

Current trends in headgear use for the treatment of Class II malocclusions

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ABSTRACT

Objective: To investigate American and Canadian orthodontists' opinions and perceptions on the use of headgear in the treatment of Class II malocclusions.

Materials and Methods: An online survey was sent to randomly chosen orthodontists (n = 1000).

Results: The study was completed by 948 orthodontists; 62% of the orthodontists indicated that they were using headgear in their practice. Those who were not using the appliance (38%) reported that this was mainly due to the availability of better Class II correctors in the market and lack of patient compliance. Of those who use headgear, 24% indicated that the emphasis on headgear use during their residency was an influential aspect of their decision making ($P < .05$). Nearly a quarter of those who do not use headgear reported that learning about other Class II correctors through continuing education courses was an important factor ($P < .05$). There was no difference between the headgear users and nonusers in the year and location of practice. Compared with previous studies, this study showed a decline in the use of headgear among orthodontists.

Conclusions: Despite a decline, more than half of the orthodontists (62%) believe headgear is a viable treatment. Availability of Class II correctors in the market and familiarity with these appliances though continuing education courses are the reasons for the remaining 38% of orthodontists to abandon use of the headgear. (*Angle Orthod.* 2016;86:584–589.)

KEY WORDS: Headgear; Class II malocclusion; Patient compliance; Class II corrector

INTRODUCTION

Management of Class II malocclusions is dictated by the severity of the problem and the age of the patient. A variety of treatment modalities are available, including extraction of maxillary premolars, headgear, Class II elastics, functional appliances, and orthognathic surgery.

The use of headgear has been shown to be successful for correcting skeletal Class II discrepancies in growing patients by providing some orthopedic and mostly dental effects.^{1–4} However, despite the potential

for achieving desirable treatment results, the success of this treatment modality depends heavily on patient cooperation.^{5,6} It has previously been shown that compliance with headgear use has a significant effect on treatment outcome and duration.^{6–8}

In the orthodontic specialty, there was a rapid increase in the use of headgear through the mid-1980s followed by a decline in the routine use of this appliance from 1996 to present.^{9–11} Interestingly, over the years the headgear treatment modality has been in and out of favor. Especially over the past decade, clinicians appear to have abandoned headgear use because of increased difficulty in getting children to wear this appliance due to social or psychological concerns.¹⁰ Whether to use headgear or alternative appliances, such as MARA (mandibular anterior repositioning appliance), Forsus, and Herbst, which are more acceptable to today's children, is a practice management decision. Indeed, patients' acceptance of treatment with headgear has been reported to be only 41% as opposed to 88% with other Class II treatment modalities.¹²

Another reason for the abandonment of the headgear could be the availability of new treatment options for correcting Class II malocclusions. With Class II functional appliances gaining popularity, there has

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been a decrease in the amount of headgear use. Some examples of Class II fixed functional appliances include Mara, Forsus, and Herbst, which can be used in conjunction with fixed appliances in Class II malocclusions without a need for patient cooperation.⁹ However, previous studies have shown that these noncompliance appliances are able to induce a combination of some skeletal but mostly dentoalveolar changes.^{13–15}

In addition, geographic location has been shown to affect the rate of routine use of headgear.¹⁰ Therefore, the decision to use headgear may depend on the local market because of the fear of losing patients to practitioners who use other Class II treatment modalities instead of headgear.

To date, although a declining trend has been demonstrated in the literature, the reasoning behind orthodontists' choice to select alternative modes of treatment has not been investigated. Therefore, it would be of interest to know the factors behind the decrease in headgear use in modern orthodontics for Class II corrections. This study investigates orthodontists' opinions and perceptions on the use of headgear in the treatment of Class II malocclusions.

MATERIALS AND METHODS

Prior to the study, Institutional Review Board approval was obtained from the Office of Research. Online surveys were sent to 1000 American and Canadian orthodontists whose names were randomly selected from the American Association of Orthodontists' nationwide database. A short explanation of the study was provided on the front page of the survey requesting voluntary participation. The surveys had identifying markers to trace back individual respondents, which were matched to a coding list at the mailing center to maintain confidentiality of the answers submitted. A follow-up survey was sent 4 weeks later to all the orthodontists who did not complete the survey with the first mailing.

All respondents were asked to provide their location and years in practice, regardless of their preferences. The initial series of questions dealt with individual practitioners' opinions on treatment efficiency, compliance requirements, preference for headgear treatment modality when other treatment modalities are available, and the trend in headgear use in their practice and in other practices within the same market. The second part of the survey listed a variety of Class II malocclusion scenarios and assessed the orthodontists' likelihood of headgear use in each category. Finally, orthodontists were asked whether or not they use headgear in their practice. If the answer was yes, they were asked to indicate the percentage of

headgear use in patients with Class II malocclusion. If the answer was no, then respondents were asked to give the reason for not using headgear. Each survey had a blank section for the respondents' comments regarding the use of headgear.

Online data collection was managed using REDCap Version 6.8.2, Vanderbilt University, Nashville, Tenn, survey software. The results were summarized using SAS software (SAS version 9.2, JMP version 8.0.2, SAS Institute Inc, Cary, NC).

The level of statistical significance across all of the items was controlled using a Bonferroni correction. Statistical significance was kept at $P < .05$ for all analyses.

RESULTS

Out of 1000 surveys, 948 were returned. The average number of years in practice was 20.7 ± 12.2 . Of the responding practitioners, the majority (93%) practiced in the United States whereas 7% were in Canada. Of the American orthodontists, 21% were located in the Pacific Coast, 20% in the South, 12% in the Midwest, 11% in the Northeast, 11% in the Southwest, 9% in the Middle Atlantic, 9% in the Great Lakes, and 6% in the Rocky Mountains.

Table 1 shows the reported prevalence and frequency of current headgear use among the respondents. Out of 948 respondents, 363 (38%) answered no to the question "Do you currently use headgear for the treatment of Class II patients in your practice?" Of the non-headgear users, 63% indicated the availability of better Class II treatment modalities as the main reason. The lack of patient compliance was the second most important factor in not using headgear (32%). Only 0.5% of the nonusers reported not having had formal training during their residency as the reason for not choosing headgear in the treatment of Class II malocclusions. One percent of the orthodontists listed "fear of losing patients as no one else in my local market uses headgear" as the reason for not using headgear as a Class II treatment modality.

Of the respondents, 62% indicated that they currently use headgear for the treatment of Class II patients in their practice; however, there was a broad range of how often headgear was used. Of 585 orthodontists, 225 reported the use of headgear in about 10% of Class II cases, 141 used headgear in about 25% of Class II cases, and 98 reported the use of headgear in more than 25% but less than 50% of Class II cases; however, 121 orthodontists indicated wide use of headgear in their practice (Table 1).

There was no difference between the headgear user and nonuser groups on years of practice ($P = .35$) or whether they were American or Canadian ($P = .71$).

Table 1. Prevalence and Frequency of Current Headgear Use

Question	n	%
<i>Do you currently use headgear for the treatment of Class II patients in your practice?</i>		
No		
<i>Please indicate the most important reason.</i>		
Fear of losing patients as no one else in my local market uses headgear	4	1
Did not receive enough training during my residency on headgear	2	0.5
Treatment outcome seems to be poor due to lack of compliance	116	32
There are better treatment modalities to use for the correction of Class II malocclusion	228	63
Other	13	3.5
Total	363	38
Yes		
<i>Please indicate how often.</i>		
0–10% of Class II cases	225	38
11–25% of Class II cases	141	24
26–50% of Class II cases	98	17
51–100% of Class II cases	121	21
Total	585	62
Grand Total	948	

However, there was some indication of regional differences ($P = .05$). Headgear was used the most in the Northeast and Midwest and the least in the Rocky Mountain region.

Table 2 lists the questions asking the opinions of orthodontists pertaining to compliance, treatment success, acceptability, and market trends of headgear. Statistically significant differences were found between the two groups on all opinion questions. For example, although 50% of the orthodontists who use headgear indicated that headgear treatment would be the most effective if the compliance were near perfect, only 19% of the nonusers felt the same ($P < .01$). To the question “If patients are told to wear their headgear 12 hours per day, how compliant do you feel patients are?” 55% of the nonusers, as opposed to only 10% of the headgear users, indicated that patients would not be compliant ($P < .01$).

To the question “If both headgear and an alternative treatment modality would achieve Class I canines and molars, how likely are you to choose the alternative form of treatment?” 87% of nonusers indicated that they would use the alternative treatment modality instead of headgear. On the other hand, orthodontists who use headgear were equally interested in using either headgear or an alternative treatment modality if it were highly possible to achieve ideal occlusion with Class I canines and molars. These responses were significantly different ($P < .01$).

Although 22% of nonusers indicated that the headgear treatment modality would have a negative effect on the image of their practice, only 7% of the users felt the same ($P < .01$). About 50% of the users

and nonusers reported that they would not choose an alternative treatment modality over headgear use in fear of losing patients to a competitor.

About 50% of the users reported that the trend in headgear use had stayed the same since the beginning of their time in practice, whereas 70% of the nonusers indicated that the trend had decreased significantly. About 70% of orthodontists in both groups expressed that the trend has been the same in the use of headgear among other orthodontists in their local market.

When respondents were asked about the likelihood of using headgear under various clinical scenarios, there were significant differences between the groups ($P < .001$; Figure 1). Once again the majority of the nonusers (about 80%) expressed that they would most likely not use headgear in any of the clinical categories. Nonusers would not consider headgear to avoid extractions or to hold maxillary posterior teeth. About one-third of the orthodontists who use headgear indicated that they would very likely use this treatment modality for phase I, anterior-posterior maxillary excess, full-step Class II molar correction, and moderate to severe Class II correction with already proclined mandibular incisors.

In this section of the survey, 25% of the clinicians indicated that they were more likely to choose a Class II corrector such as a Forsus or similar appliance instead of headgear out of fear of losing a patient to a fellow colleague who does not use headgear for the treatment of Class II malocclusion.

Both users and nonusers indicated current research to be an influential factor in their decision-making process ($P > .05$). However, formal training during residency and familiarity with Class II correctors through continuing education courses indicated significant differences between the two groups ($P < .0001$; Figure 2). Nearly a quarter of current headgear users (24%) indicated the emphasis on headgear use during their residency as an important aspect of their decision making, and nearly a quarter of those who do not use headgear reported the familiarity with other Class II treatment modalities through continuing education courses as an influential factor.

DISCUSSION

This survey, which had a return rate of 95%, has indicated that orthodontists are very much involved with their profession. Furthermore, the comments they included in the blank section of the survey demonstrated how passionate and opinionated some of these clinicians are.

One orthodontist commented, “There is no doubt that a properly adjusted headgear worn at the

Table 2. List of Questions to Explore the Orthodontists' Opinion on Headgear Use

Question	Do You Use Headgear?	Percentage					Mean	SD
		1	2	3	4	5		
If compliance were near perfect, how effective do you feel headgear is as treatment for a Class II patient?	No	Most effective				Not effective		
	Yes	19.0	35.3	21.5	14.3	9.4	2.60	1.22*
If patients are told to wear their headgear 12 hours per day, how compliant do you feel patients are?	No							
	Yes	0.3	2.5	6.3	35.3	54.5	4.43	0.75*
For a Class II patient seen in your practice, how likely are you to use headgear?	No	Very compliant				Not compliant		
	Yes	2.4	18.1	35.6	33.2	9.9	3.30	0.96
If both headgear and the alternative treatment modality would achieve Class I canines and molars, how likely are you to choose an alternative form of treatment?	No	Very likely				Not likely		
	Yes	0.0	0.0	0.8	3.3	95.3	4.95	0.25*
How influential is patient perception of your practice on your decision to use/not use headgear?	No							
	Yes	21.2	17.1	21.2	22.7	16.9	2.97	1.39
How likely are you to choose an alternative form of treatment in fear of losing a patient to a fellow colleague who does not use headgear for the treatment of Class II patients?	No	Very likely				Not likely		
	Yes	86.8	8.0	2.8	0.8	1.4	1.22	0.66*
Since beginning your practice, what has been the trend of headgear in the treatment of Class II patients?	No							
	Yes	29.2	26.0	23.4	14.2	6.2	2.41	1.22
In your opinion, what has been the trend of headgear use in the treatment of Class II patients among other orthodontists in your local market?	No	Very influential				Not at all influential		
	Yes	22.3	24.8	17.4	12.9	22.0	2.88	1.47*
In your opinion, what has been the trend of headgear use in the treatment of Class II patients among other orthodontists in your local market?	No							
	Yes	6.8	14.5	16.9	26.5	34.5	3.68	1.27
In your opinion, what has been the trend of headgear use in the treatment of Class II patients among other orthodontists in your local market?	No	Very likely				Not likely		
	Yes	16.0	9.1	15.2	10.7	47.7	3.66	1.53*
In your opinion, what has been the trend of headgear use in the treatment of Class II patients among other orthodontists in your local market?	No							
	Yes	5.6	8.5	12.1	22.6	50.9	4.05	1.22
In your opinion, what has been the trend of headgear use in the treatment of Class II patients among other orthodontists in your local market?	No	Gone up	About same	Same	Down	Ceased		
	Yes	0.0	9.9	20.4	69.4	0.0	3.60	0.66*
In your opinion, what has been the trend of headgear use in the treatment of Class II patients among other orthodontists in your local market?	No							
	Yes	1.7	40.5	54.2	3.1	0.0	2.59	0.58
In your opinion, what has been the trend of headgear use in the treatment of Class II patients among other orthodontists in your local market?	No	Gone up	About same	Same	Down	Ceased		
	Yes	0.0	12.9	70.0	16.0	0.0	3.03	0.54*
In your opinion, what has been the trend of headgear use in the treatment of Class II patients among other orthodontists in your local market?	No							
	Yes	0.3	12.6	76.1	7.7	0.0	2.94	0.47

* $P < .01$, statistically significant.

appropriate stage of growth can have a positive impact on the course of treatment," while another simply stated, "How long are we going to promote ignorance? Headgear is nothing more than child abuse. It was never proven to accomplish anything."

In this 2011 survey, 62% of respondents indicated headgear use as opposed to 38% who did not use it at all for the treatment of Class II malocclusions. In a 1993 study, O'Connor⁹ conducted a survey to explore current trends in orthodontics and compared the results of their study with trends of 5 years earlier. In that study, 58% of respondents indicated that they were using headgear routinely, followed by 30% who used it occasionally. In 1993, only 4% indicated that they never use headgear. It was somewhat interesting to note that while the percentages of orthodontists who used headgear as a treatment modality in 1993

and 2011 were similar (58% vs 62%), there was a drastic increase in the percentage of practitioners who indicated that they never use headgear (38% vs 4%). However, in a recent study by Keim et al.,¹¹ only 15% of orthodontists reported routine headgear use, while 54% of orthodontists indicated occasional use.

In the literature, the reason for orthodontists to move away from the headgear treatment modality was attributed to a combination of causes. The availability of other Class II correctors and the lack of patient compliance were the main explanations for orthodontists to not use headgear. The need for patient compliance is a well-recognized factor for orthodontists to choose fixed functional appliances over removable appliances and headgear.^{8,16} In addition, significant technological developments and new designs, along with ever-increasing marketing from manufacturers

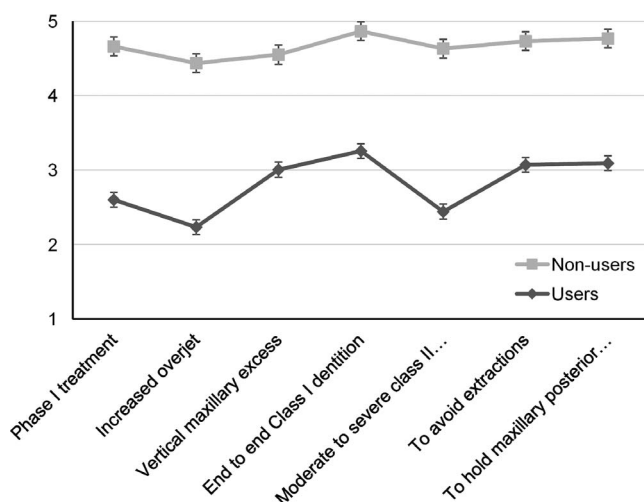


Figure 1. Answer to question “On a scale from 1–5, with 1 being *very likely* and 5 being *not likely*, how likely are you to use headgear in the following situations or for the following reasons?” (means and 95% confidence intervals).

and advocates, have greatly aided in the rising popularity of alternative Class II correctors.^{16–18}

Both headgear users and nonusers indicated that knowledge based on the current research and literature was the most influential aspect in their decision-making process (54% and 53% for orthodontists who use and do not use headgear, respectively). Of the orthodontists who indicated routine headgear use in their practice, 24% also indicated that the emphasis given to the headgear treatment modality during residency and therefore their familiarity with this appliance was the second important factor.

For nonusers, lack of familiarity with headgear and exploration of new Class II treatment modalities from continuing education courses were significant influential aspects in their decision-making process. This was expressed with such comments as “I have found other options to be an effective means of treating Class II malocclusions successfully.” One nonuser orthodontist was even bothered about the idea of using headgear and remarked, “It is sad that you are at a very good school and still promoting headgear use.” Another comment made was, “Kids reject wearing headgear; they are smart enough to realize it is of no value.”

Although there were no significant differences in headgear use between the American and Canadian practitioners, there was some indication of regional differences, which suggests that local markets may be a significant factor in considering headgear for the treatment of Class II malocclusion. It was interesting to note that although “fear of losing patients” was not indicated as a deciding factor in the first part of the

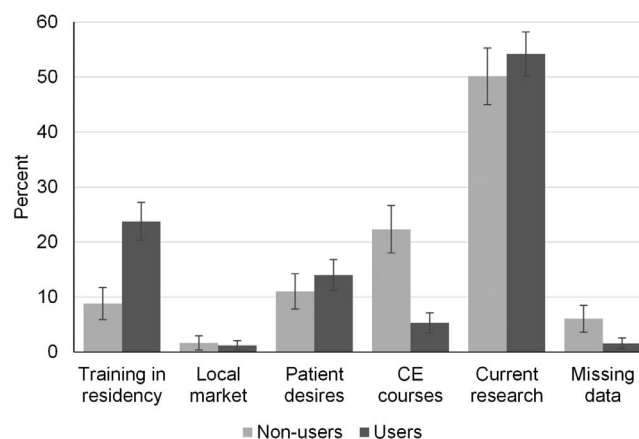


Figure 2. Secondary factors influencing treatment decisions (percentage and 95% confidence intervals).

survey, in the second part of the survey 25% of the clinicians who do not use headgear expressed their fear of losing patients to their fellow colleagues in their local market. Therefore, the culture, the acceptance, and the status symbol of headgear may be the contributing factors for the regional differences observed in this study.

As previously mentioned, patient cooperation is a recognized concern by both headgear users and nonusers. Nonusers reported the availability and familiarity with Class II correctors followed by current research as reasons for their not using headgear. On the other hand, current research and formal training on headgear use during residency were reported by orthodontists as reasons for their using headgear. Therefore, it would be of interest to conduct a study to survey orthodontic residency programs to investigate current trends on headgear use in an academic environment.

It was also somewhat surprising to note that years in practice did not have a significant effect on the decision-making process when considering headgear as a viable treatment option. One would expect recent graduates and young practitioners to prefer new appliances and treatment modalities to traditional headgear when treating patients with Class II malocclusion.

The weakness of this study is that it simply evaluates the orthodontists' perception of the use of headgear for the treatment of Class II malocclusions; therefore, the results may have intrinsic bias.

In summary, this study has shown that despite its long history, the headgear appliance continues to stimulate much debate relating to its use and effectiveness among orthodontists. Overall, a decline in headgear use may be due to the fact that this appliance is no longer well received by patients and is bad for business.

CONCLUSIONS

- More than half of the orthodontists (62%) who responded to the survey still believe headgear is a viable treatment option.
- Orthodontists who use headgear expressed that the emphasis given to the headgear treatment modality during residency was the most influential factor in their decision-making process.
- Orthodontists who do not use headgear stated that the availability of other Class II correctors was the most influential factor in their decision-making process.

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REFERENCES

1. Brandao M, Pinho HS, Urias D. Clinical and quantitative assessment of headgear compliance: a pilot study. *Am J Orthod Dentofacial Orthop.* 2006;129:239–244.
2. Egolf RJ, BeGole EA, Upshaw HS. Factors associated with orthodontic patient compliance with intraoral elastic and headgear wear. *Am J Orthod Dentofacial Orthop.* 1990;97:336–348.
3. El-Mangoury NH. Orthodontic cooperation. *Am J Orthod.* 1981;80:604–622.
4. Firouz M, Zernik J, Nanda R. Dental and orthopedic effects of high-pull headgear in treatment of Class II division 1 malocclusion. *Am J Orthod Dentofacial Orthop.* 1992;102:197–205.
5. Tulloch JF, Phillips C, Koch G, Proffit WR. The effect of early intervention on skeletal pattern in Class II malocclusion: a randomized clinical trial. *Am J Orthod Dentofacial Orthop.* 1997;111(4):391–400.
6. Jacob HB, Buschang PH, dos Santos-Pinto A. Class II malocclusion treatment using high pull headgear with a splint: a systematic review. *Dental Press J Orthod.* 2013;18:21.e1–e7.
7. Enoki C, Matsumoto MAN, Ferreira JTL. Orthopedic cervical headgear in Class II treatment: case report. *Braz Dent J.* 2003;14:63–66.
8. Cureton SL, Regennitter FJ, Yancey JM. Clinical versus quantitative assessment of headgear compliance. *Am J Orthod Dentofacial Orthop.* 1993;104:277–284.
9. O'Connor BM. Contemporary trends in orthodontic practice: a national survey. *Am J Orthod Dentofacial Orthop.* 1993;103:163–170.
10. Keim RG. The Editor's Corner: the state of the profession. *J Clin Orthod.* 2009;43:9–10.
11. Keim RG, Gottlieb EL, Vogels DS III, Vogels PB. 2014 JCO study of orthodontic diagnosis and treatment procedures. Part 1. Results and trends. *J Clin Orthod.* 2014;48:607–630.
12. Hamdan AM. The relationship between patient, parent and clinician perceived need and normative orthodontic treatment need. *Eur J Orthod.* 2004;26:265–271.
13. McSherry PF, Bradley H. Class II correction-reducing patient compliance: a review of the available techniques. *J Orthod.* 2000;27:219–225.
14. Siara-Olds NJ, Pangrazio-Kulbersh V, Berger J, Bayirli B. Long-term dentoskeletal changes with the bionator, Herbst, twin block, and MARA functional appliances. *Angle Orthod.* 2010;80:18–29.
15. Ghislanzoni LTH, Toll DE, Defrai E, Baccetti T, Franchi L. Treatment and posttreatment outcomes induced by the mandibular advancement repositioning appliance: a controlled clinical study. *Angle Orthod.* 2011;81:684–691.
16. Littlewood SJ, Tait AV, Mandall NA, Lewis DH. The role of removable appliances in contemporary orthodontics. *Br Dent J.* 2001;191:304–310.
17. Wahl N. Orthodontics in 3 millennia Chapter 6: More early 20th-century appliances and the extraction controversy. *Am J Orthod Dentofacial Orthop.* 2005;128:795–800.
18. Tadic N, Woods M. Contemporary Class II orthodontics and orthopedic treatment: a review. *Austr Dent J.* 2007;52:168–174.