



# The Role of Attitude Modification Interventions in the Reduction of Orofacial Pain in Patients Undergoing Orthodontic Treatment: A Scoping Review

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## Abstract

By summarizing evidence from existing literature, the aim of this study is to investigate the effect of attitude modification interventions in the reduction of orthodontic pain in patients undergoing orthodontic treatment. A comprehensive search strategy was implemented using both manual and electronic search methods to identify both indexed and nonindexed articles in databases as well as to reduce the possibility of excluding relevant studies by chance. The online database search strategy incorporated the following databases: PubMed, Google Scholar, and EBSCO from 1940 to May 2020. The results of this review suggest that attitude modification interventions including cognitive behavioral therapy, structured phone calls, and text messages are effective methods in the reduction of pain intensity in patients undergoing orthodontic treatment. In conclusion, attitude modification methods are promising and safe nonpharmacological interventions that can be used to control pain in patients undergoing orthodontic treatment without having any side effects or complications.

## Keywords

- ▶ attitude modification interventions
- ▶ orofacial pain
- ▶ orthodontic pain
- ▶ pain

## Introduction

Many patients have a negative attitude toward orthodontic treatment because of the treatment duration, expenses, and pain. Among these, pain is considered the major factor to discourage patients, end treatment, and affect their compliance.<sup>1,2</sup> Studies have shown that 28% of patients undergoing orthodontic treatment report pain as the major factor to cease treatment.<sup>2</sup> Pain starts to become more significant at 4 and 24 hours following the placement of archwire and gradually starts to decrease after 7 days.<sup>3</sup> On the other hand, several reports emphasize that more than 40% of patients continue to experience pain after 7 days of the placement of archwire.<sup>4</sup> The application of orthodontic force to the teeth sets up a series of biological events which ends with the release of

many inflammatory mediators including histamine, bradykinin, prostaglandin, substance p, and serotonin.<sup>5,6</sup> These inflammatory mediators stimulate the nerve endings to induce pain. Orthodontists usually prescribe analgesics to control pain and discomfort resulted from the orthodontic treatment, mostly ibuprofen and paracetamol.<sup>7-9</sup> However, these analgesics can block the inflammatory pathway and interfere with the tooth movement.<sup>10</sup> In addition, they have negative side effects and contraindications. Recently, many nonpharmacological methods have been introduced to alleviate pain and reduce discomfort including low-level laser therapy,<sup>11,12</sup> vibratory device,<sup>13</sup> cognitive therapy,<sup>14,15</sup> and psychological interventions.<sup>16</sup>

Attitude modification interventions are promising non-pharmacological safe methods to reduce pain and discomfort

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in patients receiving orthodontic treatment. Psychological factors have a significant influence on the perception of pain. Since perceived pain intensity and degree of pain tolerance are influenced by cognition, personality, and past experience.<sup>17</sup> Therefore, by summarizing evidence from the existing literature, the aim of this study is to investigate the effect of different attitude modification interventions on the intensity of pain in patients undergoing orthodontic treatment.

## Materials and Methods

A comprehensive search strategy was implemented using both manual and electronic search methods to identify both indexed and nonindexed articles in databases as well as to reduce the possibility of excluding relevant studies by chance. The online database search strategy incorporated the following databases: PubMed, Google Scholar, and EBSCO from 1940 to May 2020. The manual hand search incorporated the following journals: *Journal of Orthodontics* (2005–2020), *European Journal of Orthodontics* (2009–2020), *American Journal of Orthodontic and Dentofacial Orthopedics*

(2000–2020), and *Angle Orthodontist* (1990–2020). Articles were comprehensively examined against the inclusion and exclusion criteria, and only studies involving patients: (1) undergoing orthodontic treatment, (2) minimum age of 10 years, (3) receiving an attitude modification intervention to control the resulted pain and discomfort, (4) no oral disease which alters pain perception, and (5) currently not taking antibiotics and analgesics were included in this review. Abstracts, titles, and subsequently full texts of potential articles were examined carefully by two authors to make sure they were eligible to meet the inclusion criteria. Furthermore, references of all reviewed articles were assessed carefully for their eligibility to meet the inclusion criteria.

## Results

The flowchart in ►Fig. 1 identified the included and excluded articles at each stage. Four hundred and eight articles were assessed including 394 articles from the electronic databases, 12 from the manual hand search, and 2 articles from the reference lists. Fifty articles were duplicates, and 335 did

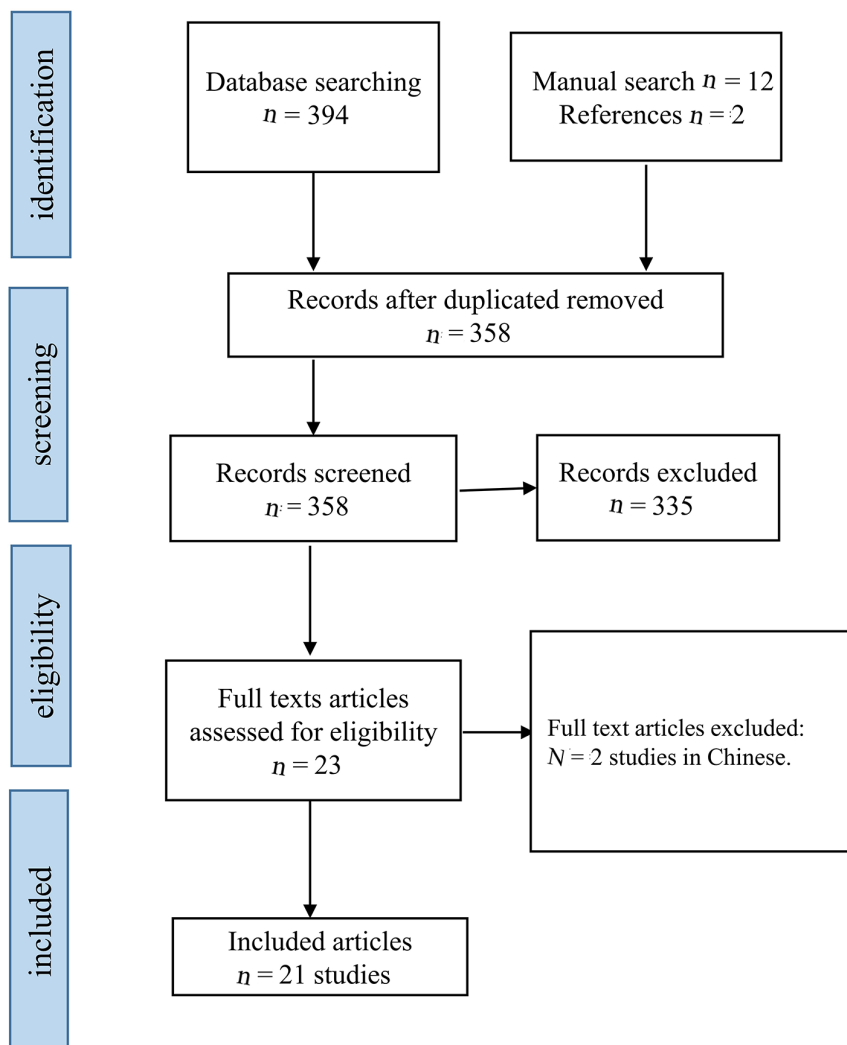


Fig. 1 A flowchart describing the search methodology and number of articles included/excluded at each step.

not relate to the research question, thus leaving 23 articles for potential inclusion in the study. Following the inspection of the full texts of these articles, two studies were not written in English. This means only 21 studies were included in the review for further analysis. Three studies compared the cognitive behavioral therapy to patients who did not receive any treatment and revealed a statistical significance reduction in the intensity of pain between the two groups.<sup>14,18,19</sup> Thus, cognitive behavioral therapy was an effective method in the reduction of orthodontic pain in patients undergoing orthodontic treatment. In all these three studies, patients in the cognitive behavior therapy groups were asked to perform self-practice cognitive behavior therapy skills for 15 minutes. These include daily relaxation training procedures (15 minutes) which were taught in an audio program with soft background music and played at patients' homes when orthodontic pain occurred. Furthermore, two studies investigated the role of structured phone calls in the reduction of orthodontic pain.<sup>20,21</sup> Among these, one study revealed a statistically significant reduction in the level of pain intensity in the structured phone calls group compared with the control group.<sup>21</sup> The structured phone calls were composed of the following points: the importance of maintaining positive attitude, oral hygiene, diet, reassurance, pain level, and patient's well-being. On the other hand, a study by Teifer et al compared the role of courtesy phone calls only in the reduction of orthodontic pain to 600 mg of acetaminophen and revealed that phone

calls are as effective as 600 mg acetaminophen in the reduction of orthodontic pain.<sup>23</sup> However, this reduction in pain intensity was not statistically significant. Two studies investigated the role of text messages in the reduction of orthodontic pain and revealed a reduction of pain intensity in the text messages group compared with patients who did not receive any treatment.<sup>20,23</sup> However, this reduction in pain intensity was not statistically significant. Patients in the text message groups received a standardized and structured text messages offering encouragement to the patients and stressing the importance of a positive attitude toward orthodontic treatment. Only one study directly compared the effect of text messages to structured phone calls and emphasized that structured phone calls are more effective in the reduction of orthodontic pain than text messages<sup>20</sup> (► **Table 1**).

**Discussion**

According to our knowledge, this is the first scoping review to investigate the effect of attitude modification interventions in the reduction of orthodontic pain. The results of this review suggest that attitude modification interventions including cognitive behavioral therapy, structured phone calls, and text messages are effective methods to control pain in patients undergoing orthodontic treatment. Three studies compared the cognitive behavioral therapy to control patients who did not receive any treatment and revealed a significant reduction

**Table 1** Summarized published data of the studies included in this scoping review

Study ID	Participant size, gender, age(y), dropout	Interventions	Mode of intervention	Method of pain assessment	Author's conclusion
Bartlett et al, 2005 <sup>22</sup>	N = 150 patients (69 males, 81 females) Mean age (y) 15.9 No drop out	Group 1 Structured telephone calls Group 2 Attention telephone calls Group 3 Control	Group 1 Structured telephone calls daily and 4 hours after initial archwire placement Group 2 attention telephone calls only made daily and 4 hours after initial archwire placement Group 3 Control	VAS	Structured phone calls significantly reduce orthodontic pain compared with the attention calls only and the control group
Wang et al, 2012 <sup>15</sup>	N = 450 patients Mean age (y) 16.8 21 drop out	Group 1 Cognitive behavioral therapy (CBT) Group 2 Ibuprofen Group 3 Control	Group 1 self-practice CBT skills at home for 15 minutes Group 2 Ibuprofen 300 mg Group 3 Control	VAS	Cognitive behavioral therapy is as effective as ibuprofen in orthodontic pain management, indicating its clinical application potential
Keith et al, 2013 <sup>24</sup>	N = 39 patients (14 males, 25 females) Mean age (y) 13.4 No drop out	Group 1 Text messages Group 2 Control	Group 1 Text message sent daily and 4 hours after initial wire placement Group 2 Control	VAS	Text messages sent from orthodontic office was effective in the reduction of orthodontic pain

(continued)

Table 1 (continued)

Study ID	Participants size, gender, age (y), dropout	Interventions	Mode of intervention	Method of pain assessment	Author's conclusion
Teifer et al, 2014 <sup>23</sup>	N = 120 (43 males, 64 females) 13 drop out	Group 1 Pre and post 600 mg acetaminophen Group 2 Pre-placebo and 600 mg post-acetaminophen Group 3 Pre-600 mg acetaminophen post-placebo Group 4 Pre- and post-placebo Group 5 Pre- and post-courtesy phone calls Group 6 Control	Group 1 600 mg acetaminophen before arch wire placement and after recording VAS Group 2 Placebo before archwire placement and 600 mg acetaminophen after recording VAS Group 3 600 mg acetaminophen before arch wire placement and placebo after recording VAS Group 4 Placebo before archwire placement and placebo after recording VAS Group 5 Courtesy phone calls before arch wire placement and after recording VAS Group 6 Control	VAS	Acetaminophen, placebo, courtesy telephone calls, and no treatment were all equally effective in controlling orthodontic pain
Sawada et al, 2015 <sup>20</sup>	N = 32 (16 males, 16 females) Mean age (y) 28.4 No drop out	Group 1 Cognitive behavioral therapy (CBT) Control Group 2 Control	Group 1 self-practice CBT skills at home for 15 minutes Group 2 Control	VAS	Cognitive behavioral therapy was shown to be effective in the management of orthodontic pain and could merit clinical application
Cozzani et al, 2016 <sup>21</sup>	N = 150 (43 males, 41 females) mean age (y) 13.3 8 drop out	Group 1 Control Group 2 Text messages Group 3 Structures phone calls	Group 1 Control Group 2 Text messages were sent daily and 5–7 hours after bonding by the orthodontist Group 3 Structured phone calls were made daily and 5–7 hours after bonding by the orthodontist	VAS	Patients in the structured telephone calls and the text messages groups reported less pain compared with the control group
Huang et al, 2016 <sup>19</sup>	N = 36 Mean age (y) 22 No drop out	Group 1 Cognitive behavioral therapy (CBT) Group 2 Brainwave music therapy Group 3 Control	Group 1 self-practice CBT skills at home for 15 minutes Group 2 Brain wave music therapy for 15 minutes Group 3 Control	VAS	Both cognitive behavioral therapy and brainwave music were effective in the reduction of orthodontic pain

Abbreviation: VAS, Visual Analogue Scale.

in the intensity of perceived pain.<sup>14,18,19</sup> However, both the Huang et al<sup>19</sup> study and the Sawada et al<sup>20</sup> study had a relatively small sample size; in addition, the gender distribution in the Huang et al<sup>19</sup> study and the Wang et al<sup>15</sup> study was not stated clearly. On the other hand, using cognitive behavioral therapy as an intervention to reduce the intensity of pain in orthodontic patients may interfere with the patient's willingness

and compliance to continue the treatment due to the addition of more expenses. Therefore, it is of great importance to compare the cost-effectiveness of cognitive behavioral therapy to other noninvasive interventions. We recommend future studies evaluating the effect of cognitive behavioral therapy on the level of pain intensity in patients undergoing orthodontic treatment to be ascertained of the effect of this intervention

using functional magnetic resonance imaging rather than the patients' own perception of pain to accurately identify the neural functional activities before and after treatment. Three studies compared the efficacy of structured phone calls to patients who did not receive any treatment and emphasized a significant reduction in the level of pain intensity.<sup>20-22</sup> However, the Cozzani et al<sup>21</sup> and Teifer et al<sup>23</sup> studies had a small sample size. Two studies compared the efficacy of text messages to patients who did not receive any intervention and revealed a reduction in the intensity of pain.<sup>20,23</sup> However, both studies had a small sample size. Furthermore, only one study compared between the efficacy of structured phone calls and the text messages and revealed that structured phone calls are more effective in the reduction of orthodontic pain than the text messages.<sup>20</sup> However, as mentioned earlier, the sample size of this study was small. Therefore, to draw a better conclusion, it is recommended to conduct better designed studies with large sample size in the future. For better understanding of the role of attitude modification interventions in the reduction of pain intensity, future studies should concentrate more on the level of perceived pain at different functions since sensation of pain during biting was different from the pain experienced when jaws at rest.<sup>24,25</sup>

## Conclusion

Fifteen-minute self-practiced cognitive behavior therapy, structured phone calls, and text messages are effective and safe methods in the reduction of orofacial pain in patients undergoing orthodontic treatment.

Standardized and structured phone calls are more effective in the reduction of orthodontic pain than text messages.

To base our practice on scientific evidence, well-designed studies with good sample size are needed to investigate the effect of attitude modification interventions on the intensity of pain in patients undergoing orthodontic treatment.

### Funding

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### Conflict of Interest

None declared.

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