

Service Evaluation of a New Physiotherapy Management Service for Patients with Chronic Temporomandibular Dysfunction

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Abstract

Aims: This service evaluation explored and reported findings from a new multi-disciplinary service where physiotherapists were incorporated into an orofacial team who managed patients with chronic Temporomandibular Dysfunction (TMD). **Methods:** We collected data before the physiotherapists' involvement and on discharge from physiotherapy management. Outcomes were patient-reported pain (numerical rating scale (NRS 0 to 10)), patient specific functional score (PSFS), health-related quality of life (EQ-5D) and range of mandibular depression (mm). Exploratory analyses compared baseline to follow-up scores on discharge from physiotherapy. **Results:** 79 patients (mean age 40 (SD 18); female 87%) received physiotherapy. At discharge, there was a mean reduction in pain: 2.8 (95% CI 2.0 to 3.6), improvement in function: -4.0 (95% CI -4.7 to -3.3), improvement in health: -0.139 (95% CI -0.196 to -0.082) and increase in mandible depression: -6.6. (95% CI -9.1 to -4.1). **Conclusions:** The results provide early, exploratory evidence that patients with chronic temporomandibular dysfunction treated by physiotherapists achieve clinically important changes in pain, function and health in the short term.

Keywords

Temporomandibular, Pain, Orofacial, Physiotherapy

1. Introduction

The most common causes of chronic orofacial pain originate from temporomandibular dysfunction (TMD) [1]. TMD is where a combination of the mus-

cles surrounding the temporomandibular unit, the disc in the joint and/or the joint itself can cause pain and disability [1]. It is common for young adults to develop the condition with symptoms frequently persisting into middle age if not longer. The prevalence of TMD has been reported to affect 10% - 25% of the population, with 5% seeking medical intervention [2] [3]. Females are more commonly affected [4].

Typical presentations to TMD are localised pain on opening the mouth and diffuse discomfort during normal function of the facial muscles (e.g. chewing, talking and yawning). The pain descriptors used by patients are usually non-specific, commonly described in terms of “tightness”, “strong ache” and “toothache” which can sometime be accompanied by “earache” and “headaches” on active movements of the jaw [1] [5]. Frequent pain restricts jaw movement and limits function. In addition (usually if the disc is involved), patients have associated painful clicking and locking of the jaw. It is well documented that people who have pain and compromised function will be affected psychologically and socially, thus having a negative impact on a person’s physical, mental, social and economic wellbeing [6] [7]. In these instances, a holistic bio-psychosocial approach is the management of choice [6] [7].

It has been advocated that the majority of patients with TMD should respond to conservative management based around bio-psychosocial models of care [5] [6] [8]. It has been reported that the first line of treatment should involve simple analgesia, splint therapy (with an appropriately constructed bite raising appliance) and tailored advice on activity modification (e.g.; soft diet, avoiding nail biting and yawning) [1]. Unfortunately, many patients provided with this advice in primary care find their symptoms become chronic, resulting in a referral to specialist teams for support. In some instances, secondary or tertiary centres focus on screening patients for surgical interventions before optimising conservative management. As few patients require surgical intervention, the majority are discharged back in to the community without appropriate bio-psychosocial input. In many instances, as the symptoms continue, the patient will repetitively seek help from GPs, dentists, orthodontic and maxillofacial specialists leading them to become “revolving door” patients within both primary and secondary care services. This is likely to cause dissatisfaction for the patients, aggravate negative catastrophising behaviour [9] and become a considerable drain to health service resources.

If first line management has not helped to reduce symptom severity, other conservative interventions should be considered. There is moderate evidence to support the use of bio-psychosocial input from physiotherapists [5] [8] [10]; however, the majority of physiotherapy departments do not train physiotherapists to manage patients with TMD, as this is seen as a specialist skill. At an acute hospital in the West Midlands, a multidisciplinary clinic was developed which included a specialist physiotherapist as part of the maxillofacial team.

The aim for the study was to identify whether the patients suffering with TMD

who received physiotherapy intervention achieved clinically meaningful change on key outcomes that would indicate an improvement on pain and function.

2. Methods

The study was a prospective service evaluation. Methods for design and reporting were based on SQUIRE 2.0 guidelines [11]. The study did not require ethical approval but was registered with the trust clinical audit programme (registration number: 3295).

Either a maxillofacial medical specialist or specialist physiotherapist with an interest in TMD assessed patients with orofacial pain referred from dental practitioners at a maxillofacial specialist clinic. The physiotherapist provided the patient with immediate advice and a referral to a dedicated specialist TMD physiotherapy team where further physiotherapy was provided if needed. In the clinic, baseline measures were taken in line with standard practice. Baseline measures included patient reported outcome measures for pain, function and health. In addition, a physical measure was taken of mandibular depression (amount of mouth opening). Patients were re-assessed on their outcomes at point of discharge from physiotherapy. Statistical tests (paired sample t-test) were used to evaluate effectiveness of the service.

Outcome Measures

Pain: The Numerical Rating Scale (NRS) was used to identify pain. The patient was asked to rate the worst pain they had had in their face over the preceding week on a 0 to 10 scale, where 0 represented “no pain” and 10 represented “the worst pain imaginable”. Changes in a score of 2 or more points are considered clinically meaningful [12] [13] [14].

Function: The patient specific functional score (PSFS) was used to identify function. The patient is asked for up to three key functional tasks that they are limited with because of their facial pain. Each function is scored out of 10 with 0 representing very poor function, and 10 representing very good function. The mean of the three task scores is the total score. Changes in a score of 1.3, 2.3 and 2.7 indicate a small, medium and large clinically meaningful change respectively for musculoskeletal pain [15].

Health: The Euroqol is a generic outcome measure, validated to identify changes in health-related quality of life. The scale comprises of five questions relating to physical and psychological domains, as well as asking the patient to score their health on a 0 - 100 health state thermometer. An online electronic formula calculates scores [16]. Scores range from -0.11 (poor health) to 1 (full health) [17]. A clinically meaningful change in EQ5D score has been identified as 0.10 for patients with chronic musculoskeletal pain conditions [18].

Mandibular depression: Unlike the other outcome measures, mandibular depression is a physical evaluation rather than a patient reported outcome. It is the measure of maximal mouth opening. Minimal functional range for mouth opening can be considered as less than 40 mm [19]. It has been reported that

adults without any TMJ dysfunction are able to achieve a mouth opening in excess of 50mm [20]. Changes in a measure of more than 5mm can be considered clinically meaningful [13] [21].

On discharge from physiotherapy, patients were re-assessed on their outcomes. Statistical tests (paired sample t-test) were used to evaluate effectiveness of the service.

3. Results

A total of 79 patients were involved in the service evaluation. Patients were not included if they were unable to, or did not wish to complete the outcome measures. The service evaluation was over a duration of 20 months, commencing February 2016 and completing October 2017.

Baseline Data of Patients

Baseline data (Table 1) shows that the mean age of patients was 40 years. All patients had symptoms for more than two months, with the majority having symptoms for more than two years. Mean score for pain was 6, indicating moderate pain severities. For function, a mean score of 4 indicated that this patient population had moderate disability. Means and median values were the same for baseline variables on the NRS and PSFS indicating that data was normally distributed.

Clinical Outcomes

All outcome measures demonstrated clinically meaningful and statistically significant improvement from baseline to discharge (Table 2; Figures 1-4). Change scores in function exceeded what is considered a large clinically meaningful

Table 1. Baseline data for patients.

	Baseline variables (n = 79)			
	Mean (SD)	Min ⁿ , Max ^m	Median (Q1, Q3)	Missing (%)
Age(years)	40 (18)	14, 87	41 (26, 53)	0 (0)
Chronicity (months)	52 (107)	2, 79	24 (12, 48)	12 (15)
NRS(pain)	6 (2)	0, 10	6 (4, 7)	0 (0)
PSFS	4 (2)	0, 8	4 (2, 5)	7 (9)
EQ-5D	0.641 (0.157)	0.038, 0.837	0.697 (0.527, 0.740)	3 (4)
Mandible depression (mm)	36 (10)	5, 64	36 (2, 5)	2 (3)
	N (%)			
Gender				
Females	69 (87%)			0 (0)

Key: EQ-5D = EuroQol 5 dimensional health questionnaire; Max^m = maximum data point; Min^m = minimum data point; mm= millimetres; n = number of participants; NRS = numeric rating scale; PSFS = Patient Specific Functional Score; Q1 = lower quartile; Q3 = upper quartile; SD = standard deviation.

Table 2. Clinical outcomes (n = 53).

Change in Outcomes	Mean difference between baseline and discharge	95% CI		P value	Missing (%)
		Lower bound	Upper bound		
NRS (pain)	2.8	2.0	3.6	<0.000	27(34)
PSFS (function)	-4.0	-4.7	-3.3	<0.000	29 (37)
EQ-5D (health)	-0.139	-0.196	-0.082	<0.000	28 (35)
Mandible depression (mm)	-6.6	-9.1	-4.1	<0.000	27 (34)

Key: CI = confidence interval; EQ-5D = EuroQol 5 dimensional health questionnaire; mm = millimetres; NRS = numeric rating scale; PSFS = Patient Specific Functional Score.

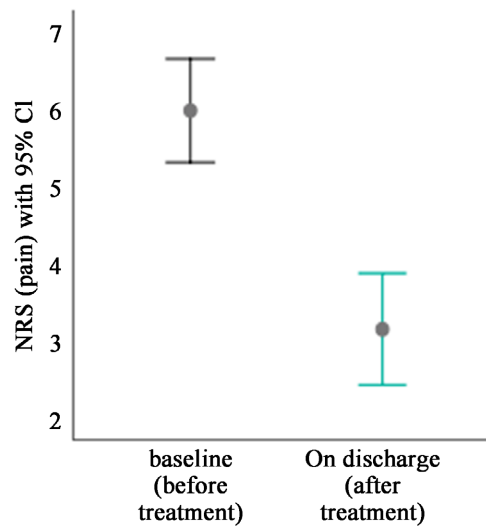


Figure 1. Error bar for NRS (pain).

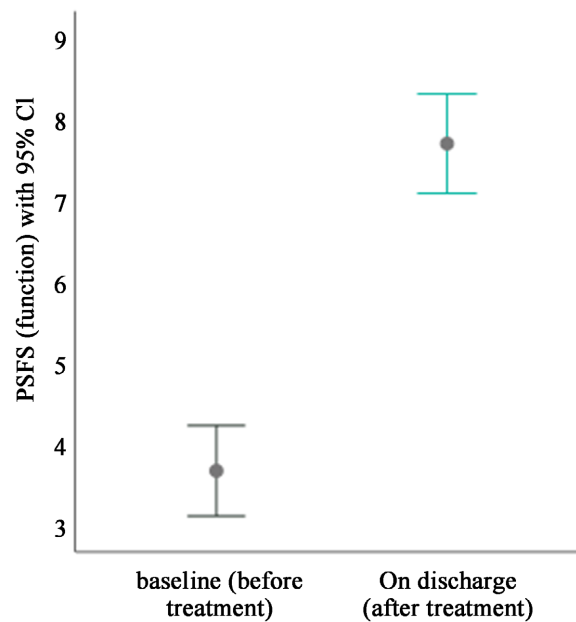


Figure 2. Error bar for PSFS (function).

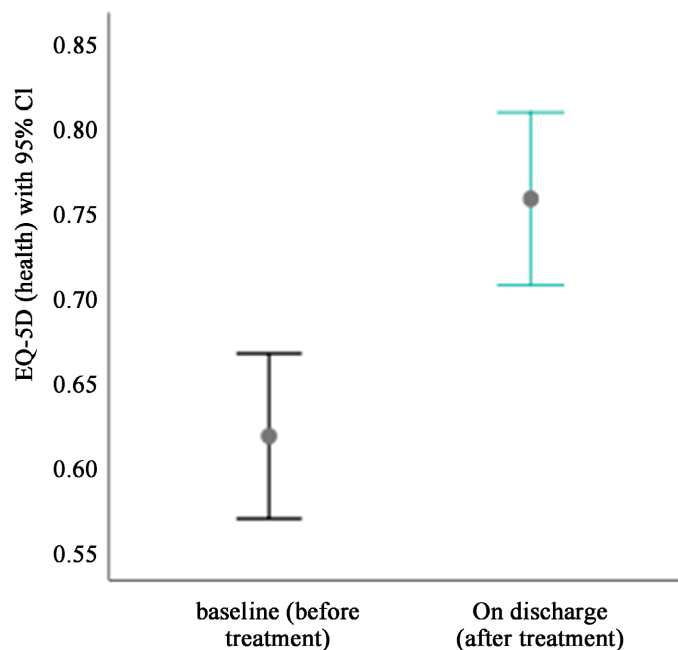


Figure 3. Error bar for EQ-5D (health).

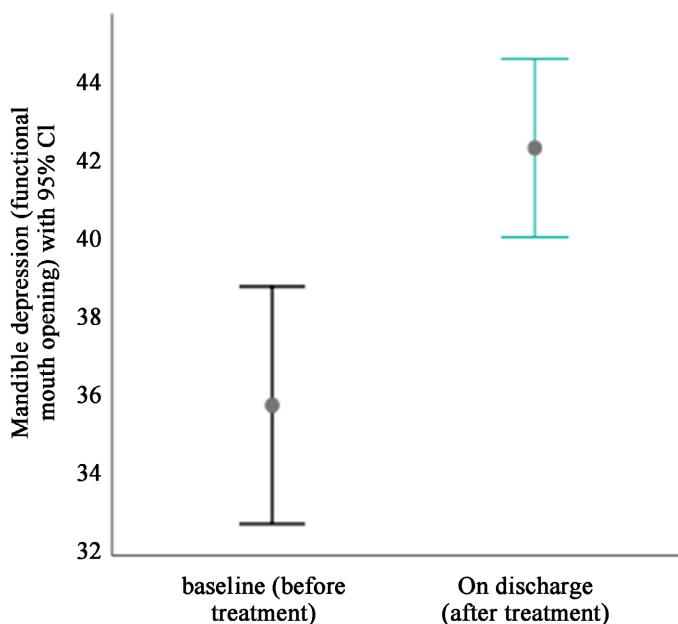


Figure 4. Error bar for mandibular depression (function).

change (>2.7 points of change).

Total Data from 53 patients (found all patients received advice and exercise; the majority attended a dedicated facial pain education group (49/53; 92%). The facial pain education group focused on psychosocial issues and provided peer support. Details of the content can be found in the attached resource. Thirty patients received manual therapy (38%) and 15 patients received acupuncture (28%). There was insufficient data to correlate intervention with outcomes. No patients went on to have surgery and no harms were reported.

The mean number of physiotherapy treatments was 5 (SD = 3). Patients receiving acupuncture received over double the amount of treatment (mean number of sessions = 9) compared to the other intervention groups (mean of sessions = 4). The average 30 minute unit cost for a physiotherapist is approximately £12. Based on this figure, the average cost for delivering this service was £60 per patient.

4. Discussion

Patients with chronic TMD who are managed by physiotherapists using a bio-psychosocial approach have clinically meaningful and statistically significant reductions in pain, improvement in function and improved mouth opening function in the short-term.

The mean change in pain on discharge was a reduction of 2.8 points on a numerical rating scale. The lower bound confidence interval was 2 indicating that 95% of patients who received this intervention reached a clinically meaningful level of change for a reduction in pain. There were similar findings for function and health change scores. It is not known whether the positive outcomes from this study are attributed to the bio (exercises, manual therapy, acupuncture) or psychosocial (education, reassurance, coping strategies) components of management. A study [13] evaluated the effectiveness of conservative approaches for TMD pain. The authors reported that manual therapy in conjunction with the self-management was superior to manual therapy alone or no treatment, indicating that a combination of biological and psychosocial interventions lead to better outcomes.

Patients taking part in the present service evaluation had a mean duration of symptoms of 52 months (4.3 years). The majority had been poorly managed in primary care settings. Primary care clinicians should be encouraged to provide better first line management such as simple analgesia, splint therapy and advice. The improvements following physiotherapy intervention might mean referral to specialist physiotherapy services would be beneficial earlier in the care pathway. Further research should seek to identify which patients are at high risk of a poor outcome, such as those with different pain states at baseline and which patients might potentially benefit from earlier referral to specialist orofacial pain clinics. In addition, it would be useful to understand which interventions, such as manual therapy or acupuncture, provide a greater degree of pain relief for patients with chronic TMD, and whether a dose-response relationship exists. Future research would require appropriately powered clinical trials to evaluate this.

The present service evaluation was not without limitations. The authors recognise that only limited information can be gained from a service evaluation due to the potential confounders of bias and in evaluating short-term outcomes only. The numbers included in the study were small and there was a high percentage of missing data (34% - 37%). There was no data to evaluate patients' level of satisfaction of the service. Whilst the study included the EQ5D, which is a measure

of overall health state; no data was captured regarding co-morbidities such as long-term rheumatic or chronic pain conditions. Without any comparative data to draw on it is not known how much of the improvement is due to the physiotherapy input or due to natural recovery. Data was collected at the point of discharge which varied from individual leading to potential inconsistencies.

The evaluation also had strengths: it provides evidence that patients with TMD managed through the physiotherapy service, following assessment within a multi-disciplinary TMD clinic, improved symptoms and function across all indicators. It is believed that this study is the first of its kind.

The findings from the present service evaluation might have implications for maxillofacial units in other healthcare settings. In this instance, a Specialist Physiotherapist worked in a clinic alongside a consultant maxillofacial specialist and surgical registrar. This collaborative working enabled a cross-pollination of skills between the therapist and the surgeons to the benefit of all the patients seen in the unit. Both the therapist and the registrar had direct and immediate access to the consultant if they had any concerns about their patients to ensure the safety of patients presenting with orofacial pain resulting from more obscure or serious pathology.

5. Conclusion

In the UK, patients often need to wait for long periods to receive their treatment owing to the limited availability of maxillofacial surgeons who specialise in orofacial pain. It is in the authors' opinion that more specialist centres, such as this, would benefit this patient group. Bearing in mind the cost of a single consultation with a maxillofacial surgeon ranges from UK £150.00 - £200.00 (USD \$185 - \$250), compared to a complete management package of physiotherapy costing only UK £60.00 (USD \$74.00) per patient, makes the physiotherapy management a cost-effective provision.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Romera-Reyes, M. and Uyanik, J.M. (2014) Orofacial Pain Management: Current Perspectives. *Journal of Pain Research*, **7**, 99-115.
<https://doi.org/10.2147/JPR.S37593>
- [2] Gremillion, H.A. (2000) The Prevalence and Etiology of Temporomandibular Disorders and Orofacial Pain. *Texas Dental Journal*, **117**, 30-39.
<https://pubmed.ncbi.nlm.nih.gov/11858062>
- [3] Oral, K., Bal Kucuk, B., Ebeoglu, B. and Dincer, S. (2009) Etiology of Temporomandibular Disorder Pain. *ARGI*, **21**, 89-94.
https://www.journalagent.com/agri/pdfs/AGRI_21_3_89_94.pdf
- [4] Okeson, J. (2005) Bell's Orofacial Pains. The Clinical Management of Orofacial

- Pain. 6th Edition, Quintessence Publishing Co., Inc., Carol Stream.
- [5] McNeely, M., Armijo and Magee, D. (2006) A Systematic Review of the Effectiveness of Physical Therapy Interventions of Temporomandibular Disorders. *Physical Therapy*, **86**, 710-725. <https://www.ncbi.nlm.nih.gov/books/NBK72924>
<https://doi.org/10.1093/ptj/86.5.710>
 - [6] List, T. and Axelsson, S. (2010) Management of TMD: Evidence from Systematic Reviews and Meta-Analyses. *Oral Rehabilitation*, **37**, 430-451.
<https://doi.org/10.1111/j.1365-2842.2010.02089.x>
 - [7] Gil-Martinez, A., Paris-Aleman, A., Lopez-de-Uralde-Villanueva, I. and La Touche, R. (2018) Management of Pain in Patients with Temporomandibular Disorder (TMD): Challenges and Solutions. *Journal of Pain Research*, **16**, 571-587.
<https://doi.org/10.2147/JPR.S127950>
 - [8] Medlicott, M. and Harris, S. (2006) A Systematic Review of the Effectiveness of Exercise, Manual Therapy, Electrotherapy, Relaxation Training, and Biofeedback in the Management of Temporomandibular Disorder. *Physical Therapy*, **86**, 955-973.
<https://www.ncbi.nlm.nih.gov/books/NBK72553>
<https://doi.org/10.1093/ptj/86.7.955>
 - [9] Lin, C. (2013) Pain Catastrophizing in Dental Patients: Implications for Treatment Management. *Journal of the American Dental Association*, **144**, 1244-1251.
<https://doi.org/10.14219/jada.archive.2013.0052>
 - [10] Paco, M., Peleteri, B., Duarte, J. and Pinho, T. (2016) The Effectiveness of Physiotherapy in the Management of Temporomandibular Disorders: A Systematic Review and Meta-Analyses. *Journal of Oral and Facial Pain and Headache*, **30**, 210-220.
<https://doi.org/10.11607/ofph.1661>
 - [11] SQUIRE (2020) Revised Standards for Quality Improvement Reporting Excellence. <http://squire-statement.org/index.cfm?fuseaction=Page.ViewPageandPageID=471>
 - [12] van Grootel, R.J. and van der Glas, H.W. (2009) Statistically and Clinically Important Change of Pain Scores in Patients with Myogenous Temporomandibular Disorders. *European Journal of Pain*, **13**, 506-510.
<https://doi.org/10.1016/j.ejpain.2008.06.002>
 - [13] Kalamir, A., Graham, P., Vitiello, A., Bonello, R. and Pollard, H. (2013) Intra-Oral Myofascial Therapy versus Education and Self-Care in the Treatment of Chronic, Myogenous Temporomandibular Disorder: A Randomised Clinical Trial. *Chiropractic and Manual Therapies*, **21**, Article No. 17.
<https://doi.org/10.1186/2045-709X-21-17>
<https://link.springer.com/article/10.1186%2F2045-709X-21-17>
 - [14] Kraaijenga, S., Molen, L., Tinteren, H., Hilgers, F. and Smeele, L. (2014) Treatment of Myogenic Temporomandibular Disorder: A Prospective Randomized Clinical Trial, Comparing a Mechanical Stretching Device (TheraBite) with Standard Physical Therapy Exercise. *Journal of Craniomandibular and Sleep Practice*, **32**, 208-216.
<https://doi.org/10.1179/0886963413Z.00000000016>
 - [15] Haxby Abbott, J. and Schmitt, J. (2014) Minimum Important Differences for the Patient-Specific Functional Scale, 4 Region-Specific Outcome Measures, and the Numeric Pain Rating Scale. *Journal of Orthopaedic and Sports Physical Therapy*, **44**, 560-564. <https://doi.org/10.2519/jospt.2014.5248>
 - [16] EuroQol. (2022) EQ-5D.
<https://euroqol.org/eq-5d-instruments/eq-5d-5l-about/valuation-standard-value-set/>
 - [17] Revicki, D.A., Kawata, A., Harnam, N., Chen, W., Hays, R.D. and Cella, D. (2009)

- Predicting EuroQol (EQ-5D) Scores from the Patient-Reported Outcomes Measurement Information System (PROMIS) Global Items and Domain Item Banks in a United States Sample. *Quality of Life Research*, **18**, 783-791.
<https://doi.org/10.1007/s11136-009-9489-8>
- [18] Yoshizawa, K., Kobayashi, H., Fujie, M., Ogawa, Y., Yajima, T. and Kawai, K. (2016) Estimation of Minimal Clinically Important Change of the Japanese Version of EQ-5D in Patients with Chronic Noncancer Pain: A Retrospective Research Using Real-World Data. *Health and Quality of Life Outcomes*, **14**, Article No. 35.
<https://doi.org/10.1186/s12955-016-0438-2>
<https://hqlo.biomedcentral.com/articles/10.1186/s12955-016-0438-2>
- [19] Li, X.Y., *et al.* (2016) The Normal Range of Maximum Mouth Opening and Its Correlation with Height or Weight in the Young Adult Chinese Population. *Journal of Dental Sciences*, **21**, 56-59. <https://doi.org/10.1016/j.jds.2016.09.002>
- [20] Agrawal, J., Shenai, P., Chatra, L. and Kumar, P. (2015) Evaluation of Normal Range of Mouth Opening Using Three Finger Index: South India Perspective Study. *Indian Journal of Dental Research*, **26**, 361-365.
<http://www.ijdr.in/text.asp?2015/26/4/361/167638>
<https://doi.org/10.4103/0970-9290.167638>
- [21] Kropmans, T.J., Dukstra, P.U., Stegenga, B., Stewart, R. and de Bont, L.G. (1999) Smallest Detectable Difference in Outcome Variables Related to Painful Restriction of the Temporomandibular Joint. *Journal of Dental Research*, **78**, 784-789.
<https://doi.org/10.1177/00220345990780031101>