alternative treatments in terms of costs and outcomes.

Methods Scoping review (PCC framework) conducted in PubMed, Embase, Web of Science, Scopus, INHTA databases (April 2026). Adults with headache receiving physiotherapy were included. Economic evaluations and cost measures were extracted. Studies were screened in two stages and synthesised descriptively. Reviews, trials, cohort, case report, case-control studies in English, Dutch, German were considered (Open Science Framework, https://doi.org/10.17605/OSF.IO/FVHXA).

Results Physiotherapy, as monodisciplinary, part of an interdisciplinary or multidisciplinary approach, was only included in eight out of 1271 studies. Interventions varied by setting (inpatient/outpatient) and delivery (individual/group). Three studies conducted cost-effectiveness analyses. A multimodal, interdisciplinary or multidisciplinary approach reduced medication-use, consultations, inpatient admissions (direct), and improved work status (indirect). However, evidence is insufficient to conclude that incorporating physiotherapy reduces healthcare costs.

Conclusion A significant gap exists regarding the cost-reducing potential of physiotherapy in headache management. Rigorous economic analyses are needed to determine its clinical and economic value. Greater transparency and consensus on cost variables are recommended, along with investigation of which physiotherapy components yield optimal cost savings without compromising individual benefits.

Clinical trial number Not applicable.

Keywords Physiotherapy, Headache, Economic analysis

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Background

Headache disorders rank among the most prevalent and disabling conditions worldwide, affecting over three billion individuals in 2021 [1, 2]. Migraine (MGR, prevalence 15%) and tension-type headache (TTH, prevalence 27%) are the most prevalent primary headaches. Cervicogenic headache (CeH) represents the most frequent secondary type (prevalence 0.4% to 42%) [3, 4]. The economic impact of headache can be estimated via direct (e.g., hospitalisation, medication expenses) and indirect (e.g., productivity loss) costs. The headache burden is considerable, particularly as MGR and TTH manifest during the most productive years. The economic impact is substantial, with annual direct costs per person in Europe estimated at €303 for TTH, €746 for episodic and €2427 for chronic MGR, and €253 for other headaches including CeH [5, 6]. Although less extensively studied, CeH similarly reduces quality of life and productivity, with evidence suggesting impacts comparable to MGR [7, 8].

Physiotherapy interventions are promising, not only clinically but potentially economically, in the management of headache. Such interventions can reduce headache frequency, intensity, duration, and disability in primary (i.e., MGR, TTH) and secondary headaches (i.e., CeH) [9–14]. Costs related to such physiotherapy management are non-trivial, and physiotherapy could be justified in headache management if the clinical gain is sufficient to reduce direct (i.e., medication use, doctor visits) and indirect (i.e., lost productivity) costs. Yet, the extent to which the inclusion of physiotherapy may reduce overall costs is uncertain, primarily due to the limited availability of economic evaluations [9–14]. Robust evidence on effectiveness and costs is essential as it informs meso- and macro-level healthcare decision-making (i.e., allocation of resources and specialist hospital discharge models) by assessing both the costs and consequences of interventions [15]. Consequently, inefficient headache care pathways can be identified and potentially adjusted [16, 17]. Calculating the cost and efficiency of an intervention requires economic evaluations. Such evaluations are a broad concept covering cost-effectiveness, cost-benefit, cost-utility, cost-minimisation, and cost-consequence analyses [18, 19]. Each analysis depends on the information required to estimate the value of an intervention or program relative to its cost [18]. Health economic evaluations offer a framework for aligning clinical efficacy with cost considerations, fostering healthcare decisions that are both evidence-driven and economically sustainable. Therefore, the present review aims to map economic evaluations in physiotherapy management of headache.

Materials and methods

This scoping review was conducted in accordance with the framework of Arksey et al. (2005), and reported following the PRISMA-ScR guidelines. The methodology comprised five stages: (1) formulating the research questions (RQ), (2) identifying relevant studies through a comprehensive search strategy, (3) selecting eligible sources of evidence based on predefined criteria, (4) charting the data using a standardized data extraction form, and (5) collating, summarising, and reporting the results [20]. In line with PRISMA-ScR recommendations, results are presented using descriptive numerical summaries of study characteristics and a narrative synthesis of the included evidence. The study methodology was preregistered at the Open Science Framework (https://doi.org/10.17605/OSF.IO/FVHXA).

Formulating the research questions

Primary research question

What is the extent, characteristics, and findings of economic evaluations in the physiotherapy management of headache disorders?

Secondary research questions

1. What are the characteristics of applied physiotherapy interventions in the management of headaches?
2. Which economic evaluations (i.e., cost-effectiveness, cost-benefit, cost-utility, cost-minimisation, cost-consequence analyses) were used and how were costs and/or cost-reductions measured?

Identifying relevant studies

Eligibility criteria

Relevant studies were identified using inclusion criteria according to the Population Content, and Context (PCC) method:

Population Adults (> 18 years), headache diagnosis.

Content Physiotherapy management of headache. The content of "Physiotherapy" was based on the MeSH-term "physical therapy modality(ies)".

Context Characteristics of the intervention, study design, headache, healthcare economics (e.g., cost-effectiveness, cost-benefit, cost-utility, cost-minimisation, cost-consequence), and outcomes (e.g., quality adjusted life years, direct/indirect costs).

Publication type Reviews, clinical trials, cohort, case report, and case-control studies were considered without publication date limitation.

Studies were excluded if they failed to match the PCC, were not written in Dutch, English, German, were

conference proceedings or conference reports, editorials, letters, book chapters, master classes, or 'abstract only'.

Databases and search query

A systematic literature search was conducted in the PubMed, EMBASE, Web of Science, and Scopus databases (last update April 6th, 2026), following the PRISMA-ScR reporting guidelines (Fig. 1) [21]. The search strategy combined controlled vocabulary and free-text terms related to headache, physiotherapy, and economic evaluations, using the Boolean operator *AND* to ensure inclusion of studies addressing all three domains. Additional keywords encompassed specific headache types (e.g., MGR) and economic concepts such as cost-effectiveness, cost-utility, direct and indirect costs, and quality-adjusted life years.

Additional searches were conducted in the International HTA Database to identify relevant health technology assessments and policy reports. These sources were used to supplement te database searches described above, and capture grey literature. An additional word file shows the detailed search strings (Additional file 1). The strategy and design were executed by the main researcher (SM).

Selecting the studies, data extraction, and collating

One researcher (SM) applied the selection criteria in two phases (phase 1: Title and Abstract and phase 2: Full-text). The full-text was consulted during phase 1 in case of doubt. After phase 2, references of the included publications were hand-searched to ensure no relevant publications were overseen. A single extraction search with verification afterwards was applied. Screening was facilitated by the Rayyan tool [22], and duplicates were removed using EndNote (EndNote™, Clarivate 2023). Data extraction covered headache type(s), intervention details (e.g., type, frequency, duration), economic analyses and outcomes. Data from the included sources of evidence were charted by a single reviewer.

Results

The search yielded 1271 unique hits. Following title and abstract screening, 1230 studies were excluded. Thirty-five studies were further excluded from the remaining

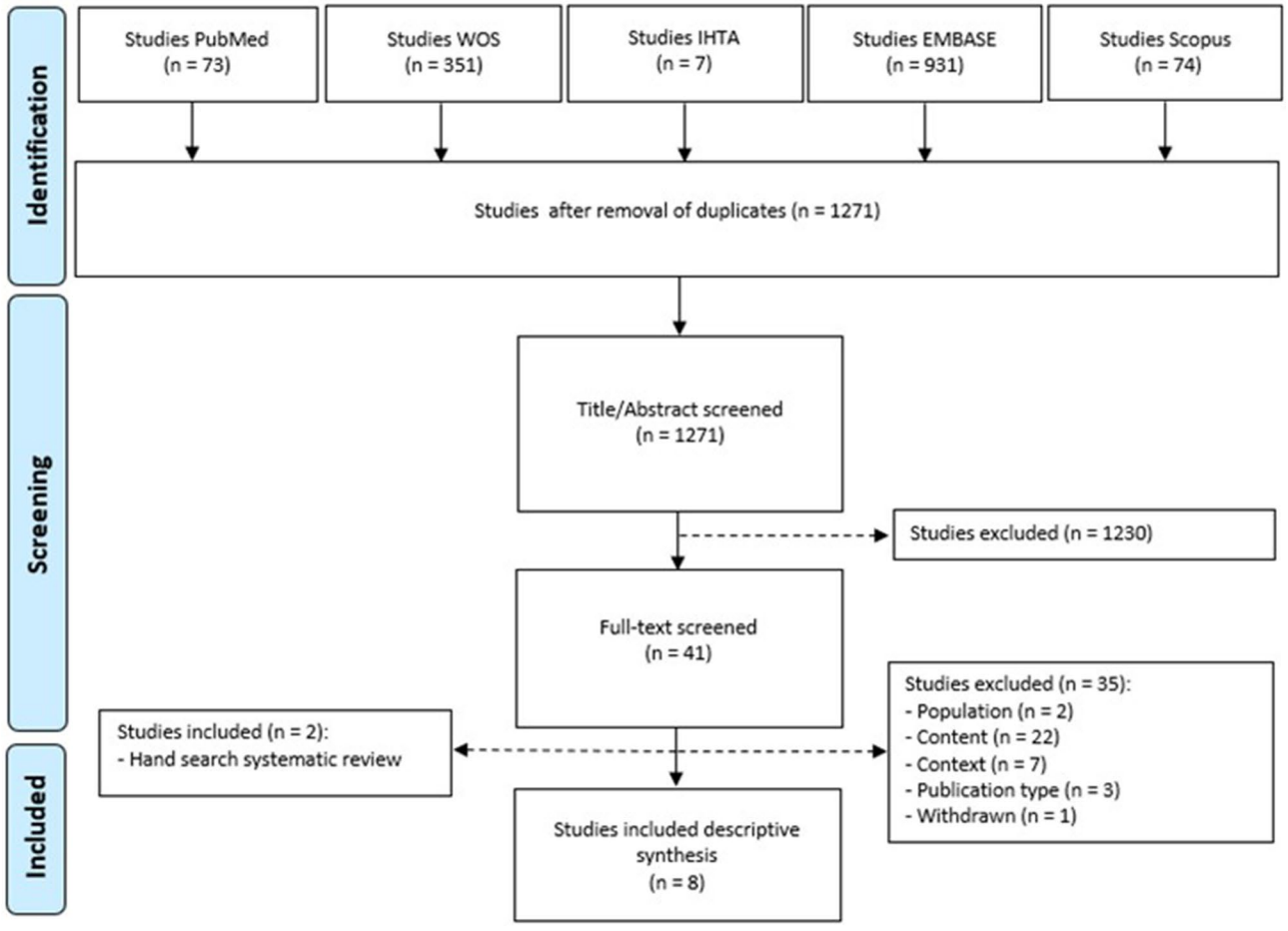

Fig. 1 PRISMA flowchart (IHTA = international HTA database; WOS = web of science; n = number of studies)

41 studies after full-text screening based on the population (n = 2), content (n = 22), context (n = 7), and publication type (n = 3) criteria. One study was withdrawn (i.e., Cochrane review unable to be completed within the available editorial resources) [23]. Finally, after adding two studies based on hand search of a systematic review [24], eight studies met the inclusion criteria (Fig. 1) [25–32]. These studies discussed integrated care in chronic headache [25], multimodal manual therapy in mechanical neck pain with headache [31, 32], a multidisciplinary intervention in MGR [26], and an interdisciplinary outpatient group treatment in intractable headache [27], interdisciplinary care in chronic daily headache [28], manual therapy in MGR [29], and osteopathic manual therapy in MGR [30].

What is the extent, characteristics, and findings of economic evaluations in the physiotherapy management of headache disorders?

The included studies were randomized controlled trials (RCT, n = 4) [26, 29, 31, 32], a review (narrative) (n = 1) [25], a comparative longitudinal study [27] (n = 1), a case study (n = 1) [28], and a clinical trial (n = 1) [30]. Physiotherapy was part of an integrated headache approach [25–28], or a standalone intervention [29–32]. Headaches of interest were recurring headache [27], neck disorder with headache of cervical origin [31, 32], chronic MGR [26, 29, 30], refractory headaches (i.e., chronic MGR, chronic/episodic TTH, cluster headache, medication-overuse headache, trigeminal autonomic cephalgia, trigeminal/cranial neuralgia), and chronic daily headache [28]. All studies reported clinical outcomes. In five studies such outcomes were clinically relevant (e.g., 50% reduction in headache [25, 27], number needed to treat of 6 with 37–41% treatment advantage [31, 32], reduction in disability (change in disability handicap inventory from 62 to 38) [28]) after the intervention. It was not clear if changes in outcomes (i.e., pain frequency, pain intensity, pain duration, pain-related disability, depression, functional status, quality of life, health status) were clinically relevant in three studies [26, 29, 30]. Specific diagnostic headache criteria, i.e., International Classification of Headache Disorders, first [26] and second edition [25] (both n = 1), International Headache society (n = 1) [29], and International Classification of Diseases, 9th Revision (n = 1) [30] were mentioned in four studies (Table 1).

What are the characteristics of applied physiotherapy interventions in the management of headaches?

Table 1 provides a summary of the characteristics of the included studies.

Scharff et al. (1994) applied an interdisciplinary group program integrating medical, physical, and psychological therapies during six weeks (1 or more sessions/week) versus a no-treatment control group. An outpatient setup was used, and groups contained five to ten people. The physical component entailed progressive muscle relaxation, postural advice, stretching, and breathing techniques [27].

Provinciali et al. (1996) applied a generic multimodal physiotherapy approach, including passive mobilization, massage, exercises, and/or patient education with 10 one-hour sessions (2/week) compared to thermal agents (i.e., pulsed electromagnetic field, transcutaneous electrical nerve stimulation) [31].

Geibel et al. (1997) compared a generic multimodal physiotherapy program (i.e., manual therapy combined with active exercises, ice, analgesics as needed) to passive or standard care (i.e., collar, analgesics). The intervention lasted three weeks [32].

Lemstra et al. (2002) evaluated a six-week multidisciplinary group program involving a neurologist, physiotherapist, exercise therapist, psychologist, dietitian, and massage therapist. Additional components included psychological support (i.e., relaxation, stress management), dietary counselling (i.e., trigger substitution), and two massage sessions. The physiotherapist provided a biomechanical assessment, education, and barrier identification.The control group (waiting list) received standard medical care from their family physician [26].

Diener et al. (2011) described models of headache care. Care models compared within the scope of this study were:

Essen (Germany)

A modular program was implemented. Module 1 targeted patients with uncomplicated, infrequent headaches, who were assessed by a headache specialist and referred to a network neurologist for episode treatment and preventive (medical and non-medical) therapy. Module 2 addressed frequent or chronic headaches. This module involved neurologists, behavioural psychologists, and physical/sport therapists to develop comprehensive treatment plans, which were subsequently implemented by private practice neurologists. The exact content of the physiotherapy program was not defined.

Danish headache centre – Copenhagen (Denmark)

An individualized multidisciplinary strategy was pursued until headache symptoms were stabilized, with referrals from general practitioners, neurologists, or other neurological departments. Management options included physiotherapy (pericranial muscle tenderness), psychological therapy (stress, anxiety, or suspected psychological triggers), headache nurses (medication overuse), and specialist input (e.g., neurosurgery for trigeminal neuralgia or hydrocephalus, gynaecology for menstrual or hormonal-related MGR). Individualized physiotherapy

Table 1 Summary of characteristics of the included studies ($n=8$)

First author (year)	Intervention	Headache type and Classification	Economic analysis and outcome(s)	Clinical outcome(s)	Study type
Scharff (1994)	Integrated, interdisciplinary outpatient group approach *IG*: medical, physical, and/or psychological therapy *CG*: no treatment	Recurring headache Classification: not mentioned	Cost-effectiveness analysis (1) Medication-use IG 71% reduction at follow-up	IG: 70% ≥ 50% headache reduction at follow-up	Longitudinal Follow-up: 5.8mths
Provinciali (1996)	Multimodal physiotherapy approach *IG* ($n=60$): MT, massage, ET (eye fixation), education (individualized, according to Neck School described by Sweeney, relaxation, psychological support to reduce anxiety and limit emotional influence) Frequency: 10 1-h sessions/2wk *CG* ($n=60$): TENS, PEMF	Neck disorder + cervical headache (acute, subacute) Classification: not mentioned	Analysis not stated (1) Time to work IG: reduced time to return to work (16days)	IG: NNT = 2–6 with 37–41% treatment advantage at short term	RCT Follow-up: 180days
Geibel (1997)	Multimodal physiotherapy approach *IG* ($n=97$): MT, ET, ice, analgesics as needed *CG* ($n=103$): collar, analgesic Duration: 3 wks	Neck disorder + cervical headache (acute) Classification: not mentioned	Analysis not stated (1) Direct cost Estimated cost of treatments: CG: 57 USD IG: 78 USD (3) Sick days CG: 330 days IG: 187 days	IG: 5.5% treatment advantage	RCT Follow-up: 9wks
Lemstra (2002)	Low cost, group, multidisciplinary intervention *IG*: neurologist intake, physical therapist intake, 18 supervised ET sessions with exercise therapist, 2 group lectures with psychologist, 1 group lecture with dietitian, 2 massage sessions *CG*: waiting list	Chronic MGR Classification: ICHD, 1988	Cost-effectiveness analysis (1) Medication-use No difference IG (1.18 ± 0.24) vs. CG (0.22 ± 0.11) (2) Work status IG back to work 9% vs. CG 0%	IG decrease: pain frequency ($p=0.000$), pain intensity ($p=0.001$), pain duration ($p=0.000$), pain related disability ($p=0.000$), depression ($p=0.000$) at follow-up IG increase: functional status ($p=0.000$), quality of life ($p=0.000$), health status ($p=0.000$) at follow-up	RCT Follow-up: 3mths
Diener (2011)	European model of integrated multidisciplinary headache care, with cooperation between government, insurance companies and headache centres	(1) Refractory headache Chronic MGR Chronic/episodic TTH Cluster headache MoH TAC Trigeminal/cranial neuralgia Classification: ICHD-2, 2004	Cost-effectiveness analysis (1) Cost reductions resulting from decreased sickness absence, diagnostic testing, fewer emergency department visits and inpatient admissions.	*Essen Headache Centre* Improvement headache > 50% in 41.5%, adherence to exercise and sport 72%, 61% to relaxation, 64% prophylactic drugs *Danish Headache Centre* Headache frequency: reduction 20d/mth to 11d/mth Headache duration reduced significantly in all headaches *Kiel Headache Centre and German Headache Treatment Network* Normalization SF-36 > 85.4% entirely satisfied	Narrative review Follow-up: 1y Follow-up: 2y Follow-up: 2y

Table 1 (continued)

First author (year)	Intervention	Headache type and Classification	Economic analysis and outcome(s)	Clinical outcome(s)	Study type
Mihalov (2018)	Interdisciplinary program, individual and group-based interventions *IG*: 13 individual hrs, 16 group hrs during 3 wks. Key components: postural re-education, body mechanics training, ergonomic advice. - Individualized home exercise programs targeting cervical mobility, stretching, and functional movement. - Group physiotherapy sessions incorporated aquatic therapy, stretching, cardiovascular conditioning.	Chronic daily headache Classification: not mentioned	Analysis not stated (1) Reduced medication-use (from 40 mg morphine equivalent daily dose to 0 mg) (2) Return to employment	IG: reduced headache frequency and headache intensity	Case study Follow-up: 1y
Davidson (2018)	Cervical manual therapy C0-C3 *IG* ($n=37$): Watson Headache® Approach (sustained manual pressure applied to cervical spine segments); 6 sessions over 3–6 wks *CG* ($n=43$): delayed intervention (wait list).	Migraine Classification: International Headache Society	Analysis not stated (1) Reduced medication-use 20% decrease in mean medication-use at 1y	Between-group analysis: no difference between IG and CG for headache intensity/duration/frequency Within-group analysis: IG reduction headache intensity ($p=0.007$), duration ($p<0.001$), headache frequency ($p<0.001$), hours of severe migraine headache ($p<0.001$)	RCT Follow-up: 3-6-12mths
Schabert (2009)	Osteopathic manipulative treatment *IG* ($n=213$): osteopathic clinic group counterstrain, high-velocity, low-amplitude technique, ligamentous articular strain technique, muscle energy, cranial osteopathy. *CG* ($n=418$): allopathic clinic group	Migraine Classification: International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes for migraine (i.e., 346.XX)	Analysis not stated (1) Lower medication cost IG: \$103–\$111 vs. CG: \$284.93 per visit ($p<0.001$) (2) Reduced cost of care IG: \$187.50–\$203.76 vs. CG: \$363.84 ($p<0.001$)	No significant difference pain intensity between IG (3.84) and CG (3.52) ($p=0.509$)	Retrospective review Follow-up: at least 1y

ICHD = international classification headache disorders; TTH = tension-type headache; TAC = trigeminal autonomic cephalgia; MoH = medication-overuse headache; MT = manual therapy; ET = exercise therapy; NNT = number needed to treat; SMD = standardized mean differences; wks = weeks; mths = months; y = year; IG = intervention group; CG = control group; RCT = randomized controlled trial; hrs = hours; PEMF = pulsed electromagnetic field; TENS = transcutaneous electrical nerve stimulation

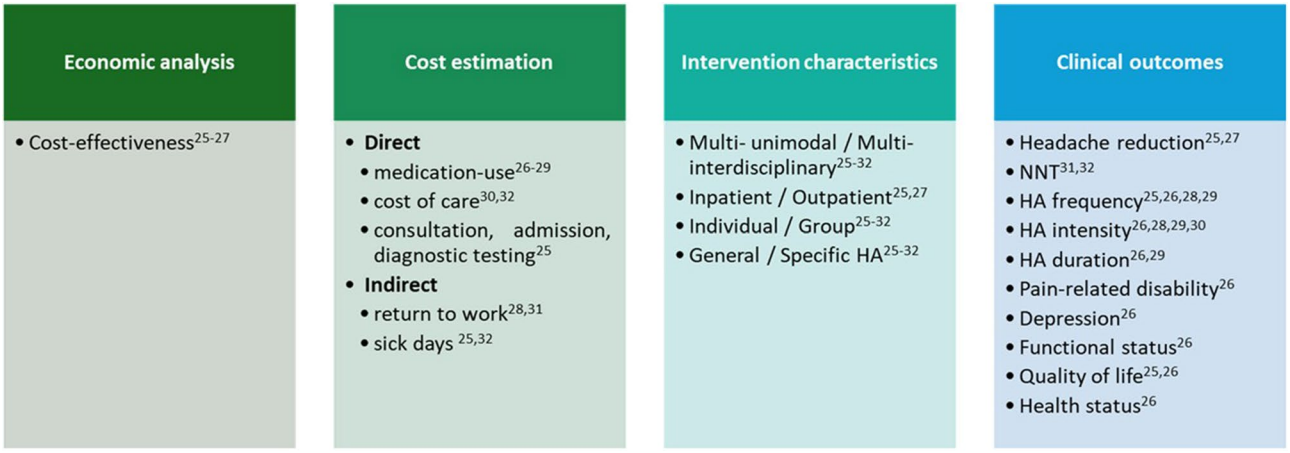

Fig. 2 Summary of the general study findings (NNT = number needed to treat; HA = headache)

was offered to individuals with TTH or mixed headaches and pericranial tenderness. Therapy focussed on posture and muscle assessment, active exercise, and education on reducing muscular stressors, passive treatments were avoided.

Kiel headache centre and German headache treatment network (Germany)

Integrated multidisciplinary care in three phases: (I – local) diagnosis, screening, and treatment planning across sectors; (II – supra-regional) neurological and behavioural-medicine therapy across sectors; and (III – local) outpatient follow-up and monitoring across sectors. The program involved neurologists, psychiatrists, anaesthesiologists, psychologists, physiotherapists, sport therapists, social workers, and headache nurses, with access to additional medical and surgical specialties as required. The exact content of the physiotherapy program was not defined.

Mihalov et al. (2018) described physiotherapy as part of an interdisciplinary pain management program which included both individual and group-based interventions (i.e., 13 individual hours, and 16 group hours for 3 weeks). Key components comprised postural re-education, body mechanics training, and ergonomic advice to address musculoskeletal contributors to headache. Patients received individualized home exercise programs targeting cervical mobility, stretching, and functional movement. Group physiotherapy sessions incorporated aquatic therapy, stretching, and cardiovascular conditioning to improve overall physical capacity and reduce pain sensitivity [28].

Davidson et al. (2018) implemented the Watson Headache Approach, a cervical manual therapy intervention. Treatment involved sustained manual pressure applied to the cervical spine to reproduce, and subsequently alleviate headache. The intervention primarily utilised sustained, non-oscillatory grade IV mobilisations (i.e., end-range pressure into joint resistance) to improve segmental mobility, alignment, and reduce nociceptive input. No high-velocity thrust techniques were used. Participants received up to six treatment sessions over 3–6 weeks [29].

Schabert et al. (2009) retrospectively reported on migraine management, primarily involving pharmacological treatments and procedural interventions, including osteopathic manipulative treatment. The manual techniques used during various visits included counterstrain, high-velocity, low-amplitude technique, ligamentous articular strain technique, muscle energy, and osteopathy in the cranial field [30].

Which economic evaluations were used and how were costs and/or cost-reductions measured?

Three studies explicitly mentioned the applied economic analysis, i.e., cost-effectiveness [25–27]. Cost reductions were directly (i.e., medication use [25–27], diagnostic testing [25], hospital admission [25]), and indirectly (i.e., return to work, sick days [25, 26]) measured.

Five studies indirectly described cost reductions (i.e., return to work [28, 31, 32], sick days [24], medication use [28–30], cost of the treatment regime [30, 32]) without explicitly mentioning the economic analysis (Table 1; Fig. 2) [28–32].

According to Scharff et al. (1994), an interdisciplinary outpatient group treatment could provide a cost-effective and time-efficient treatment option for patients with recurring headaches. Such cost-effectiveness was supported by a 71% reduction in medication use at follow-up (5.8 months) by the intervention group. No cost data were reported [27].

The RCT by Provinciali et al. (1996) revealed that a multimodal strategy, i.e., exercise therapy and manual therapy increased sick days saved (143 days), and reduced

time to return to work (16 days treatment advantage). No cost data were reported [31].

Geibel et al. (1996) demonstrated in their RCT that generic multimodal physiotherapy interventions yield superior short-term outcomes compared to passive modalities. Estimated cost of treatments were 78 USD (multimodal physiotherapy) and 57 USD (passive modalities), while the number of sick days were 187 (multimodal physiotherapy) and 330 (passive modalities) [32].

Lemstra et al. (2002) developed a low-cost multidisciplinary group intervention for people with chronic MGR. Such intervention did not cause a significant reduction in medication-use between the intervention group (1.18 ± 0.24) and control group (0.22 ± 0.11). Yet, return to work increased with 9% in the intervention group compared to 0% in the control group. The group, community-based intervention costed approximately 250 Canadian dollar [26].

Diener et al. (2011) reported that an integrated multidisciplinary program reduced costs of headache care in Germany and Denmark for people with refractory headache, chronic MGR, chronic/episodic TTH, cluster headache, medication-overuse headache, trigeminal autonomic cephalgia, and trigeminal/cranial neuralgia. Such reductions were attributed to decreased diagnostic testing, emergency department visits, and inpatient admissions. The costs of the Essen model of integrated care were consistently lower (€2750–€3720) compared to usual care (€4437–€4853) from 2005 to 2007, representing an average cost reduction of about 30% with organized care.

Mihalov et al. (2018) described that an interdisciplinary chronic pain program reduced medication intake (from 40 mg morphine equivalent daily dose to 0 mg), indicating decreased pharmacological costs. Additionally, improvements in function and symptom management facilitated return to employment, suggesting a reduction in indirect costs related to work disability and productivity loss. No cost data were reported [28].

Davidson et al. (2018) reported a significant reduction in medication-use over time ($p < 0.001$). Participants demonstrated an average reduction of approximately 6 fewer medication doses post-treatment, corresponding to a 20% decrease in mean medication-use, which was sustained for up to 1 year. Longitudinal data indicated further improvement, with a 27% reduction in medication-use from baseline to 6-month follow-up. Extrapolated annually, this equates to approximately 72 fewer headache-related medication doses per participant per year. No cost data were reported [29].

Schabert et al. (2009) showed that osteopathic manipulative treatment was associated with significantly lower total healthcare costs per visit compared with allopathic care. Mean total cost per visit was approximately 50% lower in the osteopathic clinic (187.50–203.76 USD vs. 363.84 USD; $p < 0.001$). Cost difference was primarily driven by reduced medication-use and costs, with osteopathic care associated with fewer prescriptions per visit (0.696 vs. 1.285; $p < 0.001$) and lower medication costs (103–111 USD vs. 284.93 USD per visit; $p < 0.001$) [30].

Discussion

The objective of the current review was to map the extent, characteristics, and findings of economic evaluations in the physiotherapy management of headache disorders.

What are the characteristics of applied physiotherapy interventions in the management of headaches?

Content

Physiotherapy was delivered as a standalone musculoskeletal intervention [29–32], or as part of an interdisciplinary or multidisciplinary programme across the included studies [25–28]. In three studies, these programmes were implemented in a group-based format [26–28]. Interventions were rather generic and comprised biomechanical education, muscle relaxation, stretching, breathing exercises, exercise therapy, and manual therapy, applied to heterogeneous populations of individuals with headache [25–32].

Such a generalized approach conflicts with the contemporary recommendation that clinical reasoning be employed to determine appropriate therapeutic strategies for each individual with headache [33]. Therefore, it should be determined which individual could benefit from physiotherapy management by considering a stratified approach [33]. Prognostic variables to guide non-pharmacological interventions in individuals with TTH or CeH were already identified [34–36]. For instance, Jull et al. (2005) found that the absence of migrainous features such as photophobia was associated with better outcomes after spinal manipulation/mobilization and exercise therapy in individuals with CeH [36]. Current evidence suggests that individuals with a lower degree of facilitated central pain processes, but with cervical musculoskeletal impairments, will benefit to a greater extent from a manual approach [33].

Challenges

Healthcare costs are higher in more complex musculoskeletal presentations, such as those with comorbidities or coexisting psychological distress. In these particular cases, a slower recovery from an episode of pain, or flare of symptoms could be expected [37, 38]. Essentially, fewer healthcare resources could be provided to those individuals at low risk of poor outcome, whereas more comprehensive care is provided to those at high risk [39]. Both groups need a tailored approach however, overspending

healthcare budgets could be managed by targeting individual needs. Such approach might require an integrated and individualized inpatient or outpatient approach for those individuals at high risk of persistent pain and disability [39]. The European Commission points out that European health and welfare systems face major challenges, such as ageing populations, multimorbidity, lack of healthcare professionals, and the growing problem of non-communicable preventable diseases [40]. With ageing populations, new concepts of long-term care need to be developed. These developments prioritize healthcare transformation in many countries [40].

However, there is a small caveat regarding MGR, which is a life span neurological disorder that follows an evolutive age-dependent change in its prevalence [41].

Physiotherapist-delivered models of care might reduce pressure on an overburdened curative medical system. A systematic review by Desmeules et al. (2012) provided low-grade evidence that for individuals with musculoskeletal disorders, advanced physiotherapy-delivered models of care may be as beneficial (or more so) than usual care provided by physicians in terms of diagnostic accuracy, treatment effectiveness, use of healthcare resources, and patient satisfaction [42]. Similar findings were recently confirmed as physiotherapist-led musculoskeletal triage is widely used to stratify patients to the correct level of care. Such triage was effective in reducing waiting times, unwarranted variation in clinical pathways, clinician caseload, and costs [43–45].

Format

Physiotherapy care can be provided either at group or individual level. Three studies included in the current review applied group-based programs [26–28]. A retrospective cohort study found that multidisciplinary group-based and individual-based pain management programs are equally effective [46]. Yet, it should be questioned if a group-based approach is beneficial for all people with headache. For instance, group sessions focusing on self-management were unlikely to be effective for people with chronic headaches and MGR in the Chronic Headache Education and Self-Management Study [47]. Nonattendance is a common barrier in group-based trials for chronic pain [48, 49]. Although group sessions are perceived as informative, few people reported making actual changes to how they managed their headaches because of the (irrelevant) specific content [50]. Generic self-management interventions only have a small clinically unimportant post-intervention effect on physical function and pain intensity in chronic musculoskeletal pain [51].

More insight is needed on the importance of self-management and therapy adherence in the management of headache. Lemstra et al. (2002) reported that: "*These low-cost nonclinical alternatives would also enable patients to assist in the management of their own disorder* [26]. "

Following the preceding, a relevant follow-up period is needed to evaluate self-management as such process requires behavioural changes. Follow-up periods in the included studies ranged from short (9 weeks) to long (two years) [25, 32].

Which economic evaluations were used and how were costs or cost-reductions measured?

Content

Direct (i.e., medication use, consultations, hospitalizations) and indirect (i.e., work status, return to work, and sick days) costs were reported interchangeably to estimate savings via cost-effectiveness analyses [25–27].

Challenges

Such outcomes provide only limited insight into the true economic impact. Formal economic evaluations—including cost-effectiveness (CE), cost-benefit (CB), cost-utility (CU), cost-minimisation (CM), and cost-consequence (CC) analyses—are necessary, as they assess intervention efficiency in relation to outcomes achieved [18, 19]. Each evaluation addresses distinct decision-making needs: CE analysis compares alternatives in terms of outcomes achieved per monetary unit, with costs measured in monetary units and effects in non-monetary units (e.g., clinical outcomes). CB analysis monetizes both costs and benefits to determine net or relative gains. CU analysis standardizes outcomes across interventions using utility measures such as quality-adjusted life years (QALYs) or disability-adjusted life years (DALYs). CM analysis compares costs of alternatives with equivalent health effects. Finally, CC analysis reports relative costs alongside multiple outcomes without reducing them to a single summary measure.

Currently, several recurring issues dominate the field of physiotherapy management of headache. Economic analyses beyond cost-effectiveness, standardized methodologies, defined target populations, and relevant outcomes are insufficiently defined. Further, four authors compared a multimodal/multidisciplinary/interdisciplinary/unimodal approach to 'no treatment', 'waiting list', or 'passive coping' [26, 27, 29, 32]. Such limitations complicate deducting the added economic value of physiotherapy, and thus receiving research funding. The latter remains insufficiently relative to its actual burden [52]. American and European health data showed that MGR and headache disorders obtained the lowest relative funding among the nation's most burdensome diseases [51], and that MGR is the most underfunded disease when comparing allocated public research money to economic costs [53–55].

Therefore, robust and well-considered health economic analyses are required in future physiotherapy studies. Such analyses estimate the value for money and support the optimal allocation of already limited resources [19, 56]. There is need for long-term follow-up studies which consider both direct and indirect costs, and non-monetary outcomes (e.g., quality of life). Additionally, more insight is needed to which component(s) (e.g., intensity, modality, supervision, home-based vs. clinic, remote vs. face-to-face, individual vs. group) deliver most cost-savings without reducing the minimal important personal gain. Within this context, adding components (e.g., technology, additional interventions) doesn't always justify the extra cost in terms of additional clinical gain.

Physiotherapy was regularly delivered within multidisciplinary care models, making it difficult to isolate its specific contribution to cost outcomes. Reported cost reductions, such as decreased medication use, healthcare utilization, and improved work participation, cannot be directly attributed to physiotherapy alone. Moreover, inconsistent findings and the lack of cost data further limit interpretation. Overall, there is insufficient evidence to determine the independent impact of physiotherapy on cost reduction in headache care.

Limitations and suggestions

The findings were heterogenous, thereby limiting this review study to a scoping review. The review was set-up according to the framework of Arksey et al. (2005) [20]. While an extensive literature search was performed, there is always the possibility that not all literature was captured (e.g., publication bias). Though scoping reviews have the potential to reduce research waste, it must be acknowledged that they lack critical appraisal of the included studies [57]. Further, scoping reviews are not indicated to analyse effectiveness, feasibility, meaningfulness, and appropriateness of interventions, as opposed to systematic reviews [58]. The absence of dual screening, a librarian, and duplicate data extraction increases the risk of selection bias and subjective interpretation of eligibility [58]. Yet, single screening by an experienced reviewer can be an acceptable shortcut with minimal risk of missing relevant studies [59]. Results should therefore be interpreted within this context.

An important research gap has been identified regarding the potential of physiotherapy to reduce costs in the management of headache. It is essential to investigate whether the integration of comparatively low-cost interventions, such as physiotherapy, could contribute to reducing overall treatment costs given the substantial economic burden associated with headache care. Long-term follow-up is required to assess the persistence of clinical benefits and potential cost savings of physiotherapy interventions [18, 19]. Economic evaluations should account for non-monetary outcomes (e.g., quality of life, QALYs) alongside with direct costs, and cost reductions [18].

A limitation of this study is that no formal health economic evaluation was conducted, and the team does not include a health economist. Future research incorporating health economic expertise would be valuable to assess cost-effectiveness and broader system-level implications. Such research should prioritise rigorously designed randomized controlled trials incorporating concurrent cost-effectiveness analyses, complemented by the systematic use of real-world evidence to address existing evidence gaps and enhance both the internal validity and external generalisability of economic evaluations in physiotherapy for headache.

Further research is needed to establish whether individual-based or group-based programs provide comparable clinical and economic values, and whether physiotherapy-led care represents a cost-saving strategy. Generalizability remains challenging, as physiotherapy costs, reimbursement structures, and wages vary across health systems, limiting cross-country comparability [19]. Additionally, a shift from a curative to preventive approach needs more thought.

Conclusion

A significant research gap exists regarding the cost-reducing potential of physiotherapy in headache management. Physiotherapy, as standalone intervention or part of an interdisciplinary or multidisciplinary approach, was only included in eight studies on economic evaluations of headache management. The specific economic return of integrating physiotherapy in headache management could not be estimated. Robust health economic analyses are required to assess if such integration could be clinically and economically beneficial. Greater transparency and consensus on cost variables are recommended, along with investigation of which physiotherapy components yield optimal savings without compromising individual benefit.

Abbreviations

CeH	Cervicogenic headache
CB	Cost-benefit
CC	Cost-consequence
CE	Cost-effectiveness
CM	Cost-minimisation
CU	Cost-utility
DALY	Disability-adjusted life years
MGR	Migraine
PCC	Population, content, context
RQ	Research question
TTH	Tension-type headache
QUALY	Quality-adjusted life years

Supplementary Information

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Supplementary Material 1

Author contributions

Sarah Mingels designed the study, performed the literature search, data analysis, and wrote the first draft. Ina Diener, Marita Granitzer, and Wim Dankaerts revised the manuscript and provided essential feedback. Wim Dankaerts supervised the study. All authors read and approved the final manuscript.

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Data availability

Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.

Declarations

Human ethics and consent to participate

Not applicable.

AI use

During the preparation of this manuscript, AI-assisted software Rayyan™ was used solely to facilitate reference screening by suggesting potential inclusions or exclusions. All screening decisions, data extraction, analysis, and manuscript writing were performed by the authors. No other AI tools were used in the conduct or preparation of this study.

Consent for publication

Not Applicable.

Competing interests

The authors declare no competing interests.

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