

A Systematic Review of Systematic Reviews of the Efficacy of the Stabilization Splint in the Management of Patients with Temporomandibular Disorders

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ABSTRACT

BACKGROUND

This is a review of the literature conducted by the Clinical Guidelines Committee of the American Equilibration Society. It provides a systematic review of published systematic reviews on the efficacy of splint therapy for TMD patients.

TYPES OF STUDIES REVIEWED

The committee members conducted an extensive literature review utilizing 18 databases and 4 research libraries to find all published systematic reviews related to a defined PICO question. All systematic reviews of trials that examined the effectiveness of stabilization splints for the treatment of patients with Temporomandibular Disorders were eligible for inclusion.

RESULTS

The literature search produced 238 potential articles resulting in the selection of 4 systematic reviews included in this report. The systematic reviews evaluated 36 trials, reporting 22 different outcome assessments, 17 different clinical problems, 13 different treatment comparisons, and variation in the interventions used. The quality and strength of the systematic reviews was hindered by the lack of quality evidence and the specificity of the trials reviewed.

CLINICAL IMPLICATIONS

The results of this review suggest that the best available evidence for or against the use of stabilization splint therapy for TMD patients is based on a level of evidence below the level of randomized controlled trials.

KEY WORDS

stabilization splint, temporomandibular disorders, systematic reviews, randomized controlled trials, localized myalgia, myofascial pain, evidence based dentistry, temporomandibular joint dysfunction syndrome, occlusal splints

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BACKGROUND

Numerous patients have signs and experience symptoms of Temporomandibular Disorders.¹ Although the scientific literature is abundant with published articles, the literature is equivocal. This has resulted in a lack of consensus in the management of many TMD patients.

Intraoral devices known as Stabilization Splints [SS] have a long history of use in dentistry and in the management of specific Temporomandibular Disorders.¹ Recent systematic reviews [SRs] related to stabilization splint therapy have attempted to examine the indications, use, and efficacy of this therapy for TMD patients.²⁻⁹

Description of the condition(s) - TMD

The clinical signs and symptoms of masticatory system dysfunction can be grouped into categories according to structures that are affected: (1) the muscles, (2) the temporomandibular joints (TMJs), and (3) the dentition. Muscle and TMJ disorders make up the group of conditions known as Temporomandibular Disorders (TMDs).^{1,10}

Description of the intervention: Stabilization Splint Therapy

Occlusal Device: Any removable artificial occlusal surface used for diagnosis or therapy affecting the relationship of the mandible to the maxilla. It may be used for occlusal stabilization, for treatment of temporomandibular disorders, or to prevent wear of the dentition.¹¹

There are various types of intraoral devices used in the management of TMD patients. The stabilization splint (SS) is one such type of device that is characterized by providing complete coverage of the maxillary or mandibular dental arch. It provides non-traumatic occlusal contact for all opposing teeth that have a potential for hyper-eruption. The SS is generally fabricated of dense acrylic or a material that resists occlusal forces generated by the patient and is dimensionally stable.¹² The device should have a flat plane posterior occlusal surface and not dictate closure into a protrusive, lateral or retrusive position. The SS eliminates posterior tooth interferences during jaw movements by providing anterior tooth contact that separates posterior teeth during any lateral or protrusive jaw movements. It should provide for an interference free occlusal relationship. Paramount in SS therapy is the progressive selective adjustment of the splint over time. This is to maintain stable occlusal contacts on the SS that may change as a result of wear and/or mandibular reposturing.¹²⁻¹⁴

How the intervention might work

There are numerous opinions and theories proposed to explain the therapeutic effects. Four categories have been proposed – Biomechanical, Behavioral, Neurosensory, and Placebo.^{1, 15}

Why it is important to do this review

Similar to all patient care, treatment for patients with TMD should be based upon the best evidence available. Systematic Reviews [SRs] are thought to offer the highest level of research evidence on a given clinical problem. If future clinical decisions are to be based upon SRs, it is imperative that they address clinically relevant, focused questions, and follow a transparent, well-designed protocol.^{16,17} The value of a SR is

limited by the quality of the randomized control trials that it reviews. The quality of SRs should also be critically reviewed.

An objective assessment of published SRs on the use and efficacy of stabilization splints will provide direction and guidance to dental practitioners who endeavor to help patients manage their TMD. A SR of published SRs considering stabilization splint therapy for TMD patients has not been published.

Objectives

In an attempt to reduce confusion and provide direction to oral health care providers, the Guidelines Committee of the American Equilibration Society [AES] conducted an evidence-based literature review to identify and evaluate the current body of literature that represents the highest level of evidence regarding the use of stabilization splints. To accomplish this goal, the AES Guidelines Committee completed an intensive training program in Evidence Based Dentistry and the scientific methodology used by the Cochrane Collaboration. During this training, the Committee realized that perhaps the best way to identify and evaluate the desired body of evidence was to critically appraise the published SRs on stabilization splint therapy and complete a Systematic Review of published SRs. Guidelines for the reporting of SRs of both randomized controlled trials and observational studies have been proposed.^{16,17}

The purpose of this paper is to perform a Systematic Review of published SRs that address the efficacy of stabilization splint therapy for the management of TMD patients.

METHODS SECTION

Criteria for considering studies for this review

Types of studies

All SRs of Trials that examined the effectiveness of intervention by stabilization splints for the treatment of TM Disorders were eligible for inclusion.

Search Strategies for identification of studies

The AES Guidelines Committee established a PICO question through group consensus [APPENDIX: Table 1]. When evaluating the literature pertaining to any topic, it is important to search broadly for the available literature.¹⁸ The PICO question was intentionally formulated with a broad perspective in order to include any SR that would relate to the use and efficacy of SS therapy for TMD patients.

Electronic searches

Five members of the Guidelines Committee formed the Library Search Group [LSG] and recruited librarians to conduct a search of the literature following the PICO protocol. The health science libraries at The University of Alabama at Birmingham (UAB), University of Nevada Las Vegas (UNLV), University of Oklahoma (OU) and Vrije Universiteit Amsterdam participated in the study. A sampling of the search strategies used by each librarian is included in the APPENDIX: Table 2. A complete documentation of the electronic searches is on file.

In total, an exhaustive electronic search was accomplished from September 1966 to December 2009 using the bibliographic databases included in Table 3 [APPENDIX.] The 4 libraries yielded a combined list of 238 articles matching each librarian's search strategy based upon the PICO question. See Table 4 [APPENDIX]

Other sources

Grey literature: no additional articles were found that met the inclusion criteria.

Hand searching: Additionally, a direct library search for recent publications (March 2005 – October 2010) was conducted in an attempt to include all available studies.

See Table 5 [APPENDIX]

Experts: no additional articles were found that met the inclusion criteria.

Reference lists: no additional articles were found that met the inclusion criteria.

Correspondence: no additional articles were found that met the inclusion criteria.

Methods of the Review

Selection of studies

The broad electronic and auxiliary searches found 238 potential studies. The Library Search Group [LSG] reviewed the 238 abstracts of these studies and identified 57 potential studies and excluded 181 studies. The LSG, upon reflection of the evaluation process, decided to create a more transparent process of documentation. An “Abstract Evaluation Tool” was created to document why studies were excluded and maintain transparency to the process. Article abstracts were re-evaluated and included or rejected based on three criteria: [1] Was the PICO question addressed in the article? [2] Was the article a systematic review? [3] Did the abstract provide enough information for questions 1 and 2 or is it necessary to review the complete article to determine inclusion or exclusion? The LSG documented the studies that were excluded and consensus was reached to form a master list of 57 articles warranting further review as seen in Table 6 [APPENDIX]. A complete and thorough process was completed to identify all SRs of Trials on the topic of stabilization splint therapy used in the management of TMD patients.

The evidence based literature and published guidelines did not provide the specific tools for a Systematic Review of Systematic Reviews. This required the development of new assessment tools for this specific review. The 57 articles were arbitrarily assigned to five teams of two members each from the AES Guidelines Committee for critical appraisal [CA], according to the “critical review process” model established for Cochrane reviews.¹⁶ Each article was analyzed independently by each member of the team utilizing a “Critical Appraisal Summary Tool”. This six question summary tool identified articles that warranted a more extensive critical appraisal which was completed using the “Critical Appraisal Tool v 4.01” shown in Figure 1[APPENDIX]. A final selection of six SRs were judged by consensus of the AES Guidelines Committee to meet the selection criteria and are listed in Table 7 [APPENDIX]. Two authors wrote two SRs each, based on the same underlying research. These repetitive articles may result in problems associated with publication bias. Publication bias can occur when there is repeated publication of the same data.¹⁸ It was therefore decided to use the most recent publication of each author’s SR’s. One of the six SR’s⁸ was not focused on stabilization splint therapy, but rather acupuncture for TMD patients. Since all the trials reviewed in this paper were also included in the other three SR’s, this SR⁸ was excluded from further analysis. This left 3 SR’s to include in this review.

A sub-committee, The Writers Group, (WG) was formed to study the 3 SRs that referenced 66 Randomized Controlled Trials. Although 66 Trials were referenced by the 3 SRs, due to duplication of references only 26 different Trials¹⁹⁻⁵⁴ were actually

used by the 3 SRs. Of the 26 Trials, 24 were used by multiple SRs at least twice, while 2 Trials were used only once. See Table 8 [APPENDIX].

Due to the extended review process and in order to be as current and complete as possible the search time parameters were expanded to October 2010. This was accomplished by updated electronic searches in December of 2009 and October 2010. This yielded one additional systematic review ⁹ resulting in a total of 4 SRs for evaluation in this review [see table 8].

Using the PRISMA format,⁵⁵ a Flow Diagram of the Identification, Screening, Eligibility, and Inclusion process is presented in Figure 2. [APPENDIX]

Data extraction and management

The data from the four SRs was extracted and presented to the writers group for review, verification and organization into the results table. See Table 9 [APPENDIX]

Assessment of Methodological Quality of Included SRs

Although teams of two reviewers had independently assessed all of the SRs through the earlier CA process, each of the 4 final SRs and CAs were presented to the writers group and any disagreements about the reviews were discussed and resolved. No authors were contacted for any questions about the papers.

Consideration of the Data

An important next step in the review process includes the extraction and consideration of the types of data for outcome measurements. When the research design yields homogenous data, the statistical power of the SR is increased. Data from smaller Trials can be compared and combined, or pooled into a larger sampling and meta-analysis of the data can be undertaken. This allows an improved, quantitative evaluation of the

efficacy of a given treatment modality. However, when the resultant data is too diverse, it may be meaningless to complete a meta-analysis, or worse, it may be misleading.¹⁶

When the heterogeneity of the data is such that it cannot be pooled, then the resultant data is measured by qualitative rather than quantitative standards.^{56, 57}

There are three methods to assess the quality of clinical trials: individual markers, checklists, and scales.⁵⁸ The SR's used all three methods and this review was confounded by the difference in the methods used by the SRs to evaluate the quality of the reviewed RCT's. Moreover, when using check lists and scales to assess the quality of Trials, there can be a tendency to confuse the quality of reporting with the validity of the design and construct of a trial.

Furthermore, while the simplicity of developing summary qualitative scores (weighted or unweighted) is enticing, it also lacks the explicitness necessary to evaluate the individual components of a qualitative assessment. This lack of transparency also increases the risk of confusion between quality and validity.¹⁶ This is of importance since high quality does not necessarily mean that the trial is adequately designed. The issue of validity is thus different from that of quality.⁵⁷

Because three reviewed SRs^{5,7,9} used Scales with resultant summary scores, each was further evaluated for additional narrative descriptive findings of the more explicit components of Level I qualitative criteria. With the exception of Friction⁹, all of the SRs provided a descriptive analysis of the explicit qualitative criteria.

In an attempt to approach consistency (reliability), the authors of this SR addressed this issue by extracting the qualitative criteria that were found common to each of the

studied reviews and developed a comparison table of qualitative assessment [see Table 9].

Assessment Tools

Three SRs^{5,7,9} in this review used three accepted assessment scales, the Jadad Scale⁵⁹, the Antczak Scale⁶⁰, and the Consort Statement.⁶¹ Al-Ani used the Cochrane Reviewers handbook criteria for randomization and allocation concealment¹⁶ and applied yes/no(binary) answers or a simple count for other quality criteria.

Randomizing and Allocation Concealment

Properly performed randomization is considered crucially important in trial design.⁶² Conversely, inadequate allocation concealment yields an over estimation of the effects of treatment. Inadequate allocation concealment is recognized to be a major problem in the RCT level of TMD literature. In one descriptive study, eighty five percent (85%) of RCTs failed to address this selection bias problem.⁶³ In this review, attempts to describe the allocation of intervention assignment procedures were accomplished in three^{24,25,39} of the 36 RCTs identified in the 4 SRs. The topic of blinding of the allocation process was discussed in all of the SRs and all 4 authors of the SRs described this as a serious concern.

Blinding of the Outcome Assessment

There was consensus amongst 3 of the SRs^{4,5,7} that it probably was not feasible to blind both the treating professional and the patient when undertaking stabilization splint therapy. Conversely, there should never be any difficulty with blinding the investigator that is assessing the treatment results.

Al-Ani, et al⁴ stated that blind outcome assessment was described in two trials.^{23,43} Forsell, et al⁵ related that none of the trials mentioned the fulfillment of the blinding process, while Turp et al⁷ cited 5 trials^{24, 26, 39 42, 43} that were blinded to outcome assessment. Friction⁹ described 7^{23,35,40,44,46,50,53} out of the 36 RCTs that mentioned blinding of the outcome assessment.

Sample Size

Inadequate group sizes may produce unreliable findings. The concept for determining an adequate sample size is referred to as power analysis for sample size determination.⁶⁴

None of the four SRs reported on whether the sample sizes used in the Trials were determined by the use of power analysis. All 4 SRs reported the various sample sizes included in the Trials as listed in Table 8. All authors lamented the small size of the trial studies.

Dropout Report

Patient dropout in these studies is more appropriately called attrition bias because of the weakness of the pre-allocation exclusion and inclusion criteria for enrolling the patients. The dropout reporting was generally limited to describing the losses from the studies without much regard to how the losses were handled.¹⁶ Al-Ani⁴ and Turp⁷ were specific in describing the number of dropouts while Forsell⁵ reported that the number of dropouts were usually less than 10%. Friction's management of attrition bias provided a summary score without an explicit narrative description.⁹

Patient Selection Description

As reported in table 9, there was wide variation and lack of specificity in the patient selection process.

Therapeutic regimen definition

The treatment intervention cited in the SRs fell within the scope of the inclusion criteria that is defined in this review. Descriptions of the therapeutic regimen must be sufficiently detailed to allow proper interpretation of the result, comparison with other reports, and replication in future studies or practice.

Pooled data completed

Forsell and Turp found that the heterogeneity of the RCTs was such that pooling of the data was “not possible”⁵ or “impossible”⁷

Al-Ani, et al

In an attempt to determine the significance of discrepancies in the estimates of treatment effects from the different trials, Al-Ani ⁴ pooled the data by organizing 7 comparative intervention sub-groups and applying the Cochrane Collaboration Statistical guidelines and Test for Heterogeneity.¹⁶

Friction, et al

The goal of this study⁹ was to extract the RCT's from their literature search database that met the specific criteria necessary to be included in a meta-analysis. The three sub-groups of RCT's included stabilization splints versus non-occluding appliances treatment, stabilization splints versus no treatment, and all appliances versus other treatment. The patient population for all three sub-groups demonstrated TMJD characteristics and the outcome assessment was the decrease or elimination of non-standardized pain measurement between groups. The reduction of pain was used as an

outcome measure. Level I criteria was used for evaluating bias and a mean quality summary score of CONSORT criteria⁶¹ was used to determine the quality of the methodology.

Two sub-groups including stabilization splints versus non-occluding splints and stabilization splints versus no treatment were selected for meta-analysis.

Meta-analysis attempted

Forsell and Turp did not perform meta-analysis due to the inability to pool the data.^{5,7}

Al-Ani, et al

Data analysis was undertaken by Al-Ani⁴

for comparisons and outcomes derived from RevMan. Meta analysis was undertaken using a random effects model. Risk ratio (RR) values were calculated including the Mantel-Haenszel (H-M) statistical method with a 95% confidence interval (CI) for dichotomous (binary) data. The weighted means difference (WMD), also with a 95% CI, was used for continuous data. The significance of discrepancies in the estimates of treatment effects from the different trials was assessed by inspection of a graphical display (Forest Plot) and by means of Cochran's test for heterogeneity. The resultant calculus for determining effect size, whether dichotomous or continuous data, and for all of the comparative intervention sub-groups was either designated as 'Not estimable' or 'Totals not selected'.

Friction, et al

Data analysis was undertaken by Friction, et al, for outcomes derived from Comprehensive Meta Analysis (version 2).⁶⁵ Meta-analysis was undertaken and the

random-effects model was selected. In addition, studies using continuous versus dichotomous variables were combined and relative risk (RR) and Odds Ratio (OR) were calculated to determine the estimates of benefit of the stabilization splint. The Standardized Means Difference (SMD) was used to synthesize data where different scales were used. Both the RR and OR were calculated to determine the clearest method of presenting the meta-analysis results.⁹ The calculus results were not presented.

Graphical displays (Forest Plot) were used to demonstrate the efficacy of stabilization splints versus no treatment and non-occluding appliances.

Assessment of the Literature Search Process of the SRs

“The quality of a systematic review is tied directly to the clarity, transparency, and reproducibility of its literature search for appropriate studies”⁶⁶ The literature search process of the 4 SRs was evaluated using the criteria suggested by Major⁶⁶ and based upon the Cochrane Handbook for Systematic Reviews of Interventions¹⁶. The results are presented in Table 10 [Appendix] and demonstrates that the authors of the SRs made a significant attempt to find, review and evaluate the current literature related to their systematic review.

Stabilization Splint Criteria

Table 11[Appendix] compares critical features of stabilization splint therapy, as stated earlier in this review, to the description of interventions used in the 4 systematic reviews. The results indicate that a variety of appliance designs were included. Some of the variations noted were:

- on which arch the appliance was worn,

- how much time the appliance was to be used on a daily basis,
- the duration of the study,
- the material used to construct the appliance,
- follow-up maintenance and adjustment schedule,
- and post-insertion instructions.

While it may be possible to assume that certain criteria are followed when an appliance is described as a “Tanner” or “Michigan Splint”, such descriptions lack the specificity required to determine if two interventions are actually comparable or if salient features of the intervention result in different therapeutic effects

RESULTS

The 4 SRs utilized a total of 36 Trials as seen in Table 8. Some of these Trials are utilized in all 4 SR papers, others in only one. In order to avoid giving more weight to any one Trial used in multiple reviews, the number of Trials contributing to any specific comparison treatment has been tabulated in Table 12 [APPENDIX].

The 36 Trials (and therefore all 4 SRs) contain 17 different Problems (Diagnoses) being studied, as demonstrated in Table 13 [APPENDIX]. However, Friction often labeled the diagnostic problems within the RCTs he reviewed as “TMJD” (21 of the 26). This is not a term used by the other SR authors.

From this list, it can be seen that several of the RCT’s included by the SR authors did not meet the inclusion criteria for this SR of SRs. These RCT’s are noted with an asterisk in Table 12.

Intervention:

All but 3^{36,39,44} of the 36 trials utilized what could be considered a stabilization splint. In nine of the trials^{19,26,27,28,29,35,36,43,44} stabilization splint therapy was a comparison treatment, rather than the primary intervention being studied.

Comparison Treatment:

As noted in Table 12, thirteen different comparison treatments were studied in these 36 trials. These ranged from 1 to 3 comparison treatments for each trial. Only three of the comparison treatments (untreated controls and non-occluding orthotics, anterior deprogrammers) were addressed by more than 4 of the 36 trials included in these reviews.

Outcome Assessment:

Twenty-two different outcome measures were utilized in the RCT's, as reported in the SR's: see Figure 3 [APPENDIX]

The results for stabilization splint therapy, as published in the included SRs, are included in Table 12. These results, based on the conclusions of the review authors, are as follows:

Al-Ani, et.al.⁴

“Our SR of the literature showed that there is only weak evidence to suggest that SS therapy may be beneficial in comparison to minimal or no treatment. However, there was no evidence of a statistically significant difference in the effectiveness of stabilization splint therapy in reducing symptoms in patients with myofascial pain when compared with other conventional treatments. In general, the comparisons were based on a small number of patients with no standardization of the outcomes measured. Little attention was given to the randomization process and concealment allocation in the

included studies, increasing the risk of selection bias. We conclude that there is insufficient evidence either for or against the use of stabilization splint therapy over other active interventions.”

Forssell, et.al.⁶

“The judgment of the clinical relevance of the outcomes was hampered by the great number of control treatments, especially because some of them (e.g. acupuncture, ultrasound, TENS) lack clear evidence of effectiveness. Furthermore, three studies used palatal splints as controls. It is not clear whether these should be considered placebos or active control treatments having effects on muscle function, or increasing cognitive awareness of oral habits.

Turp, et.al.⁷

“Due to the limited number of available studies, our clinical question can only be answered tentatively: based on the currently best available evidence it appears that most patients with masticatory muscle pain are helped by the incorporation of a stabilization splint. Nevertheless, evidence is equivocal that improvement of pain symptoms after incorporation of an intraoral appliance is caused by a specific effect of the splint.”

Fricton, et.al.⁹

“Methodological problems in the majority of the studies that were reviewed preclude definitive conclusions and point to the need for more well-controlled RCTs with improved methods. For example, the small sample sizes of almost all of the research limits conclusions and, in some cases, may generate type II errors and false negative results. Both the measurement of pain and its conversion to a comparable measure

may have introduced bias into the meta-analyses. The review concludes that hard stabilization appliances when adjusted properly have good evidence of modest efficacy in the treatment of TMJD pain when compared to non-occluding appliances and no treatment.”

DISCUSSION

Assessment of the Methodological Quality of the SRs:

The rationale for SRs has been well documented.⁶⁸ Within the hierarchy of scientific evidence, SRs are considered to have a high quality level and are useful when applied to focused clinical questions related to health care.⁶⁹ These types of publications are carried out to answer one or more focused clinical questions related to health care. SRs follow explicit, well-documented, scientific methodology in order to reduce both systematic errors (biases) and random errors (those occurring by chance) and provide a more objective, comprehensive view of the research literature.⁶⁹

Just as the authors of the SRs assessed the methodological quality of their included randomized controlled trials, these same SRs have also been critically evaluated for the quality of their appraisal. This was not undertaken to criticize the efforts of the authors of each of the SRs, but rather to more accurately establish the level of evidence that is available to the clinical practice of dentistry.

It is the impression of the WG that each of the reviewed SRs fulfilled the rigorous protocol required of a SR. However, all four SR's lament the dearth of adequate well-controlled, high quality RCT's on this subject. Indeed, the low quality of evidence would support the findings of the SR authors. The lack of allocation concealment, blinding, and treatment outcome blinding, leads to findings that are highly susceptible to bias. Also,

differing treatment outcomes results in heterogeneity, and weaken any meaningful quantitative estimates assessments of treatment effect.

A systematic review begins with the development of a clear question with explicit components. The inconclusive results reported by the SR authors can be attributed to the failure of the underlying RCTs to rigorously follow the structure of the PICO model. Our review found significant deficiencies in each component of the PICO question, as described below.

Problem #1: Diagnostic Nomenclature:

“Temporomandibular disorders (TMD) refer to a collection of medical and dental conditions affecting the temporomandibular joint and/or the muscles of mastication as well as contiguous tissue components.”⁷⁰ Nonspecific categories such as Temporomandibular Disorders(TMD), Temporomandibular Myofascial Pain(MPD), Temporomandibular Pain Dysfunction Syndrome(TPDS), TM Joint Dysfunction(TMJD), Temporomandibular Joint Disorders(TMJD), etc. are confusing, do not represent a diagnosis based on diagnostic criteria and continue to contribute to controversy. The use of this broad, collective categorization has been long discouraged and it is strongly recommended that the use of this broad language be abandoned and replaced with terminology that more accurately represents an explicit sub-group. This would permit the elimination of the broad-based categorization.^{10, 70, 71} In the current collection of SRs and their included trials, non-diagnostic categorization has been used to describe the patient population. see Tables 1 and 13.

The use of nonspecific categories in Trials is summarized in the SR and article authored by Forssell⁶ “The actual definitions of the patient samples varied. The study population

was described to consist of TMD (or alike) patients, and patients with muscle pain and different types of joint problems were placed into a single group. However, the distinct clinical entities that constitute TMD are likely to exhibit differences in treatment responses. Trials using more detailed patient disorder definitions would probably be more sensitive and give more clinically useful information.”

Problem #2: Multiple Interventions:

The second major problem with the PICO question pertains to the description of interventions utilized in trials of the SRs. It is not possible to ascertain from the 4 reviewed SRs if the intervention being evaluated meets the criteria for “stabilization splint” therapy as described in this review. Some trials, as evaluated in the SRs, did not utilize stabilization splint therapy. Some interventions had different treatment goals, designs and methods of treatment.

Problem #3: Comparison Treatments

The third major problem with the PICO question is comparison treatments utilized in the trials of the SRs. There were 13 discrete comparison treatments found in the 4 SRs. Five comparison treatments were represented by just 1 trial. The comparison treatment utilized most within the trials was “non-occluding appliance”(8 Trials) (See Tables 8 & 12). The level of evidence of a SR is compromised when the comparison treatment data cannot be pooled for further evaluation. The level of evidence of this review is also compromised due to this same limitation.

Problem #4: Outcomes Assessment Variability

The fourth major problem with the PICO questions is outcomes assessment utilized in the trials of the 4 SRs. There were twenty-two methods used to determine the outcome of various interventions. As noted by several authors of the SRs, this is a significant impediment to the evaluation of the efficacy of stabilization splint therapy. This is another reason why some of the authors did not attempt to pool data and perform quantitative analysis.

Problem Summary:

Even if clinical trials are randomized, controlled and blinded, not using more explicit diagnostic criteria, well-defined interventions, uniform comparison treatments, and standardized outcome assessments will forever condemn the TMD RCT process to inconclusive results and a low quality of evidence.

“A common mistake when there is inconclusive evidence is to confuse ‘no evidence of an effect’ with ‘evidence of no effect’.” “Another common mistake is to reach conclusions that go beyond the evidence that is reviewed”.¹⁶ Three SR authors^{4,5,7} concluded that there was weak to modest evidence to make a supportive statement regarding the efficacy of stabilization splint therapy in the treatment of TMD. One author⁹ concluded that there was good evidence of modest efficacy of stabilization splint therapy. All the authors acknowledged the problems and limitations of the RCTs while reaching their conclusions.

Implications for future Research

All of the authors of the 4 SRs conclude that higher quality randomized controlled prospective trials are critically needed in order to definitively answer the question at

hand regarding the efficacy of stabilization splints. The quality and strength of the SRs was hindered by the lack of quality evidence and specificity of the trials reviewed in the 4 SRs.

Past research has been inadequate to answer the question, partly due to the multifactorial nature of Temporomandibular Disorders and the failure to control for variables and confounding factors during clinical trials.

Future research should more rigorously incorporate all four components of a properly designed question, utilizing the framework provided by the PICO structure to improve the quality of the trials on this subject. Specifically, the goal of TMD research should be to use more explicit diagnostic nomenclature, better-defined interventions, uniform comparison treatments, and clearly stated outcome assessments. It is only after this is accomplished that we can hope to have the level of evidence necessary to definitively establish which treatment modalities are truly efficacious.

CONCLUSIONS

1. The reviewed SRs fulfilled the transparent, rigorous protocol of a SR while describing the inadequacies of the referenced trials related to stabilization splint therapy.
2. The results of this review suggest that the best available evidence for or against the use of stabilization splint therapy for TMD patients is based on a level of evidence below the level of randomized controlled trials. Specifically, expert opinion and clinical observation appear to be the best quality of evidence available regarding stabilization splint therapy in the management of temporomandibular disorders.

3. Future trials should be designed with well-defined inclusion criteria, specifically chosen to target more explicit diagnostic criteria.
4. Future studies should provide adequate documentation of the therapy provided. Criteria suggested for stabilization splint therapy has been described in this review.
5. The available evidence supports the conclusion statements of the SR authors, namely, there is insufficient evidence for or against stabilization splint therapy, when compared with other modalities, in the treatment of temporomandibular disorders.
6. Given the level of evidence available on this subject, the inconclusive results found in the SRs is not surprising. However, the conclusions of this review should not be construed as “evidence” that stabilization splints have no effect in this patient population.

TABLE 10**AES****SEARCH STRATEGIES OF SYSTEMATIC REVIEWS**

	Al-Ani 2009	Forsell 2004	Turp 2003	Friction 2010
1 Electronic Search using at least 2 Databases	YES	YES	YES	YES
2 Electronic Search with Secondary Searches	YES	YES	YES	YES
3 Search Terms are clear and Reproducible	YES	YES	YES	YES
4 Clear way that terms were combined [Boolean op]	YES	YES	YES	YES
5 Clear and reproducible inclusion-exclusion criteria	YES	YES	YES	YES
6 Articles selected by a team of two or more reviewers	YES	YES	YES	YES
7 Includes reviews in all languages	YES	YES	YES	NO
8 Quorum Diagram	NO	NO	NO	YES
SCORE	7	7	7	7

TABLE 1-a

AES
DEVELOPMENT OF THE PICO QUESTION

PARTICIPANT	QUESTION
Auvenshine, Ron	In adults suffering from myogenous TMD, would the use of a full-coverage stabilization splint, when compared with non-full-coverage devices or occlusal therapy versus no treatment, reduce symptoms?
Gremillion, Henry	In adults with intracapsular TM disorders, does treatment with an occlusal stabilization appliance, compared to no treatment, result in a decreased pain level?
Guinn, Jim	For patients with TMD, will an orthopedic appliance, compared to no appliance, result in significant reduction of symptoms or improvement of function?
Hancock, David	In patients with extracapsular TM disorders, does treatment with an occlusal appliance, compared to no treatment, result in decreased pain levels?
Kinderknecht, Keith	In adult patients with myogenous TM disorders, would stabilization splint therapy, compared to other therapies, provide a reduction in pain?
Nelson, Stan	In adult patients with myogenous TM disorders, would stabilization splint therapy, compared to other therapies, provide a reduction in pain? provide a reduction in pain?
Racich, Mike	For the management of TMJ patients, is stabilization splint therapy, as compared to other or no therapies, efficacious?
Taylor, Ron	In patients that demonstrate TMDs, will a stabilizing orthopedic appliance, without any other treatment, provide an improvement in presenting clinical signs and symptoms?
Tylka, Dan	In a TMD population, does treatment using an occlusal splint, improve outcome over no treatment, placebo or, or other treatment for TMD not involving a splint?
Zonnenberg, Aad	In patients with masticatory system muscle pain, will treatment with stabilization splint therapy, as compared to occlusal therapy, provide a reduction of signs and symptoms?

Table 1-b

AES
DEVELOPMENT OF THE PICO QUESTION

PARTICIPANT	P Population	I Intervention	C Comparison	O Outcome
Auvenshine, Ron	In adults suffering from myogenous TMD,	would the use of a full-coverage stabilization splint	when compared with non-full-coverage devices or occlusal	reduce symptoms?
Gremillion, Henry	In adults with intracapsular TM	does treatment with an occlusal stabilization appliance	compared to no treatment	result in a decreased pain level?
Guinn, Jim	For patients with TMD	will an orthopedic appliance	compared to no appliance	result in significant reduction of symptoms or improvement of function?
Hancock, David	In patients with extracapsular TM	does treatment with an occlusal appliance	compared to no treatment	result in decreased pain levels
Kinderknecht, Keith	In adult patients with myogenous TM	would stabilization splint therapy,	compared to other therapies,	provide a reduction in pain?
Nelson, Stan	In adult patients with myogenous TM	would stabilization splint therapy,	compared to other therapies,	provide a reduction in pain?
Racich, Mike	For the management of TMJ patients	is stabilization splint therapy	as compared to other or no therapies	efficacious
Taylor, Ron	In patients that demonstrate TMDs	will a stabilizing orthopedic appliance	without any other treatment	provide an improvement in presenting clinical signs and symptoms
Tylka, Dan	In a TMD population	does treatment using an occlusal splint	no treatment,	improve outcome
Zonnenberg, Aad	In patients with masticatory system	will treatment with stabilization splint therapy	as compared to occlusal therapy	provide a reduction of signs and symptoms?

TABLE 1-c

AES
DEVELOPMENT OF THE PICO QUESTION

PARTICIPANT	P Population	I Intervention	C Comparison	O Outcome
Ron Auvenshine and Henry Gremillion	In adult patients with myogenous TMD,	would the use of stabilization splint therapy	compared with other or no treatment	decrease pain levels?
Keith Kinderknecht and Stan Nelson	In patients with any TMD,	would the use of a full coverage stabilization splint	compared to any other therapies	provide a reduction in signs and symptoms?
Jim Guinn and David Hancock	In patients with a Temporomandibular disorder,	will a stabilization orthopedic appliance	without any other treatment	provide a statistically significant improvement in clinical signs or symptoms
Mike Racich and Dan Tylka	In adult patients that demonstrate TMDs,	will a stabilizing orthopedic appliance	without any other treatment	provide an improvement in presenting clinical signs and symptoms?
Ron Taylor and Aad Zonnenberg	In adult patients that demonstrate TMDs,	will a stabilizing orthopedic appliance	without any other treatment	provide an improvement in presenting clinical signs and symptoms?

THE TEAM GENERATED PICO QUESTION			
P Population	I Intervention	C Comparison	O Outcome
In patients that demonstrate a Temporomandibular Disorder,	will a stabilization appliance,	compared with other or no treatment,	provide an improvement in the clinical signs and symptoms?

In patients that demonstrate a temporomandibular disorder, will a stabilization appliance, compared with other or no treatment, provide an improvement in the clinical signs and symptoms?

TABLE 2

**AES
LIBRARY SEARCH STRATEGIES**

1. Oklahoma Search Strategy:

- 1 exp Craniomandibular Disorders/ (11165)
- 2 (craniomandibular disorder\$ or craniomandibular disease\$).mp. (543)
- 3 (temporomandibular disorder\$ or temporomandibular disease\$).mp. (1537)
- 4 (temporomandibular joint disorder\$ or temporomandibular joint disease\$).mp.
(7134)
- 5 tmj\$.mp. (4303)
- 6 tmd\$.mp. (1957)
- 7 exp Myofascial Pain Syndromes/ (5037)
- 8 (myofascial pain dysfunction\$ or myofascial pain dysfunction\$ or mpd\$).mp. (1762)
- 9 temporomandibular joint syndrome\$.mp. (102)
- 10 costen\$ syndrome\$.mp. (51)
- 11 exp Temporomandibular Joint/ (7941)
- 12 exp Joint Diseases/ (190384)
- 13 11 and 12 (3601)
- 14 or/1-10,13 (16275)
- 15 disc displacement\$.mp. (398)
- 16 (myofascial pain\$ or myogenous pain\$ or myofascial pain\$).mp. (1308)
- 17 arthrogenous pain\$.mp. (6)
- 18 local\$ myalgia\$.mp. (22)
- 19 exp Masticatory Muscles/ (9052)
- 20 exp pain/ (204046)
- 21 19 and 20 (881)
- 22 (masticatory muscle\$ and pain\$).mp. (1018)
- 23 (muscle\$ and joint\$ and disorder\$).mp. (2803)
- 24 Arthralgia/ (1911)
- 25 arthralgia\$.mp. (5127)
- 26 or/15-18,21-25 (10044)
- 27 14 or 26 (23087)
- 28 orthopedic appliance\$.mp. (105)
- 29 occlusal stabiliz\$.mp. (19)
- 30 stabilization bite splint\$.mp. (1)
- 31 stabiliz\$ splint\$.mp. (83)
- 32 muscle deprogram\$.mp. (1)
- 33 anterior reposition\$.mp. (64)
- 34 (gelb appliance\$ or tmj appliance\$ or tanner appliance\$ or michigan splint\$).mp.
(17)
- 35 exp orthodontic appliances/ (14694)
- 36 (gelb\$ or tmj or tanner\$ or michigan\$).mp. (21472)
- 37 35 and 36 (277)

Page 1 of 7

Developed by Ron Taylor

02/07/2011
A Sampling of Search Strategies

TABLE 2

- 38 occlusal splint\$.mp. (1168)
- 39 or/28-34,37-38 (1491)
- 40 exp Complementary Therapies/ (112495)
- 41 (biofeedback\$ or acupunctur\$ or massag\$).mp. (22818)
- 42 exp physical therapy modalities/ (79706)
- 43 tens.mp. (3308)
- 44 transcutaneous electric\$ nerve stimulat\$.mp. (2637)
- 45 exp Psychotherapy/ (102746)
- 46 (cognitive behavior\$ therap\$ or cognitive behaviour\$ therap\$).mp. (2431)
- 47 exp Drug Therapy/ (419470)
- 48 dt.fs. (1212119)
- 49 (pharmacotherap\$ or pharmacolog\$ management\$ or pharmacolog\$ therap\$).mp. (15828)
- 50 repositioning therap\$.mp. (8)
- 51 reposition\$.mp. (6223)
- 52 th.fs. (947963)
- 53 51 and 52 (1207)
- 54 (pivot\$ applianc\$ or pivot\$ device\$).mp. (8)
- 55 Occlusal Adjustment/ (253)
- 56 occlusal adjust\$.mp. (542)
- 57 equilibrat\$ procedure\$.mp. (23)
- 58 occlus\$ equilibrat\$.mp. (107)
- 59 placebos/ (26018)
- 60 placebo\$.mp. (114611)
- 61 enamoplast\$.mp. (1)
- 62 coronoplast\$.mp. (5)
- 63 or/40-50,53-62 (1686931)
- 64 27 and 39 and 63 (275)
- 65 limit 64 to systematic reviews (10)
- 66 limit 64 to evidence based medicine reviews (12)
- 67 66 not 65 (10)
- 68 from 65 keep 1-10 (10)

2. Las Vegas Search Strategy:

"Temporomandibular Joint"[MeSH] OR "Temporomandibular Joint Disk"[MeSH] OR "Temporomandibular Joint Disorders"[MeSH] OR ("Temporomandibular Joint Dysfunction Syndrome"[MeSH] OR "Craniomandibular Disorders"[MeSH] OR "Myofascial Pain Syndromes"[MeSH])

"Orthodontic Appliances"[MeSH] OR "Orthopedic Fixation Devices"[MeSH] OR ("Occlusal Adjustment"[MeSH] OR "Occlusal Splints"[MeSH] OR "Orthodontic Appliances, Functional"[MeSH]) OR "Splints"[MeSH]

"Treatment Outcome"[MeSH]

TABLE 2

I combined the results with AND and limited them to humans and to reviews

I then went to the "Clinical Queries" section of PubMed and did a simple search in the "Find Systematic Reviews" section. There I simply searched temporomandibular AND splints.

3. Alabama Search Strategy:

- 1 exp temporomandibular joint/ (7966)
- 2 exp craniomandibular disorders/ (11206)
- 3 exp bruxism/ (1753)
- 4 exp masticatory muscles/ (9079)
- 5 Neck Muscles/ (3430)
- 6 Arthralgia/ (1939)
- 7 6 and 1 (62)
- 8 Myofascial Pain Syndromes/ (773)
- 9 Mandibular Condyle/ (5875)
- 10 exp temporal bone/ (11494)
- 11 exp mandibular diseases/ (25682)
- 12 1 or 2 or 3 or 4 or 5 or 7 or 8 or 9 or 10 or 11 (54888)
- 13 exp temporomandibular joint/ (7966)
- 14 exp craniomandibular disorders/ (11206)
- 15 exp bruxism/ (1753)
- 16 exp masticatory muscles/ (9079)
- 17 Neck Muscles/ (3430)
- 18 Arthralgia/ (1939)
- 19 18 and 13 (62)
- 20 Myofascial Pain Syndromes/ (773)
- 21 Mandibular Condyle/ (5875)
- 22 exp temporal bone/ (11494)
- 23 exp mandibular diseases/ (25682)
- 24 13 or 14 or 15 or 16 or 17 or 19 or 20 or 21 or 22 or 23 (54888)
- 25 (temporomandibular or temporo mandibular or temporo-mandibular).mp. (17091)
- 26 (craniomandibular or cranio mandibular or cranio-mandibular).mp. [mp=title, original title, abstract, name of substance word, subject heading word] (935)
- 27 tmj.mp. (4205)
- 28 cmd.mp. (771)
- 29 tmd.mp. (1614)
- 30 bruxism.mp. (1914)
- 31 masticatory muscle\$.mp. (6908)
- 32 masseter muscle\$.mp. (3389)
- 33 pterygoid muscle\$.mp. (890)
- 34 temporal muscle\$.mp. (1828)

TABLE 2

35	neck muscle\$.mp. (4086)
36	(arthralgia and temporomandibular).mp. (168)
37	(myofascial pain or mpd).mp. (2414)
38	mandibular condyle\$.mp. (6140)
39	temporal bone\$.mp. (9908)
40	mandibular disease\$.mp. (5378)
41	mandibular neoplasm\$.mp. (6641)
42	prognathism.mp. (2717)
43	retrognathism.mp. (1291)
44	masticatory muscle pain.mp. (57)
45	internal derangement.mp. (786)
46	myofacial pain.mp. (67)
47	disc displacement.mp. (389)
48	(pain dysfunction syndrome or pds).mp. (2288)
49	1 and degenerative joint disease\$.mp. (54)
50	myogenous pain.mp. (9)
51	arthrogenous.mp. (61)
52	localized myalgia.mp. (11)
53	crepitation.mp. (200)
54	costen\$.mp. (89)
55	(tooth adj5 grind\$.mp. (112)
56	(teeth adj5 grind\$.mp. (193)
57	(jaw adj5 clench\$.mp. (92)
58	(ear adj5 (click\$ or pop\$)).mp. (258)
59	(jaw adj5 lock\$.mp. (51)
60	or/25-59 (60937)
61	24 or 60 (64660)
62	Splints/ (5907)
63	exp orthodontic appliances/ (14724)
64	splint\$.mp. (11217)
65	orthodontic appliance\$.mp. (11767)
66	occlusal splint\$.mp. (1176)
67	orthodontic Bracket\$.mp. (1808)
68	orthodontic retainer\$.mp. (409)
69	orthodontic Wire\$.mp. (1731)
70	orthopedic appliance\$.mp. (105)
71	(stabilization adj5 orthopedic).mp. [mp=title, original title, abstract, name of substance word, subject heading word] (26)
72	occlusal stabilization\$.mp. (17)
73	(stabilization adj5 bite adj5 splint\$.mp. (7)
74	stabilization splint\$.mp. (69)
75	muscle deprogramming device\$.mp. (0)
76	gelb appliance\$.mp. (1)
77	tmj appliance\$.mp. (3)
78	tanner appliance\$.mp. (0)
79	(anterior adj5 repositioning adj5 appliance\$.mp. (17)

TABLE 2

80 michigan splint\$.mp. (13)
 81 (orthopedic adj5 stabilization).mp. (26)
 82 or/62-81 (25165)
 83 61 and 82 (3062)
 84 exp complementary therapies/ (113073)
 85 exp physical therapy modalities/ (79995)
 86 exp behavior therapy/ (33430)
 87 exp neuromuscular agents/ (49585)
 88 exp Antidepressive Agents/ (86991)
 89 exp Serotonin Uptake Inhibitors/ (21284)
 90 exp Anti-Inflammatory Agents/ (312141)
 91 exp Analgesics/ (353936)
 92 Injections, Intramuscular/ (22848)
 93 Laser Therapy, Low-Level/ (960)
 94 (dh or dt or pc or th).fs. (2662602)
 95 Placebos/ (26096)
 96 Occlusal Adjustment/ (255)
 97 or/84-96 (3183679)
 98 no treatment.mp. (12555)
 99 occlusal therap\$.mp. (87)
 100 pharmacolog\$ management.mp. (1411)
 101 biofeedback.mp. (5687)
 102 reposition\$ therap\$.mp. (11)
 103 physical therap\$.mp. (23865)
 104 pivot appliance\$.mp. (3)
 105 occlusal adjustment\$.mp. (545)
 106 equilibration procedure\$.mp. (21)
 107 tens therap\$.mp. (31)
 108 transcutaneous electric nerve stimulation.mp. (2404)
 109 alternative treatment modalities.mp. (141)
 110 psychological therap\$.mp. (386)
 111 placebo\$.mp. (115198)
 112 acupuncture.mp. (10677)
 113 massage therap\$.mp. (291)
 114 occlusion equilibration.mp. (0)
 115 enamoplast\$.mp. (1)
 116 coronoplast\$.mp. (5)
 117 (cognitive behavior\$ therap\$ or cognitive behaviour\$ therap\$).mp. (2455)
 118 or/98-117 (171477)
 119 or/97-118 (3211172)
 120 83 and 119 (2294)
 121 meta-analysis.pt,ti,ab,sh. (24941)
 122 121 or (meta anal\$ or metaanal\$).ti,ab,sh. (26904)
 123 (methodol\$ or systematic\$ or quantitativ\$).ti,ab,sh. (416200)
 124 ((methodol\$ or systematic\$ or quantitativ\$) adj (review\$ or overview\$ or survey\$)).ti,ab,sh. (12938)

TABLE 2

125 ((pool\$ or combined or combining) adj (data or trials or studies or results)).ti,ab.
(7246)
126 123 or 124 or 125 (422555)
127 126 and review.pt,sh. (52170)
128 122 or 127 (75221)
129 120 and 128 (22)
130 from 129 keep 1-22 (22)

4. Amsterdam Search Strategy:

Key of symbols:

#	set number
[MeSH]	search in Medical Subject Headings
[mesh:noexp]	search in mesh terms not exploded
*	truncation
[tw]	search as textwords in the title, abstract, other abstract, MeSH terms, MeSH Subheadings, Publication Types, Substance Names, Personal Name as Subject, MEDLINE Secondary Source, and Other Terms (see Other Term [OT] above) typically non-MeSH subject terms (keywords)
[pt]	search in field of publication type, i.e. material the article represents
[sb]	restricting search retrieval by <u>topic</u> , <u>citation status</u> and <u>journal/citation subsets</u>

Patient/population

#1

Craniomandibular Disorders[mesh] OR Bruxism[mesh] OR Prognathism[mesh] OR Retrognathism[mesh] OR Mandibular Diseases[mesh:noexp]

#2

(Jaw[Mesh:noexp] OR "Mandible"[MeSH] OR "Maxilla"[MeSH] OR Temporal Bone[mesh] OR Temporomandibular Joint[mesh]) AND ("Joint Diseases"[MeSH] OR "Arthralgia"[MeSH] OR "Arthritis"[MeSH] OR "Joint Instability"[MeSH])

#3

(Masticatory Muscles [mesh] OR Facial Muscles[mesh] OR Neck Muscles[mesh]) AND (Muscular Diseases[mesh] OR Pain[mesh:noexp] OR Neck Pain[mesh] OR Facial Pain[mesh])

#4

Tmjd[tw] OR tmd[tw] OR tmjdd[tw]

TABLE 2

#5

(Temporomandibular[tw] OR craniomandibular[tw] OR tmj[tw] OR jaw[tw] OR jaws[tw] OR mandibular[tw] OR mandible*[tw] OR maxilla*[tw] OR ((chewing[tw] OR masseter[tw] OR pterygoid[tw] OR temporal[tw] OR masticatory[tw]) AND muscle*[tw]) OR (temporal[tw] AND bone*[tw])) AND (Disorder*[tw] OR dysfunction*[tw] OR syndrome*[tw] OR disease*[tw] OR derangement*[tw] OR displacement*[tw] OR pain[tw] OR myalgia[tw])

#6

Costen*[tw] AND syndrome[tw]

#1 OR #2 OR #3 OR #4 OR #5 OR #6 > #7

Intervention

#8

Orthodontic Appliances[mesh] OR Jaw Fixation Techniques[mesh] OR Occlusal adjustment[mesh]

#9

(Orthodontic[tw] OR occlusal[tw] OR orthopedic[tw] OR orthopaedic[tw] OR intraoral[tw] OR (temporomandibular[tw] AND joint*[tw]) OR tmj[tw]) AND (appliance*[tw] OR device*[tw] OR bracket*[tw] OR retainer*[tw] OR wire[tw] OR wires[tw] OR fixation[tw] OR stabili*[tw])

#10

Orthopedic Equipment [mesh:noexp] OR Orthopedic Fixation Devices[mesh]

#11

splint[tw] OR splints[tw]

#12

Muscle[tw] AND deprogram*[tw] AND (device*[tw] OR appliance*[tw])

#8 OR #9 OR #10 OR #11 OR #12 > #13

#7 AND #13 > #14

Final search step:

#14 NOT (Animals[mesh] NOT Humans[mesh]) AND (Review[pt] OR Practice Guideline[pt] OR Systematic[sb])

TABLE 3

LIBRARIES

Database	LIBRARIES			
	UNLV	OU HSC	UAB	VU
Ovid Medline	X	X	X	X
DARE		X	X	X
AMED		X		
ACP Journal Club		X		
CDSR		X		
ERIC	X		X	
CINAHL	X	X	X	X
EMBASE		X		X
PsycINFO	X	X	X	X
Scopus	X			
Web of Knowledge	X			
ALT Health Watch	X			
Cochrane Systematic Reviews	X		X	X
BIOS			X	
JICST-EPLUS [Japan]				X
PASCAL [French/Dutch]				X
PICARTA				X
DIMDI [German]				X
UNLV	University of Nevada Las Vegas			
OU HSC	University of Oklahoma Health Sciences Center			
UAB	University of Alabama - Birmingham			
VU	Vrije Universiteit, Amsterdam, Holland			

TABLE 4

LIST OF 238
The Compiled List of Library Searches-Titles

1. Ackerman MB, Rinchuse DJ. ABO certification in the age of evidence and enhancement. *Amer J Ortho Dentofacial Orthopedics*. 2006;130:133-40.
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HAND SEARCH

1. Atsu SS, Tekdemir I, Elhan A. The coexistence of temporomandibular disorders and styloid process fracture: A clinical report. J Prosthet Dent 2006;95:417-20.

Abstract

This clinical report describes the diagnosis and treatment of a patient with both temporomandibular disorders (TMD) and styloid process fracture. The presence of tender muscles of mastication, facial pain, especially upon awakening, frequent grinding sounds, and tooth attrition indicated a diagnosis of TMD with bruxism as a possible etiological factor. However, the preliminary diagnosis of styloid process fracture based on the patient's sensation of a foreign body in the throat and some discomfort when turning the head was confirmed using radiography. The styloid process fracture was treated using conservative nonsurgical therapy, and an occlusal splint was used to treat the TMD. The patient's symptoms were significantly reduced at the 12-month follow-up visit.

2. Barnes MF, Geary JL, Clifford TJ, Lamey PJ. Fitting acrylic occlusal splints and an experimental laminated appliance used in migraine prevention therapy. Br Dent J 2006;200:283-6.

Abstract

Objective To evaluate clinical procedures and chair time required to seat and adjust hard, heat-cured acrylic occlusal splints and an alternative laminated appliance developed to simplify construction of migraine prevention appliances.

Design and setting Single-centre study in the Oral Medicine Clinic, The Royal Hospitals, Belfast, Northern Ireland.

Method Questionnaires were distributed, January-May 2003, to operators fitting occlusal splints for 100 consecutive patients selected for migraine prevention therapy. Half the appliances were made in heat-polymerised acrylic with the remainder using a novel combination of ethylene vinyl acetate and light-curing urethane dimethacrylate. Information on operator experience, the nature of any fitting surface and occlusal adjustments together with an estimate of the time taken to make alterations was recorded.

Key findings The need for adjustment to seat appliances intraorally was significantly less for migraine prevention appliances made using an experimental laminating technique. Where modifications were necessary, there was no significant difference in the chair time required to fit either the heat-cured hard or experimental laminated migraine prevention appliance.

Conclusion Provision of migraine prevention appliances may be more time efficient if the dental practitioner considers a laminated approach to construction.

3. Broussard JS. Derangement, osteoarthritis, and rheumatoid arthritis of the temporomandibular joint: implications, diagnosis, and management. Dent Clin North Amer 2005;49:327-42.

Abstract not available

4. Crider A, Glaros AG, Gevirtz RN. Efficacy of biofeedback-based treatments for temporomandibular disorders. Applied Psychophysiology and Biofeedback. 2005;30:333-45.

Abstract

Bibliographic searches identified 14 controlled and uncontrolled outcome evaluations of biofeedback-based treatments for temporomandibular disorders published since 1978. This literature includes two randomized controlled trials (RCTs) of each of three types of biofeedback treatment: (1) surface electromyographic (SEMG) training of the masticatory muscles, (2) SEMG training combined with adjunctive cognitive-behavioral therapy (CBT) techniques, and (3) biofeedback-assisted relaxation training (BART). A detailed review of these six RCTs, supplemented with information from non-RCT findings, was conducted to determine the extent to which each type of intervention met treatment efficacy criteria promulgated by the Association for Applied Psychophysiology and Biofeedback (AAPB). We conclude that SEMG training with adjunctive CBT is an efficacious treatment for temporomandibular disorders and that both SEMG training as the sole intervention and BART are probably efficacious treatments. We discuss guidelines for designing and reporting research in this area and suggest possible directions for future studies.

5. Jokstad A, Mo A, Krogstad BS. Clinical comparison between two different splint designs for temporomandibular disorder therapy. *Acta Odontol Scand* 2005;63:218-26.

Abstract

Objective. To compare splint therapy in temporomandibular disorder (TMD) patients using two splint designs. *Material and methods.* In a double-blind randomized parallel trial, 40 consenting patients were selected from the dental faculty pool of TMD patients. Two splint designs were produced: an ordinary stabilization (Michigan type) and a NTI (Nociceptiv trigeminal inhibition). The differences in splint design were not described to the patients. All patients were treated by one operator. A separate, blinded, examiner assessed joint and muscle tenderness by palpation and jaw opening prior to splint therapy, and after 2 and 6 weeks' and 3 months' splint use during night-time. The patients reported headache and TMD-related pain on a visual analog scale before and after splint use, and were asked to describe the comfort of the splint and invited to comment. *Results.* Thirty-eight patients with mainly myogenic problems were observed over 3 months. A reduction of muscle tenderness upon palpation and self-reported TMD-related pain and headache and an improved jaw opening was seen in both splint groups ($p < 0.05$; paired t -test and Wilcoxon signed-ranks tests). There were no changes for TM joint tenderness upon palpation. No differences were noted between the two splint designs after 3 months for the chosen criteria of treatment efficacy ($p > 0.05$; Mann-Whitney U-test). *Conclusion.* No differences in treatment efficacy were noted between the Michigan and the NTI splint types when compared over 3 months.

6. Klobas L, Axelsson S, Tegelberg A. Effect of therapeutic jaw exercise on temporomandibular disorders in individuals with chronic whiplash-associated disorders. *Acta Odontol Scand* 2006;64:341-7.

Abstract

Objective. The aim of this study was to investigate the effect of a specific therapeutic jaw exercise on the temporomandibular disorders of patients with chronic whiplash-associated disorders. *Material and methods.* Ninety-four consecutive patients with whiplash-related conditions were referred to and accepted for a treatment period at a center for functional evaluation and rehabilitation during 2001-2002. The patients followed a program of physical therapy, occupational therapy, and pain management. At the start of their stay, they were examined by a physician specialized in rehabilitation medicine and also by a dentist who performed a functional examination of the stomatognathic system. Of the 93 patients who accepted participation in the study, 55 were diagnosed with temporomandibular disorders and chronic

whiplash-associated disorders in accordance with the inclusion criteria. They were randomized into a jaw exercise group ($n=25$), who performed specific therapeutic jaw exercises, and a control group ($n=30$). Both groups undertook the whiplash rehabilitation program at the center. *Results.* There were no inter- or intra-group differences in symptoms and signs of temporomandibular disorders at baseline, nor at the 3-week and 6-month follow-ups, except for an increase of maximum active mouth-opening capacity in the control group. *Conclusions.* In conclusion, the therapeutic jaw exercises, in addition to the regular whiplash rehabilitation program, did not reduce symptoms and signs of temporomandibular disorders in patients with chronic whiplash-associated disorders.

7. Niemi PM, Le Bell Y, Kylmä M, Jämsä T, Alanen P. Psychological factors and responses to artificial interferences in subjects with and without a history of temporomandibular disorders. *Acta Odontol Scand* 2006;64:300-5.

Abstract

Objective . It has often been suggested that psychological factors play a role in temporomandibular disorders (TMD). However, reports on psychological factors in TMD patients and controls have been equivocal. In a previous double-blind randomized controlled study, subjects with a TMD history showed more clinical signs and subjective symptoms and adapted less well to the artificial interferences than subjects without an earlier TMD history. In the present study, we analyzed the associations of psychological factors with symptom responses and adaptation to interferences. **Material and Methods.** Before the intervention, the subjects filled in questionnaires dealing with personality traits, level of psychological and somatic stress symptoms, coping strategies, and health beliefs. Every day during the 2-week follow-up period, the subjects rated the intensity of their symptoms on 9 modified visual analog scales (VAS). **Results .** Health hardiness, positive socialization history and inhibition of aggression were associated with weaker symptom responses and better adaptation to true artificial interferences. Some personality characteristics in subjects with an earlier TMD history tended to associate with higher symptom reporting despite the type of intervention. **Conclusions .** Psychological factors appeared significant for the symptom responses to artificial interferences, and they seem to play a different role in responses in subjects with an earlier TMD history compared to those without.

8. Storm C, Wänman A. Temporomandibular disorders, headaches, and cervical pain among females in a Sami population. *Acta Odontol Scand* 2006;64:319-25.

Abstract

Objective . The aim of this study was to examine the prevalence and co-morbidity of long-standing, intense, and frequent symptoms of pain and dysfunction in the jaw-face, head, and cervical region among adult females drawn from the Sami population in northern Sweden. **Methods .** A total of 487 females, taken from the register of the Swedish Sami Parliament or registered as reindeer owners or reindeer herders in the Swedish Board of Agriculture and living in the Arctic region of northern Sweden, participated in a questionnaire study. **Results .** The prevalence of pain and/or dysfunction in the jaw-face region was 32%, of headaches 61%, and of pain in the cervical region 56%. When the criterion of frequent symptoms (once a week or more often) was used, prevalence dropped to 17%, 19%, and 30%, respectively, and when that of intense symptoms, defined as 5 or more on an 11-point numerical rating scale, was added, prevalence dropped further to 8%, 11%, and 20%, respectively. The majority reported long-standing symptoms (67-98% depending on symptom). A high statistically significant relationship was found between frequent symptoms of pain and/or dysfunction in the jaw-face, frequent headaches, and frequent cervical pain.

9. Tullberg M, Ernberg M. Long-term effect on tinnitus by treatment of temporomandibular disorders: A two-year follow-up by questionnaire. Acta Odontol Scand 2006;64:89-96.

Abstract

Objective. The aim of the study was to investigate the presence of symptoms and signs of temporomandibular disorders (TMD) in patients with tinnitus and to evaluate the effect of TMD treatment on tinnitus in a long-term perspective in comparison with a control group of patients on a waiting list.

Material and Methods. One-hundred-and-twenty patients with tinnitus were subjected to a clinical examination of the masticatory system and whether they had co-existing TMD to TMD treatment. Ninety-six patients had TMD, most frequently localized myalgia. Seventy-three of these completed the treatment and responded to a questionnaire 2 years later. Fifty patients with tinnitus who were on the waiting list served as a control group. *Results.* Eighty percent of the patients had signs of TMD, most commonly myofascial pain. Forty-three percent of the patients reported that their tinnitus was improved at the 2-year follow-up, 39% that it was unchanged, and 17% that it was impaired compared to before the treatment. Twelve percent of the subjects in the control group reported that their tinnitus was improved compared to 2 years previously, 32% that it was unchanged, and 56% that it was impaired. The difference between groups was significant (χ^2 : $p < 0.001$). *Conclusion.* The results of this study showed that TMD symptoms and signs are frequent in patients with tinnitus and that TMD treatment has a good effect on tinnitus in a long-term perspective, especially in patients with fluctuating tinnitus.

Developed by Mike Racich

02/20/2011

Hand Search

Master List of '57' Articles

1. Al-Ani MZ, Davies SJ, Gray RJM, Sloan P, Glenny AM. Stabilisation splint therapy for temporomandibular pain dysfunction syndrome. Cochrane Database of Systematic Reviews. 3, 2006.
2. Al-Ani MZ, Gray RJM, Davies SJ, Sloan P, Worthington H. Anterior repositioning splint for temporomandibular joint disc displacement. Cochrane Database of Systematic Reviews. 3, 2006.
3. Al-Ani MZ, Gray RJM, Robin J, Davies SJ, Stephen J. Sloan P, Glenny AM. Stabilization splint therapy for the treatment of temporomandibular myofascial pain: a systematic review. J Dent Educ 2005;69:1242-50.
4. Al Quran FAM, Kamal MS. Anterior midline point stop device (AMPS) in the treatment of Myogenous TMDs: Comparison with the stabilization splint and control group. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101:741-7.
5. Bledsoe WS Jr. Orthotic therapy for the partially or fully edentulous patient. Cranio Clinics International 1991;1:175-83.
6. Boero RP. The physiology of splint therapy: a literature review. Angle Orthod 1989;59:165-80.
7. Carroll D, Moore RA, McQuay HJ, Fairman F, Tramer M, Leijon G. Transcutaneous electrical nerve stimulation (TENS) for chronic pain. Cochrane Database of Systematic Reviews. 3, 2006.
8. Centre for Reviews and Dissemination. Acupuncture as a treatment for temporomandibular joint dysfunction: a systematic review of randomized trials (Structured abstract). Database of Abstracts of Reviews of Effects. Issue 3, 2006.
9. Centre for Reviews and Dissemination. A meta-analysis of EMG biofeedback treatment of temporomandibular disorders (Structured abstract). Database of Abstracts of Reviews of Effects. Issue 3, 2006.
10. Centre for Reviews and Dissemination. Cognitive-behavioral therapy for somatization and symptom syndromes: a critical review of controlled clinical trials (Structured abstract). Database of Abstracts of Reviews of Effects. Issue 3, 2006.
11. Centre for Reviews and Dissemination. Occlusal treatments in temporomandibular disorders: a qualitative systematic review of randomized controlled trials (Structured abstract). Database of Abstracts of Reviews of Effects. Issue 3, 2006.
12. Centre for Reviews and Dissemination. The use of acupuncture in dentistry: a systematic review (Structured abstract). Database of Abstracts of Reviews of Effects. Issue 3, 2006.

13. Centre for Reviews and Dissemination. Therapeutic outcome assessment in permanent temporomandibular joint disc displacement (Structured abstract). Database of Abstracts of Reviews of Effects. Issue 3, 2006.
14. Chunlan G, Zongdao S, Revington P. Arthrocentesis and lavage for treating temporomandibular disorders. Cochrane Database of Systematic Reviews. 3, 2006.
15. Clark GT. A critical evaluation of orthopedic interocclusal appliance therapy: effectiveness for specific symptoms. JADA 1984;108:364-8.
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21. Ekberg EC, Nilner M. Treatment outcome of short- and long-term appliance therapy in patients with TMD of myogenous origin and tension-type headache. J Oral Rehab 2006;33:713-21.
22. Emshoff R. Clinical factors affecting the outcome of occlusal splint therapy of temporomandibular joint disorders. J Oral Rehab 2006;33:393-401.
23. Forssell H, Kalso E, Koskela P, Vehmanen R, Puukka P, Alanen P. Occlusal treatments in temporomandibular disorders: A qualitative systematic review of randomized controlled trials. Pain 1999;83:549-60.
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37. McNamara JA Jr, Turp JC. Orthodontic treatment and temporomandibular disorders: is there a relationship? Part 1: clinical studies. *J Orofac Orthopedic* 1997;58:74-89.
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44. Orenstein ES. Anterior repositioning appliances when used for anterior disk displacement with reduction--a critical review. *Cranio* 1993;11:141-5.
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50. Simmons HC 3rd. Guidelines for anterior repositioning appliance therapy for the management of craniofacial pain and TMD. *Cranio* 2005;23:300-5.
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54. Wahlund K. Temporomandibular disorders in adolescents. Epidemiological and methodological studies in a randomized control trial. *Swed Dent J* 2003; suppl 164:2-64.
55. Wassell RW, Adams N, Kelly PJ. Treatment of temporomandibular disorders by stabilizing splints in general dental practice: results after initial treatment. *British Dent J Br* 2004;197:35-41.
56. Wig AD, Aaron LA, Turner JA, Huggins KH, Truelove E. Short-term clinical outcomes and patient compliance with temporomandibular disorder treatment recommendations. *J Orofac Pain* 2004;18:203-13.
57. Yatani H, Minakuchi H, Matsuka Y, Fujisawa T, Yamashita A. The long-term effect of occlusal therapy on self-administered treatment outcomes of TMD. *J Orofac Pain* 1998;12:75-88.

Selected Systematic Reviews

1. Al-Ani MZ, Gray RJM, Robin J, Davies SJ, Stephen J. Sloan P, Glenny AM. Stabilization splint therapy for the treatment of temporomandibular myofascial pain: a systematic review. *J Dent Educ* 2005;69:1242-50.
2. Al-Ani MZ, Davies SJ, Gray RJM, Sloan P, Glenny AM. Stabilisation splint therapy for temporomandibular pain dysfunction syndrome. *Cochrane Database of Systematic Reviews*. 3, 2006.
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6. Ernst E, White A. Accupuncture as a treatment for temporomandibular joint dysfunction. A systematic review of randomized trials. *Arch. Otolaryngol Head Neck Surg*.1999;125:269-272

Table 07 Stan Nelson

TABLE 8

Trials Included in Systematic Reviews

Ref	RCT	Al-Ani, 09	Forssell, 04	Turp	Friction	Comparison Treatment(s)	Reviewer Res Agreement
19	Brooke & Steno '83		X			Ultrasound or relaxation	n/a
20	Cane '97			X		No tx; in pts with cervical problems only	
21	Dahlstrom '82	X	X		X	Biofeedback	Y
22	Dahlstrom '85	X				"Bite plate" / Ant deprogrammer	N/A
23	Dao '94	X	X	X	X	Non-occluding and No tx	Y
24	Ekberg '03		X	X	X	Non-occluding	Y
25	Ekberg '98		X		X	Non-occluding	Y
26	Johansson '91	X	X	X	X	Accupuncture and No tx TENS; all pts have DD w/o reduction	Y
27	Linde '95		X		X		Y
28	List '92		X		X	Accupuncture and No tx	Y
29	Lundh '85		X			Anterior repositioning and no tx	N/A
30	Lundh '88		X		X	Occlusal onlays and no tx	Y
31	Lundh '92		X		X	No tx, in pts w/ DD w/o reduction	Y
32	Magnusson '99 Monteiro/Clark	X			X	Jaw exercises	Y
33	'88	X	X			Biofeedback	Y
34	Okeson '83	X			X	Relaxation or hypnosis	Y
35	Raphael '01	X	X		X	Non-occluding	Y
36	Raustia '86	X			X	Accupuncture	Y
37	Rubinoff '87	X	X	X	X	Non-occluding; both groups got add'l tx	
38	Sakuma '03			X		Non-occluding	N/A
39	Siegert & Gundlach '98			X		(Mandibular SS) Anterior orthotic	N/A
40	Truelove, '99, '06			X	X	Soft splint or conservative tx	Y
41	Turk '93	X	X			Biofeedback or no tx pts w/ depression	
42	van der Glas '99			X		Physical therapy	N/A
43	Winocur '02	X				Hypnosis, relaxation, or no tx	N/A
44	Wright '95		X		X	(No SS, soft splint only), Self-care or no tx	
45	Wassell, '04				X	(Mandibular SS) Non-occluding	N/A
46	Conti, '06				X	Non-occluding	N/A
47	Wennenberg, '88				X	Equilibration	N/A
48	Schokker, '90				X	"Std" headache medication	N/A
49	Alvarex-Arenal, '02				X	TENS	N/A
50	Wahlund, '03				X	Relaxation therapy	N/A
51	Shankland, '01				X	(Mandibular SS) NTI (anterior jig) Anterior repos appl (in closed lock pts)	N/A
52	Fayed, '04				X		N/A
53	Jokstad, '05				X	NTI (anterior jig)	N/A
54	Magnusson, '04				X	NTI (anterior jig)	N/A
	Total Trials in Each	12	16	9	27		

Qualitative Assessment of the Included Systematic Reviews				
Systematic Reviews	Al-Ani, et al. 2009	Forsell, et al 2004	Turp, et al 2003	Fricton, et al 2010
Assessment Tool	Qualitative assessment was coded according to the criteria established by the Cochrane Reviewers' Handbook.	Quality Scale of Antczak et al. 1986a	The Jadad Scale	CONSORT Statement
Number of Studies	12	16 (20 studies: 16 SS + 4 OA)	9* (with 2 combined, actually 10)	10 studies were available
Randomising and Allocation Concealment	"None of the included studies reported on the method used to generate the randomisation sequence or the allocation concealment." 0/12	"Surprisingly, the procedure of randomization was described in only 2 studies." 2/16 (x ₁ ,x ₂)	"The method of randomization was described only in two publications . (x ₂ ,x ₃)"	A composite score without a narrative description.
Outcome Assessment	"Blind outcome assessment was clearly stated in only two trials" 2/12 (x ₄ ,x ₅)	"Unfortunately, the fulfillment of the blinding process was not mentioned in any of the studies."	"Five studies [x ₂ ,x ₅ ,x ₆ ,x ₇ ,x ₈] used a blinded design: the examiner who evaluated the treatment was blind to the type of treatment the patient received."	A composite score without a narrative description.
Sample Size	n= 0-≤19 in 0 studies n=20-≤29 in 4 studies n=30-≤39 in 2 studies n=40-≤89 in 6 studies	n= <15 in 7 studies The balance of the study sizes were not stated.	n= 0≤19 in 0 studies n=20≤29 in 1 study n=30≤39 in 2 studies n=40≤289 in 6 studies	n= 0≤19 in 0 studies n=20≤29 in 1 study n=30≤39 in 0 studies n=40≤110 in 9 studies
Dropout Reportage	0 dropouts reported in 5 studies=0% 1 dropout reported in 1 study =5.0% 2 dropouts reported in 3 study =2.5% 3 dropouts reported in 1 study =11.54% 4 dropouts reported in 1 study =5.9% dropouts not stated in 1 study	"Two RCTs did not report on dropouts or number of dropouts in the RCTs was usually 10%".	0 dropouts reported in 6 studies= 0% 2 dropouts reported in 1 study =7.7% 2 dropouts reported in 1 study =3.12% 4 dropouts reported in 1 study =13.3%	A composite score without a narrative
n= sample size (number of patients selected)	x ₁ - Ekberg, 1998 x ₃ -Seigert 1989	x ₂ - Ekberg, 2003	x ₄ -Dao,1994 x ₅ -Winocur,2002 x ₆ -Johansson,1991	x ₇ - Rubinoss 1987 x ₈ - van der Glas 2000

The AES – Leaders in Occlusion & TMD Critical Appraisal Summary Tool

How to use this appraisal tool

Two broad issues need to be considered when appraising the report of a systematic review:

- **Is the study valid?**
- **What are the results?**

The 6 questions on the following pages are designed to help you think about these issues systematically.

The first two questions are screening questions and can be answered quickly. If the answer to both is “yes”, it is worth proceeding with the remaining questions.

You are asked to record a “yes”, “no” or “can’t tell” to most of the questions.

A number of italicized prompts are given after each question. These are designed to remind you why the question is important.

Record your reasons for your answers in the spaces provided.

CREDITS

This appraisal tool represents input from several different Evidence Based Dentistry literature sources. As such, it is not an original document. Therefore, this tool is to be used only on a non-commercial basis and its use shall be limited to educational purposes.

Citation:

Evaluator:

Date:

Screening Questions

1. Did the review ask a clearly-focused question? Yes ☐ Can't tell ☐ No ☐

Consider if the question is 'focused' in terms of:

– the population studied:

– the intervention given or exposure:

– the outcomes considered:

2. Did the review include the right type of study? Yes ☐ Can't tell ☐ No ☐

Consider if the included studies:

– address the review's question:

– have an appropriate study design:

3. Is this a systematic review of randomized trials? yes ☐ Can't tell ☐ No ☐

4. Is this a systematic review of cohort trials? yes ☐ Can't tell ☐ No ☐

5. Is this a systematic review of other trials? yes ☐ Can't tell ☐ No ☐

6. Is it worth continuing? Yes ☐ No ☐

The AES – Leaders in Occlusion & TMD Critical Appraisal Tool

How to use this appraisal tool

Two broad issues need to be considered when appraising the report of a systematic review:

- **Is the study valid?**
- **What are the results?**

The 13 questions on the following pages are designed to help you think about these issues systematically.

The first two questions are screening questions and can be answered quickly. If the answer to both is “yes”, it is worth proceeding with the remaining questions.

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Screening Questions

1. Did the review ask a clearly-focused question? yes ☐ Can't tell ☐ No ☐

Consider if the question is 'focused' in terms of:

- the population studied
- the intervention given or exposure
- the outcomes considered

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- have an appropriate study design

3. Is this a systematic review of randomized trials? yes ☐ Can't tell ☐ No ☐

4. Is this a systematic review of cohort trials? yes ☐ Can't tell ☐ No ☐

5. Is this a systematic review of other trials? yes ☐ Can't tell ☐ No ☐

Is it worth continuing? yes ☐ No ☐

Detailed Questions

6. Did the reviewers try to identify all relevant studies?

yes ☐

Can't tell ☐

No ☐

Consider:

- which bibliographic databases were used*
- if there was follow-up from reference lists*
- if there was personal contact with experts*
- if the reviewers searched for unpublished studies*
- if the reviewers searched for non-English language Studies*

7. Does it include a methods section that describes:

-finding and including all relevant trials?

yes ☐

Can't tell ☐

No ☐

-assessing their individual validity?

yes ☐

Can't tell ☐

No ☐

8. Did the reviewers assess the quality of the included studies?

yes ☐

Can't tell ☐

No ☐

consider:

- if a clear, pre-determined strategy was used to determine which studies were included. Look for:*
 - a scoring system*
 - more than one assessor*

9. If the results of the studies have been

combined, was it reasonable to do so?

yes ☐

Can't tell ☐

No ☐

Consider whether:

- the results of each study are clearly displayed*
- the results were similar from study to study (look for tests of heterogeneity)*
- the reasons for any variations in results are discussed*

10. Were the results consistent from study to study?

yes ☐

Can't tell ☐

No ☐

11. How are the results presented and what is the main result?

yes ☐

Can't tell ☐

No ☐

Consider:

- how the results are expressed (e.g. odds ratio, relative risk, etc.)*
- how large this size of result is and how meaningful it is*
- how you would sum up the bottom-line result of the review in one sentence*

12. Were the individual patient data used in the analysis (or aggregate data)?

yes ☐

Can't tell ☐

No ☐

13. How precise are these results?

yes ☐

Can't tell ☐

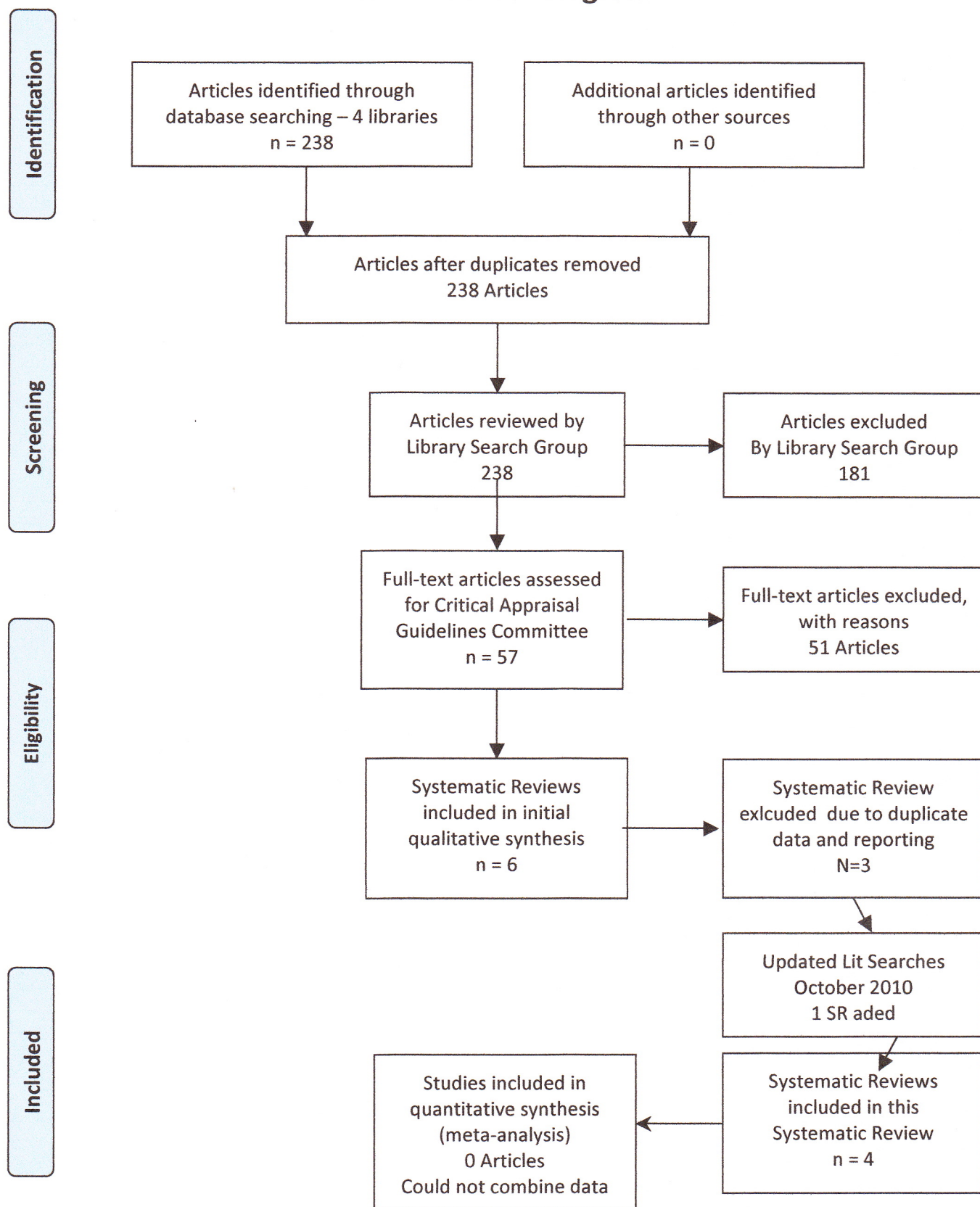
No ☐

Consider:

- if a confidence interval were reported. Would your decision about whether or not to use this intervention be the same at the upper confidence limit as at the lower confidence limit?*
 - if a p-value is reported where confidence intervals are unavailable*
-

PICO? : In patients that demonstrate a temporomandibular disorder, will a stabilization orthopedic appliance provide an improvement in the clinical signs and symptoms when compared with other or no treatment?

AES CGC Flow Diagram



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