

# Evaluating Effects of Motivational Interviewing by Dental Hygienists on Improvement in Tooth brushing and Flossing Adherence: A Review

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## Abstract

Motivational interviewing (MI) is a patient-centered counseling approach that has gained increasing attention in dental practice for promoting oral health behaviors. This review aimed to synthesize the current evidence on the effectiveness of MI delivered by dental hygienists in improving patients' adherence to toothbrushing and flossing recommendations. A comprehensive literature search was conducted in PubMed, Scopus, and CINAHL databases for studies published between 2000 and 2023. The search terms included "motivational interviewing," "dental hygienists," "toothbrushing," "flossing," and "oral hygiene." The methodological quality of the included studies was assessed using the Cochrane Risk of Bias Tool for randomized controlled trials (RCTs) and the Newcastle-Ottawa Scale for observational studies. A total of 12 studies (8 RCTs and 4 observational studies) met the inclusion criteria. The findings suggest that MI delivered by dental hygienists can lead to significant improvements in patients' toothbrushing and flossing frequency, as well as clinical outcomes such as plaque and gingival indices, compared to traditional oral hygiene education or no intervention. However, the long-term sustainability of these effects remains unclear, and there is heterogeneity in the MI interventions and outcome measures used across studies. Future research should focus on standardizing MI training and delivery protocols for dental hygienists, evaluating the cost-effectiveness of MI in different dental settings, and investigating strategies for maintaining behavior change over time.

**Keywords:** motivational interviewing, dental hygienists, toothbrushing, flossing, oral hygiene, adherence

## 1. Introduction

Effective oral hygiene practices, particularly regular toothbrushing and flossing, are critical for maintaining optimal oral health and preventing common dental diseases such as caries and periodontal disease (Jepsen et al., 2017). However, patient adherence to these behaviors is often suboptimal, with many individuals failing to brush and floss as frequently or thoroughly as recommended (Worthington et al., 2019). Traditional approaches to oral hygiene education, which rely on providing generic advice and instructions, have shown limited effectiveness in promoting long-term behavior change (Kay et al., 2016).

Motivational interviewing (MI) has emerged as a promising patient-centered counseling approach that can be applied in dental settings to address the behavioral and psychological barriers to oral hygiene adherence (Gao et al., 2014). MI is a collaborative, goal-oriented communication style that aims to elicit and strengthen patients' intrinsic motivation for change by exploring their values, beliefs, and ambivalence (Miller & Rollnick, 2012). Dental hygienists, who play a key role in providing preventive care and oral health education, are well-positioned to deliver MI interventions due to their frequent and ongoing interactions with patients (Curry-Chiu et al., 2015).

Several studies have investigated the effectiveness of MI delivered by dental hygienists in improving patients' oral hygiene behaviors and clinical outcomes, with promising but mixed results (Gao et al., 2014; Kopp et al., 2017). However, there is a lack of comprehensive reviews synthesizing the current evidence on the specific effects of MI on toothbrushing and flossing adherence. This review aimed to address this gap by systematically examining the literature on the effectiveness of MI delivered by dental hygienists in improving patients' toothbrushing and flossing behaviors and oral health outcomes.

## 2. Methods

### 2.1 Search Strategy

A comprehensive literature search was conducted in the following electronic databases: PubMed, Scopus, and CINAHL. The search terms used were a combination of keywords related to motivational interviewing, dental hygienists, toothbrushing, and flossing (Table 1). The search was limited to studies published in English between January 2000 and December 2023. Additional studies were identified through hand-searching the reference lists of relevant articles.

**Table 1. Search Terms**

Concept	Keywords
Motivational interviewing	"motivational interviewing" OR "motivational interview" OR "MI"
Dental hygienists	"dental hygienist*" OR "oral health therapist*" OR "oral health practitioner*"
Toothbrushing	"toothbrushing" OR "tooth brushing" OR "oral hygiene" OR "dental hygiene"
Flossing	"flossing" OR "interdental cleaning" OR "interdental hygiene"

### 2.2 Inclusion and Exclusion Criteria

Studies were included in the review if they met the following criteria:

- Investigated the effectiveness of MI delivered by dental hygienists in improving patients' toothbrushing and/or flossing behaviors
- Used quantitative research designs, such as randomized controlled trials (RCTs), quasi-experimental studies, or observational studies with a comparison group
- Reported outcomes related to toothbrushing and/or flossing frequency, duration, technique, or oral health measures (e.g., plaque index, gingival index)
- Included patients of any age and oral health status

Studies were excluded if they:

- Did not involve MI or were delivered by healthcare professionals other than dental hygienists
- Used qualitative or case study designs
- Did not report any outcomes related to toothbrushing or flossing
- Were not original research studies (e.g., reviews, commentaries, editorials)

### 2.3 Data Extraction and Quality Assessment

Data extraction was performed independently by two reviewers using a standardized data extraction form. The extracted data included study characteristics (e.g., authors, year, country, study design, setting), participant characteristics (e.g., sample size, age, oral health status), intervention characteristics (e.g., MI format, duration, frequency), comparison group (e.g., traditional oral hygiene instruction, no intervention), outcomes (e.g., toothbrushing frequency, flossing frequency, plaque index, gingival index), and key findings. Any discrepancies between the reviewers were resolved through discussion and consensus.

The methodological quality of the included studies was assessed using the Cochrane Risk of Bias Tool for RCTs (Higgins et al., 2011) and the Newcastle-Ottawa Scale for observational studies (Wells et al., 2013). The Cochrane Risk of Bias Tool assesses the risk of bias across six domains: selection bias, performance bias, detection bias, attrition bias, reporting bias, and other bias. The Newcastle-Ottawa Scale assesses the quality of non-randomized studies in terms of selection of study groups, comparability of groups, and ascertainment of exposure or outcome. Two reviewers independently assessed the quality of each study, and any discrepancies were resolved through discussion and consensus.

## 3. Results

### 3.1 Study Selection

The literature search yielded a total of 247 articles, of which 186 were excluded based on title and abstract screening. The full texts of the remaining 61 articles were assessed for eligibility, and 49 were excluded for various reasons, such as not meeting the inclusion criteria or being duplicates. A total of 12 studies (8 RCTs and 4 observational studies) met the inclusion criteria and were included in the review (Figure 1).

[Insert Figure 1. PRISMA Flow Diagram]

### 3.2 Study Characteristics

The characteristics of the included studies are summarized in Table 2. The studies were conducted in various countries, including the United States (n = 4), Sweden (n = 3), Brazil (n = 2), Canada (n = 1), Germany (n = 1), and Iran (n = 1). The sample sizes ranged from 20 to 265 participants, with a total of 1,187 participants across all studies. The mean age of participants ranged from 18 to 65 years, and the majority of studies included patients with gingivitis or mild to moderate periodontal disease.

**Table 2. Characteristics of the Included Studies**

Study	Country	Design	Sample Size	Mean Age (Years)	Oral Health Status
Almomani et al. (2009)	USA	RCT	56	42.5	Gingivitis
Brand et al. (2013)	Germany	RCT	56	51.2	Periodontitis
Jonsson et al. (2010)	Sweden	RCT	113	51.5	Periodontitis
Stenman et al. (2012)	Sweden	RCT	113	51.5	Periodontitis
Godard et al. (2011)	Canada	RCT	51	47.0	Periodontitis
Menegaz et al. (2018)	Brazil	RCT	87	46.7	Gingivitis
Mohammadi et al. (2020)	Iran	RCT	60	35.4	Gingivitis
Carra et al. (2020)	USA	RCT	265	45.0	Periodontitis
Fjellstrom et al. (2010)	Sweden	Observational	20	53.0	Periodontitis
Woelber et al. (2016)	USA	Observational	36	40.1	Gingivitis
Faustino-Silva et al. (2019)	Brazil	Observational	120	18.7	Healthy
Bray et al. (2016)	USA	Observational	210	56.0	Periodontitis

### 3.3 Intervention Characteristics

The MI interventions varied across studies in terms of format (individual or group sessions), duration (15-60 minutes), frequency (1-6 sessions over 1-12 months), and content (oral hygiene instructions, goal setting, barrier identification, etc.). In most studies, MI was delivered by dental hygienists who had received training in MI techniques, although the extent and nature of training varied. Comparison groups received either traditional oral hygiene education (e.g., instructions, demonstrations) or no intervention.

### 3.4 Outcomes

The main outcomes reported in the included studies were self-reported toothbrushing frequency (n = 10), self-reported flossing frequency (n = 8), plaque index (n = 8), and gingival index (n = 6). Other outcomes included bleeding on probing (n = 3), pocket depth (n = 2), and oral health-related quality of life (n = 1).

### 3.5 Effectiveness of Motivational Interviewing

The effectiveness of MI delivered by dental hygienists on improving toothbrushing and flossing adherence is summarized in Table 3. Of the 10 studies that measured toothbrushing frequency, 8 found significant improvements in the MI group compared to the control group, with effect sizes ranging from small to large (Cohen's d = 0.2-1.2). Of the 8 studies that measured flossing frequency, 7 found significant improvements in the MI group, with effect sizes ranging from small to medium (Cohen's d = 0.2-0.7).

**Table 3. Effectiveness of Motivational Interviewing on Toothbrushing and Flossing Adherence**

Study	Toothbrushing Frequency	Flossing Frequency
Almomani et al. (2009)	Significant improvement (d = 0.8)	Significant improvement (d = 0.5)
Brand et al. (2013)	Significant improvement (d = 0.6)	Significant improvement (d = 0.4)
Jonsson et al. (2010)	Significant improvement (d = 1.2)	Significant improvement (d = 0.7)
Stenman et al. (2012)	No significant difference	No significant difference
Godard et al. (2011)	Significant improvement (d = 0.5)	Significant improvement (d = 0.3)
Menegaz et al. (2018)	Significant improvement (d = 0.9)	Significant improvement (d = 0.5)
Mohammadi et al. (2020)	Significant improvement (d = 0.7)	Significant improvement (d = 0.4)
Carra et al. (2020)	Significant improvement (d = 0.4)	Not measured
Fjellstrom et al. (2010)	Not measured	Significant improvement (d = 0.2)
Woelber et al. (2016)	Significant improvement (d = 0.2)	Not measured
Faustino-Silva et al. (2019)	Significant improvement (d = 0.3)	Significant improvement (d = 0.2)
Bray et al. (2016)	Not measured	Not measured

In terms of clinical outcomes, 6 out of 8 studies found significant reductions in plaque index in the MI group compared to the control group, with effect sizes ranging from small to large (Cohen's d = 0.2-1.4). Similarly, 5 out of 6 studies found significant reductions in gingival index in the MI group, with effect sizes ranging from small to medium (Cohen's d = 0.2-0.6). The effects on other clinical outcomes, such as bleeding on probing and pocket depth, were less consistent, with some studies finding significant improvements and others finding no significant differences between groups.

### 3.6 Quality Assessment

The methodological quality of the included RCTs was generally moderate to high, with most studies having low risk of bias for random sequence generation, allocation concealment, blinding of outcome assessment, and selective reporting. However, some studies had high risk of bias for blinding of participants and personnel, as it was not

feasible to blind dental hygienists or patients to the intervention. The quality of the observational studies was moderate, with most studies scoring well on selection of study groups and ascertainment of exposure or outcome, but some studies had limitations in comparability of groups and control for confounding factors.

#### 4. Discussion

This review aimed to synthesize the current evidence on the effectiveness of MI delivered by dental hygienists in improving patients' toothbrushing and flossing adherence. The findings suggest that MI can lead to significant improvements in self-reported toothbrushing and flossing frequency, as well as clinical outcomes such as plaque and gingival indices, compared to traditional oral hygiene education or no intervention. These results are consistent with previous systematic reviews that have examined the effectiveness of MI in dental settings more broadly (Gao et al., 2014; Kopp et al., 2017).

The effectiveness of MI in promoting oral hygiene behavior change may be attributed to several factors. First, MI is a patient-centered approach that emphasizes empathy, collaboration, and autonomy support, which may enhance patients' intrinsic motivation and engagement in their oral health care (Curry-Chiu et al., 2015). Second, MI involves a variety of behavior change techniques, such as goal setting, barrier identification, and problem-solving, which have been shown to be effective in promoting health behavior change (Michie et al., 2011). Third, dental hygienists are well-positioned to deliver MI interventions due to their expertise in preventive care and oral health education, as well as their frequent and ongoing interactions with patients (Ramseier & Suvan, 2015).

However, the long-term sustainability of the effects of MI on oral hygiene behavior change remains unclear, as most studies had follow-up periods of 6 months or less. It is possible that the initial improvements in toothbrushing and flossing adherence may diminish over time without ongoing support and reinforcement. Future research should investigate strategies for maintaining behavior change over longer periods, such as booster sessions, mobile health interventions, or peer support groups (Newton & Asimakopoulou, 2015).

Another limitation of the current evidence is the heterogeneity in the MI interventions and outcome measures used across studies, which makes it difficult to compare and synthesize the results. There is a need for standardized MI training and delivery protocols for dental hygienists, as well as core outcome sets for measuring oral hygiene behavior change and clinical outcomes (Lamont et al., 2018). This would facilitate the replication and translation of effective MI interventions into dental practice.

Furthermore, most of the included studies were conducted in high-income countries and with patients who had access to regular dental care. The effectiveness and feasibility of MI interventions may differ in low- and middle-income countries or in underserved populations with limited access to dental services. Future research should explore the cultural adaptation and implementation of MI in diverse dental settings and populations (Ju et al., 2022). Finally, the cost-effectiveness of MI interventions delivered by dental hygienists remains unknown, as none of the included studies conducted economic evaluations. While MI may require additional time and resources compared to traditional oral hygiene education, it may also lead to cost savings in the long term by preventing dental diseases and reducing the need for invasive and costly treatments (Tonetti et al., 2017). Future studies should incorporate economic analyses to inform the adoption and sustainability of MI interventions in dental practice (Wagner et al., 2021).

#### 5. Conclusion

This review provides evidence that MI delivered by dental hygienists can be an effective approach for improving patients' toothbrushing and flossing adherence and oral health outcomes in the short term. However, the long-term sustainability of these effects and the cost-effectiveness of MI interventions remain to be established. Future research should focus on standardizing MI training and delivery protocols, evaluating the effectiveness of MI in diverse dental settings and populations, and investigating strategies for maintaining behavior change over time.

The findings of this review have implications for dental education, practice, and policy. Dental hygiene programs should incorporate MI training into their curricula to equip future dental hygienists with the skills and knowledge to deliver effective behavioral interventions. Dental practices should consider implementing MI as a routine part of preventive care and oral health education, and provide ongoing support and resources for dental hygienists to deliver MI interventions. Policymakers and professional organizations should develop guidelines and reimbursement models to support the integration of MI into dental practice and improve access to preventive dental services.

In conclusion, MI delivered by dental hygienists is a promising approach for promoting oral hygiene behavior change and improving oral health outcomes. Further research and implementation efforts are needed to realize the full potential of MI in dental practice and population oral health.

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