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A Study on the Effect of Media Education in Patients with Temporomandibular Joint Disorders

Min Chang | Jeong-Seung Kwon | Seong-Taek Kim | Jong-Hoon Choi | Hyung-Joon Ahn

Department of Orofacial Pain and Oral Medicine, Dental Hospital of Yonsei University College of Dentistry, Seoul, Korea

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Correspondence to:
Hyung-Joon Ahn
Department of Orofacial Pain and Oral Medicine, Dental Hospital of Yonsei University College of Dentistry, 50-1 Yonsei-ro, Seodaemun-gu, Seoul 03722, Korea
E-mail: HJAHN@yuhs.ac
https://orcid.org/0000-0001-9669-9781

Purpose: The first-line treatment of temporomandibular joint disorders (TMDs) should include self-management and education. Self-management techniques include moist heat application, stretching, diet control, and mandibular rest position adjustment. Although the effectiveness of video educational resources has been studied in multiple sectors, their application in TMD management has not yet been explored. This study seeks to assess how effective media education was at motivating TMD patients to self-management and improve symptoms.

Methods: Data were obtained from the hospital records of TMD patients who visited the Department of Oral Medicine, Yonsei University Dental Hospital, between May 2020 and December 2021. First, without any differences between groups, a significance analysis was conducted between the degree of self-management and symptom improvement over time. At the second visit, one group received media education (n=31) linked to TMD management, while the other received written-oriented education (n=45). At the third visit, the number of precautions taken by the patients was determined and contrasted to that recorded in the previous visit between the groups. Generalized estimated equation multivariate models were applied for statistical analysis.

Results: In the media education group, the frequency of stretching and the number of patients on pain-free diets increased substantially. Taking precautions improved daily pain intensity, maximum mouth opening, and pain intensity during the maximum unassisted opening.

Conclusions: Media education could be beneficial for TMD patients because it allows them to take self-management precautions. The symptoms of the media education group improved, with no considerable distinction between both groups.

Keywords: Education; Self-care; Temporomandibular joint disorders; Treatment outcome

INTRODUCTION

Temporomandibular joint disorders (TMDs) are a series of symptoms that include temporomandibular joint (TMJ) dysfunction and masticatory muscle discomfort. According to a recent systematic review, TMD affects 11% of children and adolescents and 31% of adults and older people [1]. TMD frequency seems to have risen in recent years [2,3].

Pain, limited range of motion, and TMJ noises are the three major signs and symptoms of TMD [4]. Painful oral behaviors, such as clenching, can be a risk factor for TMD [5-7]. Pain relief and enhanced jaw function are the two goals of TMD therapy. Stress and parafunction reduction via behavior modification may also be important [8]. It is

worth noting that while some symptoms and signs disappear spontaneously without therapy, others persist for years despite treatment [8]. TMD treatment options include both conservative and invasive methods. However, a non-invasive, conservative approach is prioritized as the first line of treatment [9].

Conservative care includes pharmacotherapy, physical and thermal therapies, stretching, avoiding parafunctional activities, and eating soft foods. There are various methods for using superficial heat to treat TMD, with moist heat application being the prevalent method [4]. The benefits of heat application include reduced pain and muscular tension, improved jaw function, and increased mouth opening [10]. In terms of stretching, jaw and neck discomfort have been shown to statistically and clinically improve significantly after Rocabado's TMJ 6×6 exercise program [11]. Furthermore, the patient can be asked to keep the mandible in its postural position rather than in occlusion, which requires "unintentional" muscular contraction [12]. This can help sustain the relaxed state of the jaw muscles. The dentist can assess the mandibular rest position by repeatedly asking the patient to pronounce the letter "N" [13]. Dietary changes, such as switching to a soft food diet, can also lower TMJ stress and contribute to pain relief [9]. Furthermore, clinicians can advise patients to use knives and forks similar to their teeth for cutting food items into tiny pieces [14].

Until now, most patient education has been delivered either verbally or through written instructions. However, it has been discovered that using computer videos with multimedia for patient education is more successful and efficient than using diagrams [15]. Kinnane et al. [16] demonstrated that including videos in routine chemotherapy instructions improved patient understanding of dealing with chemotherapeutic side effects and reporting treatment problems.

Durham et al. [17] emphasized that any clinical setting should be suitable for the delivery of self-management education, which must be accompanied by written instructions and information, implying that the use of electronic media for reinforcement is feasible.

To date, the impact of video education in the field of TMD has not been studied. Furthermore, no study has quantified the degree of symptom improvement in TMD patients based on the level of precautions taken. Therefore, this study seeks to contrast the effects of media education and written instructions on the degree of self-management in TMD. The link between self-management level and symptom improvement was also investigated.

MATERIALS AND METHODS

1. Patients

This study was authorized by the Yonsei University Dental Hospital Institutional Review Board (no. 2022-0042-001), and the need for collecting written informed consent was waived by the committee.

The data used for this study came from hospital records of TMD patients who visited the Department of Oral Medicine, Yonsei University Dental Hospital, between May 2020 and December 2021. Overall, 593 TMD patients were screened. The inclusion requirements were the presence of TMD, minimum age of 18 years, and TMJ or masticatory muscle pain. The exclusion criteria included pregnancy, medical contraindications, other orofacial pain conditions, occlusal splint use in the preceding years, psychiatric or neurologic disorders, recent surgery in the TMJ region, patients with closed locks, and incomplete record data. Consequently, 76 patients were included, with 31 receiving media education and 45 receiving paper-based education.

2. Outcome Measures

Three outcome variables were used to assess the patient's symptoms from the first (T1) to third visit (T3): (i) current daily pain intensity (D_NRS), (ii) range of maximum unassisted opening (MMO), and (iii) pain intensity during maximum unassisted opening (O_NRS). D_NRS was calculated by asking patients to rate their TMD-related pain on a numeric rating scale (NRS) ranging from 0="no pain at all" to 10="the worst pain imaginable" daily. MMO was calculated as the millimeter distance between the maxillary and mandibular incisal edges. O_NRS was also evaluated using the NRS when the participants opened their mouths as wide as possible.

Four outcome variables were used to assess the degree of increase in precautionary practice between the second visit (T2) and T3: (i) frequency of moist heat application, (ii) stretching, the number of patients, (iii) eating pain-free

food, and (iv) keeping their teeth apart.

Moist heat was applied to the face and neck areas using a warm heat pad for 10 to 15 minutes at least twice a day.

For the stretching exercise, participants were instructed to slowly open their mouths until which no pain was felt and to hold that position for 6 s. This exercise was done 6 times in each session, with 6 sessions per day.

Participants were instructed to eat pain-free foods and avoid foods that could cause pain, such as hard, sticky, or large-sized foods. Consuming soft or small pieces of food was proposed.

The participants were also instructed to keep their teeth apart by pronouncing the alphabet "N" upon experiencing tooth contact.

3. Methods

A total of 76 patients who met the inclusion criteria visited the hospital at least three times. The paper-based education group included 45 patients, while the media education group included 31. At T2 and T3, the degree of symptom improvement based on an increase in self-management practice compared to the previous visit was analyzed for all patients, with no difference between the two groups. At T3, the extent of improvement in self-management and symptoms compared to the previous visit was analyzed between the two groups. At T1 and T2, the patients were practically educated as follows:

1) First visit

At T1, all patients were verbally informed of the pathological issues affecting jaw function based on the clinical and radiographic findings. They were also given basic written self-care instructions, such as keeping good posture, eating a pain-free diet, keeping their teeth apart, using moist heat pads, and stretching, with no differences between the two groups.

2) Second visit

(1) Paper-based education group: At T2, the paper-based education group received reinforcement, particularly for self-care instructions that they had not followed, via paper-based education materials and verbal explanations. The paper-based material was 4 pages long and 738 words long, and it included images of correct posture and exercise methods. It was confirmed that the general public needed about 10 minutes to read the material.

(2) Media education group: At T2, the media education group was told to watch media education materials about basic self-care management in the hospital. They were also incentivized to watch media-based educational content whenever they forgot the guidelines.

The media-based educational material included video content from the YouTube website (12 minutes and 14 seconds long). The video included information and demonstrations about the physiologic mandibular rest position, parafunctional oral behaviors, dietary advice, a detailed method of applying moist heat, jaw exercise, massage, and stress reduction (Fig. 1).

4. Statistical Procedures

Statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 26.0 (IBM Co., Armonk, NY, USA). Generalized estimated equations (GEE) multivariate models were used to establish the significance of variations

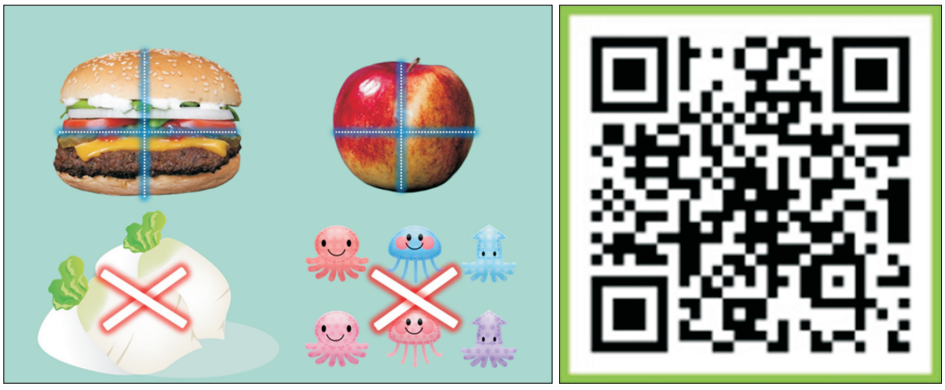

Fig. 1. Screenshot and QR code for the media education content.

between the paper-based and media education groups, with the assumption that the outcome variables progressed differently over time.

RESULTS

1. Symptom Improvement according to the Degree of Self-Management

The degree of symptom improvement based on self-management level was compared with no difference between the two groups.

According to the GEE analysis between T1 and T2, D_NRS and MMO were significantly correlated with the frequency of moist heat application. D_NRS and O_NRS were strongly related to the frequency of stretching. MMO was linked to the number of patients who kept their teeth apart. D_NRS was significantly related to the number of patients on a pain-free diet (Table 1).

Between T2 and T3, stretching was found to considerably affect D_NRS and O_NRS. Pain-free diet and D_NRS had a significant correlation (Table 2).

2. Comparison of Symptom Improvement and Self-Management Practice between the Groups

The level of improvement in symptoms and self-management between the media and paper-based education groups were compared. At T3, the frequency of stretching and moist heat application had enhanced in the media education group than that at T2 but had decreased in the same parameter in the paper-based education group (Fig. 2) between the two-time points.

The proportion of patients who kept their teeth apart decreased similarly in both groups. The number of patients eating a pain-free diet elevated in the media education group, while it dropped in the paper-based education group (Fig. 3).

D_NRS, MMO, and O_NRS were also assessed over time. At T3, D_NRS and O_NRS had lowered in both groups, while MMO had increased marginally (Fig. 4). D_NRS dropped from 3.2 to 2.9 and from 3.0 to 2.0 in the paper-based and media education groups, respectively. O_NRS dropped from 2.5 to 1.9 and 2.4 to 1.4 in the paper-based and media education groups, respectively. MMO elevated from 42.7 to 43.4 and 43.3 to 44.0 in the paper-based and media education groups, respectively.

Table 1. Wald chi-square and p-values as derived from the GEE analysis (between the 1st and 2nd visits)

Model	Wald chi-square	df	p-value
Moist heat			
D_NRS	2.642E+12	8	<0.001*
MMO	140.320	8	<0.001*
O_NRS	4.097	7	0.769
Stretching			
D_NRS	70.084	9	<0.001*
MMO	13.937	9	0.125
O_NRS	24.589	9	0.003*
Teeth apart			
D_NRS	0.016	1	0.899
MMO	5.388	1	0.020*
O_NRS	0.072	1	0.788
Pain-free diet			
D_NRS	12.312	1	<0.001*
MMO	0.074	1	0.786
O_NRS	1.379	1	0.240

GEE, generalized estimated equations; D_NRS, current daily pain intensity; MMO, range of maximum unassisted opening; O_NRS, pain intensity of maximum unassisted opening.
p-values were determined from the GEE analysis.
*p<0.05.

Table 2. Wald chi-square and p-values as derived from GEE analysis (between 2nd and 3rd visits)

Model	Wald chi-square	df	p-value
Moist heat			
D_NRS	22.083	7	0.135
MMO	12.433	7	0.087
O_NRS	6.893	7	0.440
Stretching			
D_NRS	20.616	10	0.024*
MMO	15.674	10	0.109
O_NRS	46.159	9	<0.001*
Teeth apart			
D_NRS	0.397	1	0.528
MMO	0.161	1	0.688
Pain-free diet			
O_NRS	3.172	1	0.075
D_NRS	4.310	1	0.038*
MMO	2.649	1	0.104
O_NRS	0.209	1	0.647

GEE, generalized estimated equations; D_NRS, current daily pain intensity; MMO, range of maximum unassisted opening; O_NRS, pain intensity of maximum unassisted opening.
p-values were determined from GEE analysis.
*p<0.05.

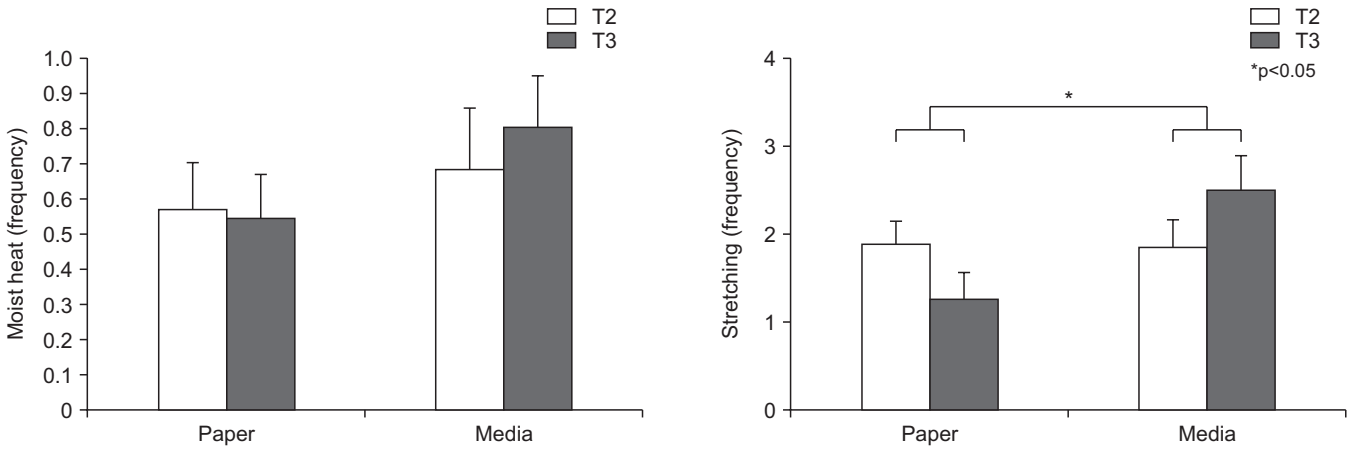

Fig. 2. Frequency of moist heat and stretching. T2, second visit; T3, third visit.

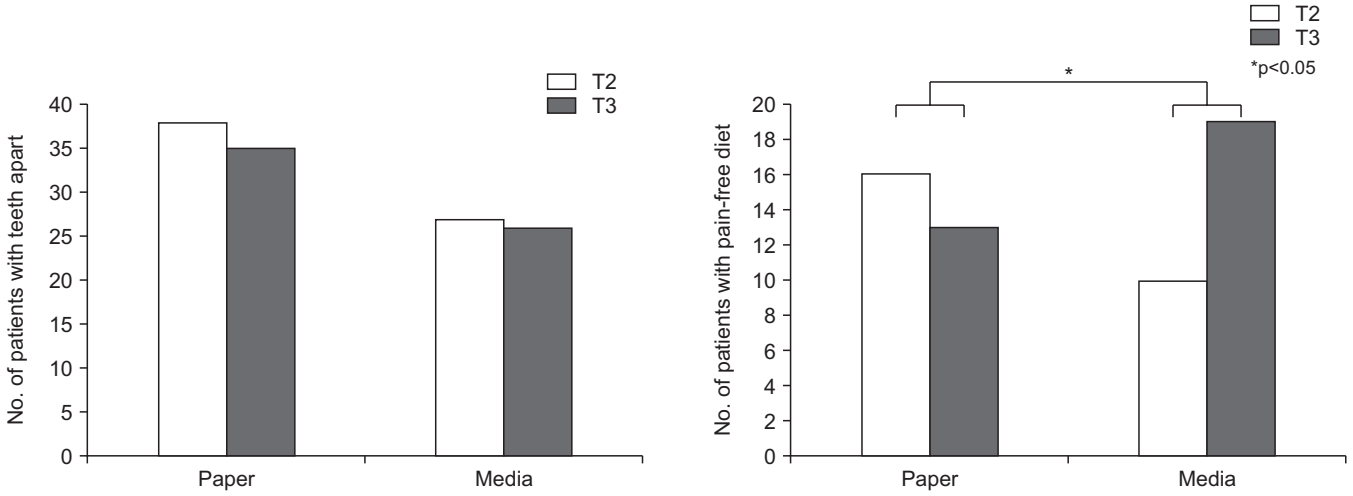

Fig. 3. Number of patients who maintained their teeth apart and were on a pain-free diet. T2, second visit; T3, third visit.

GEE models revealed substantial variations in the frequency of stretching and the number of patients eating a pain-free diet between the media and paper-based education groups. However, there were no substantial variations between the groups for the other variables (Table 3).

DISCUSSION

The findings of this research show that the frequency of stretching and the number of patients on a pain-free diet varied between the media and paper-based education groups. However, the frequency of moist heat application and the number of patients who kept their teeth apart exhibited a weak relationship with the method of education (Table 3).

D_NRS, MMO, and O_NRS changes did not differ significantly between groups, though D_NRS and O_NRS seemed to decrease more in the media education group than in the paper-based education group (Fig. 4).

We conducted statistical analysis to estimate the significance of the degree of precautionary practice and symptom improvement while excluding differences between groups. Although the symptom improvement was not statistically significant in the media education group, we believe that the absolute number of precautions could help improve symptoms based on the tendency of the results.

First, the T1 and T2 outcome parameters were examined. There were significant correlations between moist heat application frequency, D_NRS, and MMO. Stretching frequency was related to D_NRS and O_NRS. The proportion of

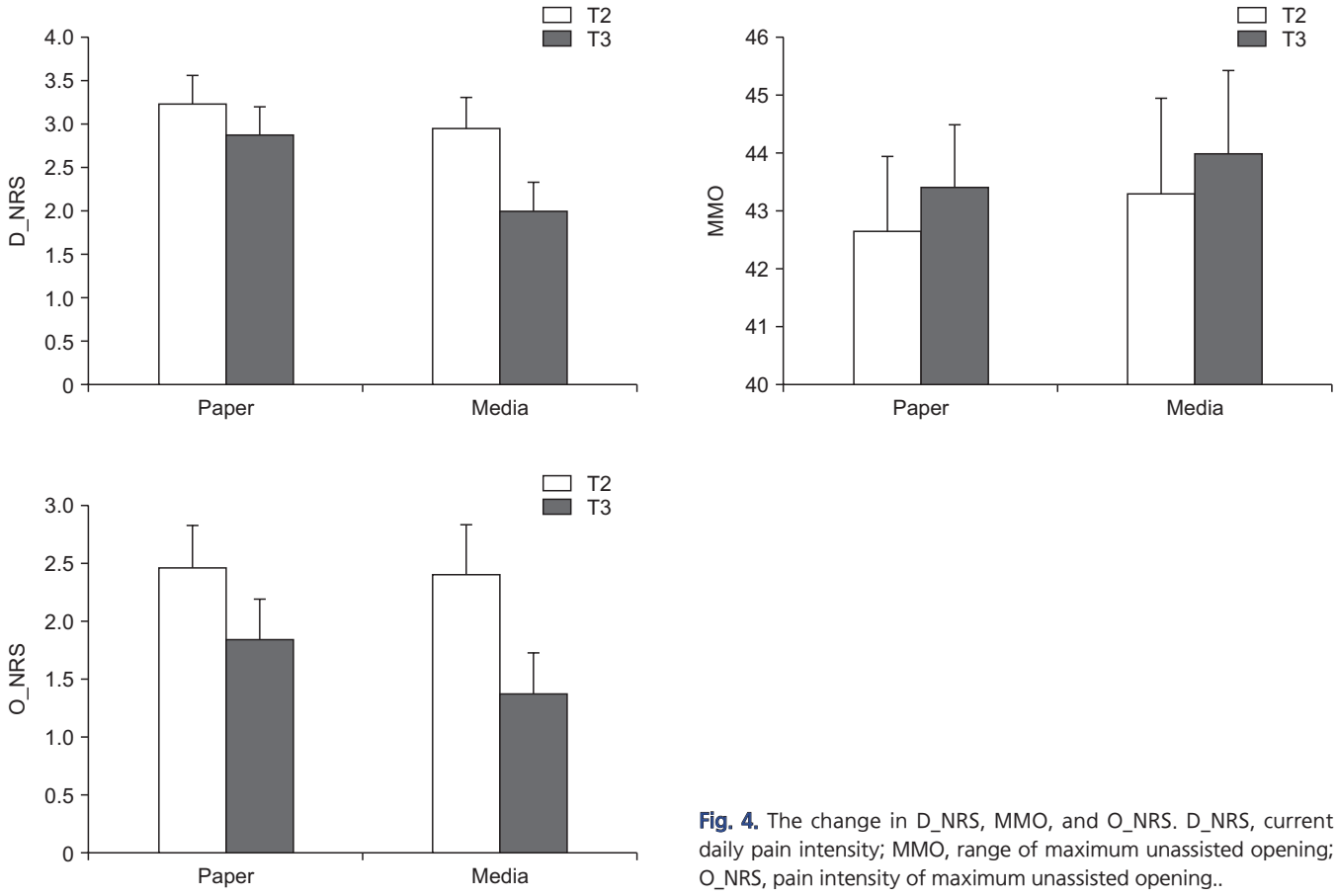

Fig. 4. The change in D_NRS, MMO, and O_NRS. D_NRS, current daily pain intensity; MMO, range of maximum unassisted opening; O_NRS, pain intensity of maximum unassisted opening..

Table 3. Regression coefficients and p-values as derived from the GEE analysis

Model	Paper T2 mean	Paper T3 mean	Media T2 mean	Media T3 mean	β	95% CI	p-value
Moist heat	0.6±0.1	0.5±0.1	0.7±0.2	0.8±0.1	0.144	−0.233-0.510	0.442
Stretching	1.9±0.2	1.3±0.3	1.9±0.2	2.5±0.4	1.262	0.460-2.064	0.002*
Teeth apart	38	35	27	26	0.225	−1.262-1.711	0.767
Pain-free diet	16	13	10	19	1.497	0.400-2.595	0.007*
D_NRS	3.2±0.3	2.9±0.3	3.0±0.3	2.0±0.3	−0.596	−1.611-0.418	0.250
MMO	42.7±1.3	43.4±1.1	43.3±1.6	44.0±1.4	−0.083	−1.679-1.513	0.919
O_NRS	2.5±0.4	1.9±0.3	2.4±0.4	1.4±0.3	−0.410	−1.210-0.389	0.315

GEE, generalized estimated equations; β, regression coefficient; CI, confidence interval; D_NRS, current daily pain intensity; MMO, range of maximum unassisted opening; O_NRS, pain intensity of maximum unassisted opening.
Values are presented as mean±standard errors or number only.
p-values were determined from the GEE analysis.
*p<0.05.

patients who kept their teeth apart was strongly related to MMO. The number of patients eating a pain-free diet was strongly related to D_NRS (Table 1).

The outcome parameters at T2 and T3 were then examined. Stretching frequency correlated significantly with D_NRS and O_NRS. Consuming a pain-free diet significantly impacted D_NRS (Table 2).

This implied that stretching is a continuous body movement activity that may be difficult to understand and practice based solely on written and verbal instructions. However, video education can help to more clearly demonstrate the instructions more, potentially improving symptoms. In the treatment of myofascial pain dysfunction syndrome, exercise therapy appears beneficial. Jaw pain and

mobility restrictions, both of which are impairing symptoms, can be greatly reduced [18].

To the best of our knowledge, this is the first study to quantitatively assess changes in self-management and symptoms over time. These findings support the notion that successful patient education for self-care is critical to achieving positive outcomes in TMD therapy [19]. For example, it is well known that using a heat or cold pad and performing range-of-motion exercises are beneficial for TMD patients and that quitting oral habits, such as chewing gum, can be extremely beneficial [20]. Therapeutic exercise has been shown to promote faster restoration of jaw function than splints [21].

The care of TMD patients should comprise self-management and education [22]. It is preferable to begin TMD management with minimally invasive therapies [23]. According to Vos et al. [24], arthrocentesis as an initial treatment can reduce pain and functional impairment faster than traditional conservative therapy. However, conservative treatment and patient education for self-management should be valued due to the cost and side effects of arthrocentesis. In this regard, the current study found that video education could significantly increase the frequency of self-management in patients.

The effectiveness of video education materials has been studied in multiple fields. According to Winters et al. [25], self-motivated individuals should use educational videos outside of the operating room to maintain physical health during a career in plastic surgery.

Furthermore, providing internet-based self-management programs to patients having chronic pain, such as TMD, is expected to enhance convenience by decreasing the number of visits [26,27].

This study found that video education did not increase the use of all precautions, implying that the content of the video educational material is important. According to Seidel et al. [28], video education is not important in improving knowledge acquisition ability, and performance can vary depending on how the content is organized. Therefore, an advanced content organization is required to improve the patient's performance.

According to Litt and Porto [29], patients non-responsive to TMD treatment frequently have psychological issues such as a high depression index, low self-efficacy, pessimism, and high levels of catastrophizing. For those having comorbid emotional distress and chronic pain, a tailored guided internet-delivered cognitive-behavior treatment program may be advantageous [30]. Our educational video materials did not address the connection between mental stress and chronic pain completely. Accordingly, if new educational videos on the psychological aspects of TMD patients are developed in the future, the new content may aid in treating patients who are resistant to TMD treatment and those who have mental issues.

This study's strength is that it is the first to compare the self-management level between patients educated through media and paper-based educational materials. The small sample size of this study was a major limitation, preventing further effective statistical analyses.

In conclusion, in the treatment of TMD, patient education for self-management is critical. Our findings reveal that following the precautions greatly enhanced symptoms. Media education was more efficient than paper education in motivating patients to conduct self-management through stretching exercises and adhering to a pain-free diet. Although the symptoms demonstrated improvement in the media education group, there were no substantial variations between the two groups.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

AUTHOR CONTRIBUTIONS

Conceptualization: MC. Data curation: MC. Formal analysis: MC. Funding acquisition: none. Methodology: MC, JSK, STK. Project administration: HJA. Visualization: MC, STK, JHC. Writing original draft: MC, HJA. Writing review & editing: all authors.

REFERENCES

1. Valesan LF, Da-Cas CD, Réus JC, et al. Prevalence of temporomandibular joint disorders: a systematic review and meta-analy-

sis. Clin Oral Investig 2021;25:441-453.
2. Klatkiewicz T, Gawriołek K, Pobudek Radzikowska M, Czajka-Jakubowska A. Ultrasonography in the diagnosis of temporomandibular disorders: a meta-analysis. Med Sci Monit 2018;24:812-817.
3. Manfredini D, Piccotti F, Ferronato G, Guarda-Nardini L. Age peaks of different RDC/TMD diagnoses in a patient population. J Dent 2010;38:392-399.
4. List T, Jensen RH. Temporomandibular disorders: old ideas and new concepts. Cephalalgia 2017;37:692-704.
5. Iodice G, Cimino R, Vollaro S, Lobbezoo F, Michelotti A. Prevalence of temporomandibular disorder pain, jaw noises and oral behaviours in an adult Italian population sample. J Oral Rehabil 2019;46:691-698.
6. Huang GJ, LeResche L, Critchlow CW, Martin MD, Drangsholt MT. Risk factors for diagnostic subgroups of painful temporomandibular disorders (TMD). J Dent Res 2002;81:284-288.
7. Huhtela OS, Näpänkangas R, Joensuu T, Raustia A, Kunttu K, Sipilä K. Self-reported bruxism and symptoms of temporomandibular disorders in Finnish university students. J Oral Facial Pain Headache 2016;30:311-317.
8. Li DTS, Leung YY. Temporomandibular disorders: current concepts and controversies in diagnosis and management. Diagnostics (Basel) 2021;11:459.
9. Hemashree J, Kumar K, Chaudhary M. Conservative treatment modalities in the management of temporomandibular joint disorders. Int J Dent Oral Sci 2021;8:2772-2777.
10. Furlan RM, Giovanardi RS, Britto AT, Oliveira e Britto DB. The use of superficial heat for treatment of temporomandibular disorders: an integrative review. Codas 2015;27:207-212.
11. Mulet M, Decker KL, Look JO, Lenton PA, Schiffman EL. A randomized clinical trial assessing the efficacy of adding 6 x 6 exercises to self-care for the treatment of masticatory myofascial pain. J Orofac Pain 2007;21:318-328.
12. Michelotti A, Farella M, Vollaro S, Martina R. Mandibular rest position and electrical activity of the masticatory muscles. J Prosthet Dent 1997;78:48-53.
13. Michelotti A, Steenks MH, Farella M, Parisini F, Cimino R, Martina R. The additional value of a home physical therapy regimen versus patient education only for the treatment of myofascial pain of the jaw muscles: short-term results of a randomized clinical trial. J Orofac Pain 2004;18:114-125. Erratum in: J Orofac Pain 2006;20:106.
14. Nasri-Heir C, Epstein JB, Touger-Decker R, Benoliel R. What should we tell patients with painful temporomandibular disorders about what to eat? J Am Dent Assoc 2016;147:667-671.
15. Painter J, Lee YK. Comparison of the effectiveness and efficiency of written diagrams to multi-media computer videos in hospitality education. J Hosp Tour Educ 2013;14:20-22.
16. Kinnane N, Thompson L. Evaluation of the addition of video-based education for patients receiving standard pre-chemotherapy education. Eur J Cancer Care (Engl) 2008;17:328-339.
17. Durham J, Al-Baghdadi M, Baad-Hansen L, et al. Self-management programmes in temporomandibular disorders: results from an international Delphi process. J Oral Rehabil 2016;43:929-936.
18. Nicolakis P, Erdogmus B, Kopf A, Nicolakis M, Piehslinger E, Fialka-Moser V. Effectiveness of exercise therapy in patients with myofascial pain dysfunction syndrome. J Oral Rehabil 2002;29:362-368.
19. Michelotti A, Iodice G, Vollaro S, Steenks MH, Farella M. Evaluation of the short-term effectiveness of education versus an occlusal splint for the treatment of myofascial pain of the jaw muscles. J Am Dent Assoc 2012;143:47-53.
20. Greene CS, Menchel HF. The use of oral appliances in the management of temporomandibular disorders. Oral Maxillofac Surg Clin North Am 2018;30:265-277.
21. Haketa T, Kino K, Sugisaki M, Takaoka M, Ohta T. Randomized clinical trial of treatment for TMJ disc displacement. J Dent Res 2010;89:1259-1263.
22. Gil-Martínez A, Paris-Alemany A, López-de-Uralde-Villanueva I, La Touche R. Management of pain in patients with temporomandibular disorder (TMD): challenges and solutions. J Pain Res 2018;11:571-587.
23. Liu F, Steinkeler A. Epidemiology, diagnosis, and treatment of temporomandibular disorders. Dent Clin North Am 2013;57:465-479.
24. Vos LM, Huddleston Slater JJ, Stegenga B. Arthrocentesis as initial treatment for temporomandibular joint arthropathy: a randomized controlled trial. J Craniomaxillofac Surg 2014;42:e134-e139.
25. Winters JN, Sommer NZ, Romanelli MR, Marschik C, Hulcher L, Cutler BJ. Stretching and strength training to improve postural ergonomics and endurance in the operating room. Plast Reconstr Surg Glob Open 2020;8:e2810.
26. Heapy AA, Higgins DM, Cervone D, Wandner L, Fenton BT, Kerns RD. A systematic review of technology-assisted self-management interventions for chronic pain: looking across treatment modalities. Clin J Pain 2015;31:470-492.
27. van Grootel RJ, Buchner R, Wismeijer D, van der Glas HW. Towards an optimal therapy strategy for myogenous TMD, physiotherapy compared with occlusal splint therapy in an RCT with therapy-and-patient-specific treatment durations. BMC Musculoskelet Disord 2017;18:76.
28. Seidel T, Blomberg G, Renkl A. Instructional strategies for using video in teacher education. Teach Teach Educ 2013;34:56-65.
29. Litt MD, Porto FB. Determinants of pain treatment response and nonresponse: identification of TMD patient subgroups. J Pain 2013;14:1502-1513.
30. Buhrman M, Syk M, Burvall O, Hartig T, Gordh T, Andersson G. Individualized guided internet-delivered cognitive-behavior therapy for chronic pain patients with comorbid depression and anxiety: a randomized controlled trial. Clin J Pain 2015;31:504-516.