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Systematic Review

Systematic Assessment of the Quality of Research Studies of Conventional and Alternative Treatment(s) of Primary Headache

State of the Data at the Mid-Point of the Decade of Pain Control and Research

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Background: Diversity of treatments used for headache, and varied quality of research conduct and reporting make it difficult to accurately assess the literature and to determine the best treatment(s) for patients.

Objectives: To compare the quality of available research evidence describing the effects and outcomes of conventional, and complementary and alternative medicine (CAM) approaches to treating primary (migraine, tension, and/or cluster-type) headache.

Study Design: A systematic review of quality of research studies of conventional and alternative treatment(s) of primary headache.

Methods: Randomized, controlled clinical trials (RCTs) of treatment(s) of chronic primary headache (in English between 1979 to June 2004) were searched through MEDLINE, PsycInfo, EMBASE, Cochrane Library, and the NIH databases. Studies were evaluated using standard approaches for assessing and analyzing quality indicators.

Results: 125 studies of conventional, and 121 CAM treatments met inclusion criteria. 80% of studies of conventional treatment(s) reported positive effects (P<0.05), versus 73% of studies of CAM approaches (chi^2 = 3.798, 1 df, p=0.051). Overall, the literature addressing the treatment of primary headache received a mean Jadad score of 2.72 out of 5 (SD 1.1). The mean Jadad score for studies of conventional therapeutics was significantly better than for those studies of CAM approaches: 3.21 ± 0.9 vs 2.23 ± 1.1 (t=7.72, 246 df, mean difference 0.98, $p < 0.0005$).

Conclusions: Studies of conventional treatments scored higher on reporting quality than studies of CAM approaches. It is possible that these differences may reflect distinctions in 1) methodologic integrity, 2) therapeutic paradigm(s), and/or 3) bias(es) in the approach(es) used to evaluate certain types of therapies. Each of these possibilities — and the implications — is addressed and considered.

Key words: chronic headache, complementary and alternative medicine, research quality, randomized controlled trial, Jadad scores

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Chronic headache is a frequent medical complaint encountered by the pain physician. This reflects current epidemiologic trends that reveal chronic headache to be a significant public health problem in the United States, affecting over 45 million Americans (1). The National Center for Health Statistics estimated that each year 5.5 million days of activity restrictions in the United States can be attributed to headache (2). Furthermore, it is estimated that $61.2 billion per year is lost due to this restricted activity, absenteeism, and the resultant medical expenses incurred by headache (3). Ruling out etiologies of mass-lesions, aneurysms and/or traumatic insult (eg., post-concussive headache), benign headache is a heterogeneous pain condition that reflects pathology of vascular, muscular and/or neural structures of the scalp, head and/or brain. Current taxonomy classifies primary headache as 1) migraine; 2) tension; or 3) cluster types.

Although tension and migraine-type headaches are separate clinical entities, a number of patients have coexisting tension and migraine headache, (1,2) and this overlapping presentation may be the result of common patho-etiologic processes (For a review of mechanisms of headache, see refs. (4-6). The lifetime prevalence for migraine headaches is 11%, and tension-type headache is 78%. Cluster headaches are pathologically distinct, and represent a smaller percentage of chronic headache 0.28% (7).

While many patients receive positive therapeutic benefit from conventional medical management of chronic headache, many others do not gain satisfactory relief, fail to obtain any lasting therapeutic effect(s), or experience adverse side effects from interventional and/or pharmacological management that either contributes to non-compliance, or completely supersedes any positive benefit. Frequently, patients who do not achieve satisfactory relief, or experience deleterious side effects from conventional therapeutics seek complementary and/or alternative medical (CAM) approaches as either adjunctive or primary care for chronic headache pain. Recent statistics illustrate that overall CAM use is becoming increasingly more prevalent (8,9). For example, since 2002, over 58.6% of Americans reported using one CAM modality, while 41.1% used 2 or more CAM therapies (8). As well, an increasing number of pain physicians often incorporate one or more CAM modalities within their scope of practice – either directly, or through collaboration with a qualified CAM practitioner (e.g., acupuncturist, chiropractor, etc). It was reported that more than 50% of American physicians at some time or another have referred their patients to CAM practitioners (10-12). The number of visits to CAM practitioners (629 million) exceeded the total number of visits to all primary care physicians (386 million) in the U.S. in 1997 (9). Likewise, the total out-of-pocket expense of $27 billion dollars per year for CAM is comparable to the total out-of-pocket expenditure for all U.S. physician services (13).

Reflecting these statistics, chronic headache is one of the leading conditions for which patients engage complementary and/or alternative medical (CAM) treatment. There are a number of reasons why patients seek and use CAM approaches for the treatment of chronic headache(s). To re-iterate, many patients do not gain relief from mainstream approaches, are frustrated by failed interventions, and as a result seek CAM therapeutics due to an underlying disenchantment with, and/or disenfranchisement from conventional care. Second, there is a pervasive public belief that CAM is "safer" than conventional therapies, (13) and CAM is also perceived as being somewhat more "patient-centered." Third, CAM approaches are commonly seen as enhancing "wellness", and therefore are commonly used for preventive care – particularly against the symptoms of chronic or recurrent disorders (e.g., chronic headache).

Yet, it is important to note that such use raises particular problems and concerns. First, many patients do not discuss CAM use with their primary or specialist mainstream physician(s), for fear of disapproval, or admonition. Second, both patient and (many) mainstream physicians are not fully aware of the quality, nature and extent of evidence to support or reneg the use of particular CAM modalities. As well, many CAM providers may also be unaware of such evidence, and may not appreciate the need for advanced knowledge of the mechanisms, effects, outcomes and applications, and/or may not recognize the potential issues arising from the combined use of CAM and mainstream approaches.

These factors have led to the increasing need and interest in research to determine the safety and effectiveness of various CAM treatments - either alone or in combination - in the management of specific conditions, including headache. This scientific evidence is of importance to pain physicians in order to 1) inform patients of available treatment options, and 2) make

appropriate evidence-based decisions regarding the choice of best therapeutics (12). Unfortunately, such direct comparisons of CAM and mainstream/conventional therapies are not consistently available, and the quality of studies of various CAM therapies varies considerably.

Studies of mechanism, effect(s) and outcomes of CAM approaches frequently fail to meet the methodological rigor that is more generally maintained in studies of mainstream/conventional therapeutics. Certainly, that is not to suggest that all studies of mainstream/conventional treatment are universally rigorous. However, the majority of mainstream medical journals, as well as the top tier, and/or indexed CAM journals maintain rather stringent peer-review and editorial processes that tend to limit errors or inadequacies in research and reporting method(s). Yet, even in top-tier CAM-focal and mainstream journals, methodological issues surrounding the conduct and reporting of CAM research have been described, (14) and many reports of mechanism, effects, and outcomes of CAM therapeutics are published in non-top tier/non-indexed journals, disseminated in newsletters, or posted on the internet. Of course, there are well-constructed, strictly monitored and reviewed websites that are valuable resources for patients, clinicians and the general public (for example: MD Anderson Cancer Research Center http://www.mdanderson.org/), but the abundance of non-reviewed or non-refereed sites make them an easily accessible source for (mis)information.

In light of this, an ongoing issue is the discernment of methodological rigor of CAM research, and how this affects the quality of information and overall value of such studies and results (14,15). In this paper, we address this issue relative to studies of CAM approaches to prevention and treatment of chronic migraine, tension and cluster-type headache. Three (3) major questions were the focus of this investigation:

1) What is the overall quality of randomized controlled trials (RCTs) of prevention/treatment of chronic primary headache?
2) What is the comparative quality of RCTs of conventional medical approaches and CAM treatments of primary headache?
3) What are the effects of CAM and conventional medical treatments on headache as reported in those studies that maintain high methodologic quality/rigor?

The response(s) to such inquiry forces consideration of 1) whether such potential differences affect clinical decision-making and the provision of information to patients, and 2) whether such discrepancies in study quality can be rectified.

As we move to the conclusion of the Decade of Pain Control and Research, one of the pressing questions remains, how has pain control been affected by research, and how has research responded to the demand of pain control. In this review, we evaluate those studies of CAM headache therapies conducted up to the first half of this decade, so as to both provide an assimilative basis for review and comparison against those studies conducted subsequently, and to contribute to the larger assessment of such findings upon the closure of this overall 10-year agenda.

Methods

Literature Search, Data Sources and Criteria.

An electronic literature search using MEDLINE, PsycInfo, EMBASE, Cochrane Library, and the NIH Complementary and Alternative Medicine literature databases was performed using a search for the key terms "controlled clinical trial" and "headache", as published in English from 1979 to June 2004. As well, bibliographies of review articles were searched to ensure that all RCTs of prevention/ treatment of primary headache were included in the review.

Study Selection

Inclusion criteria were all randomized trials on prophylactic treatment (treatment to prevent recurrence or reduce intensity) of primary headache (i.e.-migraine (with and without aura), tension, and cluster headache) published between 1979 and 2004 in the English language, that were professionally peer-reviewed. We chose 1979 as the start date of our search since this is when full MEDLINE listings of articles began and standards for clinical trials were few and far between prior to this. Exclusion criteria were non-RCTs and studies of acute headache, secondary headache or headache of organic causes (i.e., post-lumbar puncture headaches, headache due to cerebrovascular accidents, brain tumors, trauma, or meningitis).

Literature Classification

All identified RCTs of treatments for primary headache were categorized into studies of either conventional or complementary/alternative ap-

proaches, according to the definition and classification of CAM established by the National Institute of Health (NIH). (16) Per this definition, CAM is broadly described as "…those treatment modalities that are not taught widely in medical schools, not generally available in standard medical practices or hospitals." (16,17). This definition incorporates a wide variety of interventions including behavioral therapy, herbal and vitamin supplements, hypnosis, biofeedback, energy healing, chiropractic, massage, acupuncture, homeopathy, Ayurveda, and Traditional Chinese Medicine, and can be more broadly categorized into mind-body, phytomedicinal, energy, and whole-systems' approaches, in accordance with the current scheme employed by the National Center for Complementary and Alternative Medicine (NCCAM).

The Cochrane Complementary Medicine Field Registry Guidelines were used to clarify and delineate types of CAM treatments. Since 1996, the Cochrane Collaboration on CAM has been utilized as an international registry to collect, maintain and evaluate randomized controlled trials on CAM (http://www.cochrane.org/index.htm).

Data Extraction and Quality Assessment

A descriptive data extraction template was specifically developed for use in this study. This allowed for collection of information according to study title, year of publication, authors, type of study, clinical condition being studied, language, procedure, total number of participants entering the study and completing the study in each group, total drop out percentage, outcomes' claims, p-values associated with the primary outcomes, and effect sizes. All studies included were evaluated using these descriptive data. As well, the Jadad scale was employed to assess the quality of individual studies.

The Jadad Scale

The Jadad scale is a short, well-validated, and easy-to-use instrument for assessing the reporting quality of RCTs. The Jadad scale uses a scoring system that has three items that can be summed to a maximum score of five points. Zero, one or two points can be given for randomization criteria (i.e.-whether randomization was described, and whether the method(s) used to generate the sequence of randomization were amply described and appropriate to the study); Zero, 1, or 2 points can be assigned for meeting double-blinding criteria (i.e.-whether the study was described as double-blinded, and whether the method(s) used for double-blinding were appropriate to the study); and zero to 1 point can be assigned for the description of dropouts and withdrawals.

The Jadad scale specifically assesses particular measures of internal validity (i.e.- the likelihood that the outcomes are specifically due to the treatment effects in a study). The scale does not contain information about statistical accuracy or external validity (i.e.- the likelihood that the outcomes would occur in a broader population beyond those of the study). Nonetheless, the Jadad scale remains the most contemporarily popular, and most widely accepted tool to assess the quality of randomized controlled trials, and is used to evaluate both conventional and CAM studies (18, 19).

Data Extraction: Training and Performance

The data extraction template was evaluated in pilot studies by two trained reviewers. The reliability of scoring procedures was examined prior to the initiation of the study (kappa=0.90). These two reviewers assessed all chronic headache studies. If there were uncertainties regarding the conditions in, and/or conclusions of a particular study, the reviewers utilized a discursive method to resolve these issues, and/or requested peer input/advice. Any remaining discrepancies were resolved by consulting the senior authors.

Statistical Analysis

Data entry and analyses were performed using an SPSS 10.0 statistical software package. Individual measures on the Jadad scale were given one point if the item was present in the study. A total Jadad score was obtained for each individual study (maximum score of 5, and a minimum score of 1, given that all selected studies were randomized trials, in accordance with the inclusion criteria). Student's t-tests for independent samples (of continuous variables), and chi-squared analyses (for categorical variables) were used to assess the differences between groups for all measures. In all cases, statistical significance was considered at a level of $P < 0.05$.

Results

Literature Search and Study Selection

The electronic search revealed over 2,300 peer-reviewed papers on headache treatments published

between 1979 and June 2004. The majority of these papers were excluded because they: 1) dealt with acute treatments or secondary headaches; 2) were observational studies, or 3) were systematic reviews and meta-analyses. Of the 519 remaining papers, 125 studies of conventional treatments, and 121 studies of CAM treatments fully met the inclusion criteria of being RCTs of prophylactic treatment for chronic primary headache (Fig. 1).

Descriptive Results

Of the included studies of conventional treatment(s), 24% were conducted in the U.S., compared to 48% of the studies of CAM treatment(s). Studies also differed according to the types of headache and clinical conditions for which conventional or CAM treatments were used. Seventy-one percent (71%) of conventional treatments were for migraine headache, while only 27% of all studies of CAM treatments were specific to migraine. In contrast, only 16% of the studies of conventional treatments were for tension headache, versus 42% of CAM interventions. Treatment of mixed headache comprised 2% of conventional approaches, while 20% of the studies of CAM interventions focused upon mixed tension-migraine prevention/treatment.

As shown in Table 1, 99% of the 125 conventional studies that were evaluated employed pharmacological treatments, whereas there were over 10 different types of CAM treatments tested and studied, the most prominent being biofeedback or relaxation (Table 1). A more complete review of mind-body approaches used to treat various types of headache is provided by Sierpina, Astin, and Giordano (20).

Sample Size and Dropouts

One trial of conventional therapeutics included 22,071 participants; this skewed the total number of participants so as to be much larger than those in the trials of CAM treatment(s) (when summed across all studies). Excluding this study, there were no differences between the sample sizes in studies of conventional treatments (mean n=71.5) and CAM treatments (mean n=68.5). The total attrition percentage (defined as total attrition after acceptance into the study) for studies of CAM treatments averaged 14.6% (ranging from 0 to 56%, with a standard deviation of 12) while the attrition percentage in studies of conventional treatments

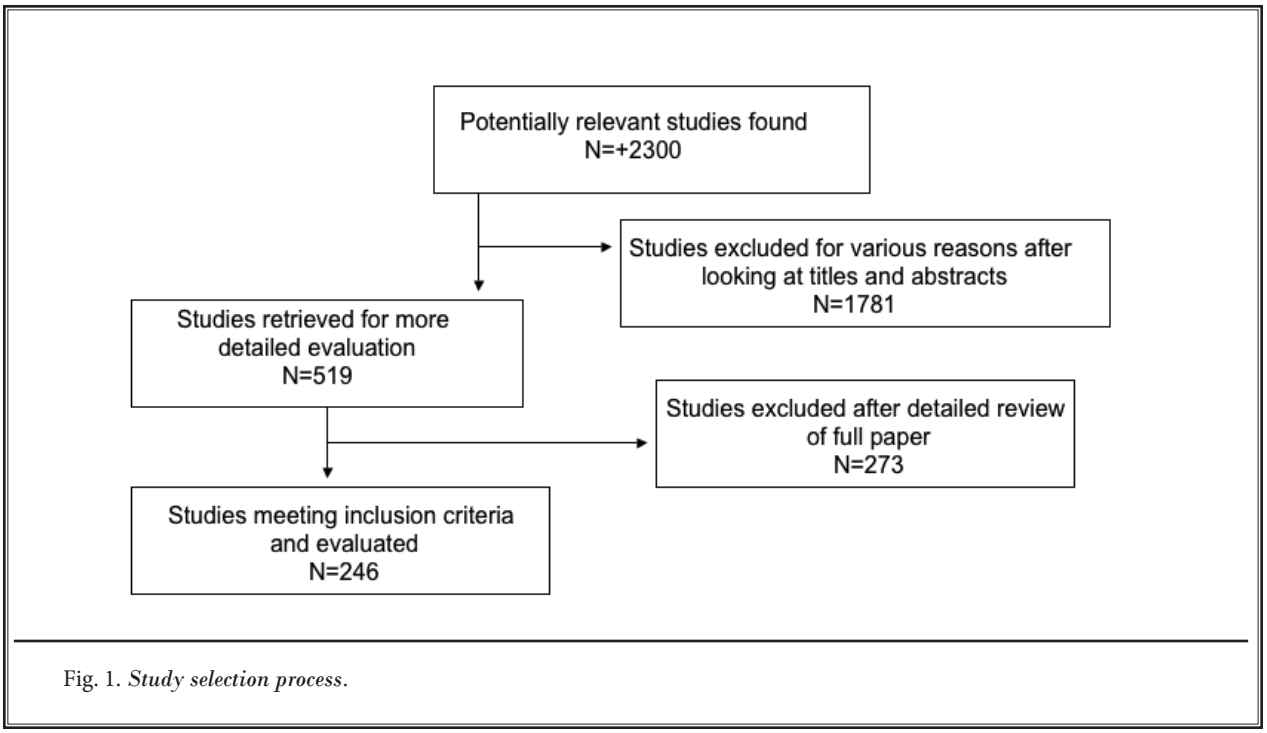

Fig. 1. *Study selection process.*

Table I. *Different procedures used for treating chronic headache in our sample of articles.*

	Treatment	Studies N, (%)
Conventional Therapy N=125	Medication	124 (99)
	Diet	1 (1)
CAM Therapy N=121	Relaxation and/or Biofeedback and/or Cognitive Therapy	62 (51.2)
	Acupuncture	23 (19)
	Manipulation	11 (9.1)
	Hypnosis	9 (7.4)
	Homeopathy	5 (4.1)
	Self or group care	4 (3.3)
	Nutritional supplements	4 (3.3)
	TENS	1 (0.8)
	Therapeutic touch	1 (0.8)
	Yoga	1 (0.8)

averaged 20% (ranging from 0 to 60% with a standard deviation of 12.9). This was a statistically significant difference in attrition percentage, with greater average attrition in studies of conventional treatments of headache versus CAM treatments (t=3.46, *P*=0.001).

Quality Assessment across Study Design

The literature on the prevention/treatment of primary headache received an overall Jadad mean score of 2.72 out of 5 (SD=1.1). The Jadad mean score (± SD) for studies of conventional treatments was significantly greater than that of studies of CAM treatments (Jadad mean score: 3.21 ± 0.90 vs. 2.23 ± 1.1, t=7.72, $P < 0.0005$). It is generally accepted that studies with Jadad scores of 3 or greater reflect "good" reporting quality (of selected internal validity measures), whereas ratings of less than 3 reflect qualitatively poorer studies, impacted by diminished internal validity.

Jadad Sub-scores:

Randomization

All included studies were randomized; therefore a minimum possible Jadad score of 1 was uniformly assigned. Assessing whether the method of randomization was adequately described and appropriate was often difficult as randomization processes were frequently not completely described, rather in many cases it was simply stated that "…the subjects were randomized to [treatment or control] groups". Only 10% of conventional treatments for primary headache described the randomization process, while 28% of the studies of CAM therapies explicitly reported and described randomization (chi^2=10.7; *P*=0.001).

Double Blinding

Eighty-six percent (86%) of the studies of conventional treatments reported double blinding, which is in contrast to only 18% of the studies of CAM approaches (chi^2=122.6; P<0.0001). The description and appropriateness of double-blinding was presented in 44% of the studies of conventional treatments for headache, while only 13% of the studies of CAM treatments fully described or presented appropriate double-blinding procedures (chi^2=29.14; *P*<0.001).

Attrition: Withdrawals and Dropouts

Significant differences in the Jadad criteria for describing attrition were noted in studies of conventional and CAM interventions for primary headache. Adequate description of withdrawals and dropouts was described in 78% of the studies of conventional treatments, and 63% of studies of CAM interventions (chi^2=6.76; *P*=0.009).

Table 2 presents further detailed depiction of qualitative differences between studies of conventional and CAM approaches to the treatment of chronic primary headache.

Table 2. *Number of Studies Meeting Specific Quality-Criteria Definitions*

Selection Data	Conventional Therapy studies	CAM Therapy studies
Total trials included	125	121
Years	1979-2004	1979-2003
Total patients entering study	30,939	8427
Total patients completing study	28,930	7168
Average sample size entering study	248 (Range=9-22,071)	69 (Range=9-715)
Median sample size entering study	50	46
Mean Jadad Score	3.2 (SD=0.9)	2.2 (SD=1.1)
Jadad score ≥3	97 (73%)	38 (28%)
Reported Positive Effects (P<0.05)	100 (80%)	88 (73%)
Double blinding reported	108 (86%)	22 (18%)
Dropout handling reported	98 (78%)	77 (63%)
Randomization described and appropriate	12 (10%)	34 (28%)

Study Outcomes

The positive (*P*<0.05) or negative effects (*P*>0.05) reported in each study were collectively assessed. The heterogeneous nature of the study sets precluded pooling these data into meta-analyses, therefore only percentages of positive outcomes could be accurately reported. Eighty percent (80%) of the studies of conventional treatments for primary headache reported positive effects, while 73% of the studies of CAM interventions indicated positive outcomes (chi^2 = 3.798; *P*=0.051).

As shown in Table 3, the number of high quality studies of conventional therapeutics reporting positive outcomes was significantly greater than the number of studies of CAM treatments in which positive outcomes were described. However, when controlling for the number of studies of CAM (versus conventional) approaches that adequately described randomization and double-blinding procedures, this apparent significant difference is no longer valid. Within the low quality studies, the percentage of positive outcomes reported for conventional versus CAM approaches shows a similar pattern. Studies of conventional therapies, whether of high or low quality, tended to report positive effects overall, while low(er) quality studies of CAM treatments tended to report more positive effects.

Discussion

Overall, studies of conventional treatment(s) for chronic headache scored higher on quality measures than studies of CAM treatments, primarily because of the greater proportion of studies of conventional ap-

Table 3. *Number of Studies with Positive Effects (P<0.05) Meeting Specific Quality Criteria*

	Quality Scores Based on JADAD			Double Blinding			Randomization Description			Double-Blinding and Randomization Description		
	≥3	<3	P-Val	Yes	No	P-Val	Yes	No	P-Val	Y	N	P-Val
Conventional Therapies	82/97 (85%)	19/23 (83%)	0.820	90/108 (83%)	11/12 (92%)	0.453	10/12 (83%)	91/108 (84%)	0.934	9/11 (82%)	10/11 (91%)	0.534
CAM Therapies	21/38 (55%)	69/83 (83%)	0.002	12/22 (55%)	77/99 (78%)	0.022	20/34 (59%)	70/87 (80%)	0.018	6/12 (50%)	65/79 (82%)	0.012
P-Value of Conventional vs. CAM Therapies	0.0001	0.977		0.003	0.274		0.125	0.413		0.110	0.472	

proaches that were double-blinded. Studies of CAM approaches had better quality scores for description of randomization, and had fewer dropouts. Such differences in measures of the quality of studies of conventional or CAM treatments may reflect 1. actual distinctions in the methodological rigor of research (and perhaps the capacities and resources of researchers) that are engaged in conventional medicine or CAM; 2. different treatment and/or research contexts; 3. differences in the medical paradigm of conventional and CAM therapeutics, and/or 4. some combination of any/all of these factors.

Characteristically, a well-designed, blinded RCT should focus upon a main research question as relevant to a specific intervention enacted within a particular population, and should evaluate a well-defined outcome. This approach may be more easily accomplished when evaluating a pharmaceutical agent intended for a specific use (e.g., treatment of a given disorder and/or administered to evaluate or elicit certain mechanism(s) or effects). Also, it may be that CAM institutions are not uniformly capable of conducting research of this caliber. Such studies are time- and financially-costly, require access to patient populations, and significant dedication of physical, personnel and fiscal resources that many CAM institutions (e.g., CAM schools) lack (15). Thus, a significant responsibility may rest upon CAM schools to enhance their research programs.

Similarly, a responsibility rests upon "mainstream" medical institutions (e.g., medical schools, hospitals, etc.) to conduct rigorous, well-designed studies of CAM therapeutics that are sensitive to CAM effects and mechanisms. But this may also be a problem in that many mainstream institutions are not prepared (or willing) to conduct research on CAM-based interventions. To some extent, there is a lingering stigma associated with some of this type of work, but while this is in fact changing, the larger issue may be that research into CAM practices, effects and mechanisms is not simply poorly conducted, but rather that the approach(es) used to study CAM processes may not accurately and/or adequately "capture" the underlying effects, mechanisms or outcomes. (14) Clearly, this needs to be considered 1) irrespective of whether such research is conducted within a conventional (i.e.-mainstream) or CAM orientation, 2) when evaluating the literature in light of observed discrepancies and differences, and 3) when designing studies to further investigate or compare these approaches.

Often, CAM interventions incur some combinatory effect, and are frequently not singularly used for a given condition. As well, interventions may be utilized based upon individual traits of particular patients or groups of patients, and may evoke more non-specific effects (21). These effects need to be considered in studies of both conventional therapeutics (e.g., pharmacogenetic variations in effect, etc), and certainly in those of various CAM systems and interventions (22).

Blinding can be a problematic factor in studying particular CAM treatments and therapeutics. For many of the interventions studied, there is not a single, accepted or standardized sham treatment that can be used as a control group comparator. Thus, many studies compare different interventions; while not wholly inappropriate, patients and/or practitioners may not be able to be blinded to treatment assignments in such situations. For example, many studies of biofeedback use relaxation as the comparison control, and many acupuncture studies use a sham acupuncture intervention – both are control techniques that obviously cannot be double-blinded. These considerations are important when making assessments based upon the Jadad scale (23-26).

Approximately 40% of the studies of conventional treatment(s) employed cross-over design(s), whereas cross-over protocols were used in only 6% of the studies of CAM therapeutics. This may reflect the fact that it is more difficult to use a cross-over design in CAM interventions as many of the interventions involve non-immediate effects that limit the use of short-term, temporally-related outcomes assessments. In studies of conventional therapeutics – particularly pharmacological effects' studies - cross-over designs are more feasible in light of identified timecourses of drug effect(s), and the use of calculated cross-over designs tend to reduce the sample size requirements and add power to the respective studies. Yet, cross-over designs may not be effective in all paradigms, and the inappropriate use of this method can be as problematic as non-use.

Many CAM treatments yield multiple outcomes; this can create problems when conducting an RCT, and limits the potential, utility, and effectiveness of this approach in evaluating certain CAM treatments (if not affecting the conduct of CAM research in general). Also, many CAM studies report multiple outcomes; this can create confusion for the reader, and can lead to ambiguous or erroneous interpretation of results. Frequently, studies of CAM interventions do not state

primary outcomes, but simply report a list of outcome measures. This confounds effect-size calculation, and risks incurring type II errors inferred from multiple measures. In light of this, it was decided not to report effect-sizes in the present study. Instead, positive effects (based on *p*-values relative to the primary outcomes) were reported.

In considering the literature as a whole, studies of both conventional interventions and CAM approaches for headache reported positive therapeutic benefit(s). This is not significantly affected by examining the quality of studies, or evaluating subsets of studies that employed adequate blinding or randomization. In fact, several quality measures that are important for reducing bias in a clinical evaluation (i.e.- appropriate randomization and blinding) were low in both studies of conventional and CAM therapeutics. The primary flaw in the CAM literature was the lack of blinding, which to re-iterate, may reflect methodologic limitations caused by the nature of several of the major CAM interventions. Studies of conventional treatments had higher dropout rates, and less commonly described the method(s) of randomization used. While studies of CAM treatment(s) are often criticized for the general lack of scientific rigor, the present review reveals that the literature on both the conventional and CAM approaches to the prevention/ treatment of primary headaches have significant flaws and limitations.

Admittedly, there were a number of limitations in the present study. First, only studies published in English were examined; many studies of CAM interventions are conducted in non-English speaking countries and reported in non-English language journals. However, the current scientific culture encourages the publication of high quality research (of both conventional and CAM approaches) in the peer-reviewed, English language literature (27). Second, the present findings may reflect different reporting requirements of mainstream journals (in which all studies of conventional treatments for headache were published), and complementary and/or alternative journals (where many if not most of the studies of CAM treatments for headache were published). Such reporting requirements and journal-specific criteria were not ascertained, evaluated or regarded in the present analysis. This raises an important point: if research is to be of value it must effectively communicate findings that are relevant to both readership and purpose. Given that the purposes of such studies are to 1) promote care, 2) avoid harm, and 3) facilitate integrative multi-disciplinary healthcare, then standardized reporting requirements for all journals (such as the CONSORT checklist) are needed to ensure accurate inclusion of quality trials throughout the peer-reviewed literature. But it is important to bear in mind that to most effectively study CAM, we may need to reduce an allopathically biased viewpoint in order to maximize the value of evidence derived from studies of particular CAM approaches.

Conclusions

In this study, we found the overall quality of research studies of conventional approaches to headache to be superior to studies of CAM approaches. But the differences revealed in the present review strengthen the viewpoint that it may be just as important to study how certain CAM approaches and outcomes are assessed, as it is to study the outcomes themselves (14). Such studies of research methodology may reveal that specific types of research design, protocol(s) and/or conduct might need to be revised so as to best illustrate the mechanisms and effects of various CAM interventions. Still, even given these considerations, it is critical that research be conducted and reported in ways that provide the most useful evidence to those individuals that will be the principal users of such information. If we seek to develop an integrative healthcare, then descriptions of how and why certain methods were utilized in particular studies, as well as uniform standards of reporting that enhance access, interpretation and utilization need to be established and enforced. Such quality control would allow for necessary differences in research methods as required to most effectively illustrate mechanisms, effects and outcomes, while at the same time set a high bar to maintain methodologic rigor and enhance more broad application(s) of any and all reported evidence.

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