



EXPLORING EVIDENCE-BASED BEHAVIORAL CHANGE STRATEGIES TO IMPROVE ORAL HYGIENE

This white paper assesses how oral care professionals can improve the oral hygiene of their patients using evidence-based behavioral change strategies and tactics



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EXPLORING EVIDENCE-BASED BEHAVIORAL CHANGE STRATEGIES TO IMPROVE ORAL HYGIENE

ABSTRACT

The global prevalence of periodontitis is still increasing, impacting health and quality of life, but also fueling the global economic burden associated with its management. Periodontitis, however, is preventable, with research demonstrating that the economic benefits of eliminating it far outweigh relative intervention costs.

As for prevention itself, evidence clearly points to the importance of plaque control. We do need to keep in mind however that plaque control is mostly a matter of patient behavior and that it is associated with a high level of automation. To help our patients, we need to better understand human behavior and the complex set of factors that influence and drive behavioral change.

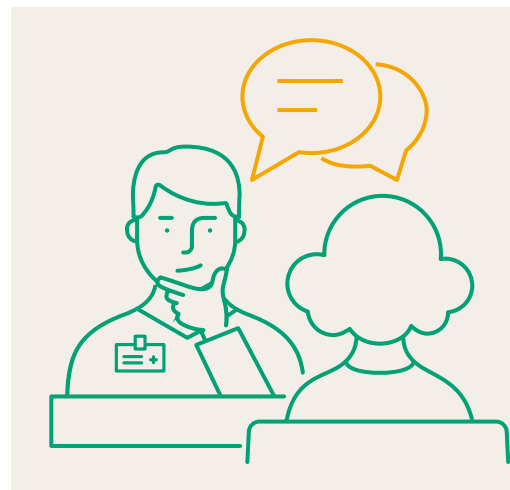
This white paper explores the scientific literature on oral hygiene-related behavior. It aims to identify sources of behavior through the COM-B Model and the behavioral change wheel, followed by reviewing three different evidence-based behavioral change models, together with their implications for oral health interventions: the Theory of Planned Behavior, Motivational Interviewing, and finally the Goal setting, Planning, and Self-monitoring (GPS) model.

The GPS model is endorsed by important international associations such as the European Federation of Periodontology. It arguably has the biggest potential, being pragmatic and easy to implement in daily practice, while building on constructs of several validated psychological models.

INTRODUCTION & OVERVIEW

Many oral diseases – such as periodontal diseases and caries – are preventable. Even if they occur, they are in most cases manageable. Overwhelming evidence points to the importance of proper, lifelong, and daily plaque control through good oral hygiene habits, such as toothbrushing and interdental cleaning (Axelsson et al., 2004; Chapple et al., 2015). Hence the crucial role of oral care professionals in educating and motivating their patients to adopt these habits. But there also lies the biggest challenge: despite efforts in education and motivation, compliance is very difficult to achieve. How do you, as oral care professional, ensure that your patient's behavior matches your treatment plans and recommendations?

This white paper explores how oral care professionals can improve the oral hygiene of their patients using evidence-based behavioral change tactics and strategies.





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PLAQUE CONTROL AND ITS IMPORTANCE

Development of plaque at and below the gingival margin is the main risk factor for developing gingivitis, a finding established almost six decades ago by Løe and colleagues (Løe et al., 1965). Whether or not gingivitis progresses to the more severe, chronic periodontitis depends on a series of risk factors, including genetics, systemic diseases (e.g. diabetes mellitus), composition of the oral microbiome, lifestyle habits (such as smoking, and other), tooth-related factors (e.g. occlusal problems) (Genco & Borgnakke, 2013; Loos et al., 2015). However, the **biggest risk factor for the progression of gingivitis to periodontitis is plaque accumulation** (Chapple et al., 2015). Interestingly, periodontal pockets, resulting from an inflammatory response to pathogens in the plaque, are more susceptible for further plaque accumulation (Murakami et al., 2018). Moreover, during this process of plaque accumulation, the relationship between the host's immune response and the biofilm shifts from a symbiosis to a dysbiosis. This means that the biofilm becomes more pathogenic, which in turn induces a stronger inflammatory response (Loos & Van Dyke, 2020). In other words, the immune system and the pathogenic biofilm interact to form a vicious cycle of self-perpetuating disease progression. To break this cycle, thereby preventing and managing gingivitis and subsequently also preventing periodontitis, proper plaque control is absolutely crucial (Chapple et al., 2015). The same is true for caries, although in this case, plaque control needs to be combined with two equally important preventive measures, namely sufficient exposure to fluoride and the reduction of dietary sugar intake (Twetman, 2018).

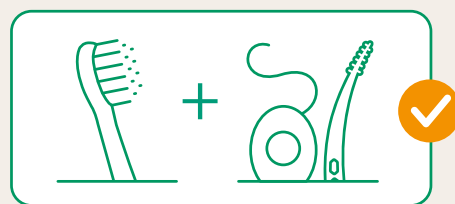
Oral hygiene strategies for plaque control can generally be divided into mechanical and chemical.

- **Mechanical plaque control**

The **two pillars of mechanical cleaning are toothbrushing and interdental cleaning, and this remains the primary method for plaque removal**. Research indicates that brushing with a manual toothbrush removes approximately

42% of plaque, whereas this percentage increases to 46% when brushing with a powered toothbrush (Van der Weijden & Slot, 2015). Although these findings were based on a single brushing exercise, long-term data confirm that self-reported toothbrushing twice per day results in fewer teeth with periodontal pockets $\geq 4\text{mm}$ (Joshi et al., 2018). The same is true for caries, on the condition that toothbrushing is combined with the use of fluoride toothpaste (Figuro et al., 2017). While toothbrushing is effective at removing plaque to a certain extent, it cannot effectively reach the interdental areas. Therefore, as discussed in our oral health white paper "*Interdental cleaning to prevent & treat gum disease*", it is crucial to remove interdental plaque using alternative interdental cleaning methods (Sälzer et al., 2020). Although floss is an established recommended solution, studies indicate its efficacy is rather questionable (Berchier et al., 2008). Interdental brushes on the other hand, provide an additional and significant plaque score reduction of approximately 32% when used as an adjunct to toothbrushing (Sälzer et al., 2015). Rubber bristles interdental cleaners are also indicated for plaque removal, with an additional benefit in terms of greater patient appreciation (van der Weijden et al., 2022).

MECHANICAL PLAQUE CONTROL



The two pillars of mechanical cleaning are **toothbrush & interdental** cleaning

- **Chemical plaque control**

Mechanical plaque control is not always sufficient. **For patients who are at increased risk of periodontal diseases, adjunctive use of chemical agents can be beneficial** for both plaque reduction (Escribano et al., 2016) and prevention of gingivitis (Figuro et al., 2019). In terms of plaque reduction, toothpastes with



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chlorhexidine and triclosan-copolymer and mouthrinses with chlorhexidine and essential oils have the highest demonstrated efficacy (Escribano et al., 2016). For gingivitis management, mouth rinses containing essential oils, triclosan-copolymer, chlorhexidine ($\geq 0.10\%$) and cetylpyridinium chloride ($> 0.05\%$) are the most effective (Figuera et al., 2019).

PREVALENCE OF SUBOPTIMAL ORAL HYGIENE

Clearly, more efforts should be made to prevent periodontal diseases and dental caries by promoting proper oral hygiene. The prevalence statistics speak for themselves. The “Global Burden of Disease” observational epidemiological study found that there were approximately 1.1 billion cases of severe periodontitis



The global economic impact of dental diseases was estimated to be 442 billion USD in 2010

and 2.0 billion of and untreated caries (in permanent teeth) in 2019 (Chen et al., 2021; Wen et al., 2022). When milder forms of periodontitis and gingivitis are included, up to 90% of the global population is thought to be affected (Pihlstrom et al., 2005). In terms of socio-economic burden, figures are also staggering. According to the paper awarded with the Sunstar World Perio Research Award in 2018, the **global economic impact of dental diseases was estimated to be 442 billion USD in 2010**, with direct treatment costs accounting for approximately 4.6% of global health expenditure (Listl et al., 2015). **A recent analysis by the European Federation of Periodontology and the Economist Intelligence Unit confirmed the prevention benefit by revealing that by far the biggest return on investment comes from eliminating gingivitis, meaning that economic benefits outweigh the intervention costs.**

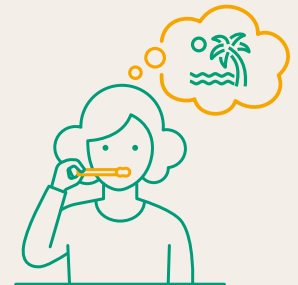
Based on the above, we can safely conclude that **promoting good oral hygiene habits to improve plaque control is not only an essential, but also a cost effective intervention.** And here is where it gets interesting.

ORAL HYGIENE AND THE NEUROSCIENCE OF HABITS

Research shows that plaque control is mostly a matter of behavior, with a high level of automation (Raison et al., 2020). And herein also lies the biggest challenge. **Habits are hard to break and behavioral change is an extremely complex and time-demanding process.** Indeed, this is one of the reasons why, despite all the research and fundamental knowledge we have gained, oral diseases such as caries and periodontal diseases remain a big (public) health concern, even in developed countries. Putting the available knowledge into practice remains a challenge, in good part because of the difficulties associated with improving adherence to oral hygiene instructions via the required behavior change of our patients. **In this white paper, we will explore the scientific literature to evaluate if and how we can use evidence-based models to make a positive impact on our patients' behavior.**

PLAQUE CONTROL DEPENDS ON HABITS

- Research shows that **plaque control is mostly a matter of behavior**, with a high level of automation (Raison et al., 2020)



HABITS ARE HARD TO BREAK

- We must remember the **complex nature of human behavior** itself (Suvan et al., 2022);
- **Behavioral change is extremely complex and time-demanding**





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IDENTIFYING SOURCES OF BEHAVIOR: THE COM-B MODEL

THE MODEL AT A GLANCE

- A complete framework incorporating 19 factors impacting behavioral change
- Identifies 3 key factors as central to behavioral change: capability, motivation and opportunity

The biggest challenge associated with designing behavioral change interventions stems from the complex nature of human behavior itself (Suvan et al., 2022). First, behaviors include many different aspects and are hence difficult to encapsulate into one model. Secondly, while numerous behavioral change theories and models exist, they tend to have one or more overlapping components, complicating research into their effectiveness.

This makes it difficult for oral care professionals to decide which approach lends itself to being used to model and then modulate oral hygiene behaviors.

In an attempt to tackle the complexity, the so-called “behavior change wheel” (Michie et al., 2014; Michie et al., 2011) summarizes into a single model 19 frameworks of behavior change, identified via a systematic literature review (figure 1). The model has three layers:

- **sources of behavior**
- **intervention functions**
- **policy categories.**

Policy categories are mostly outside the sphere of control of the daily practice of an oral care professional. This white paper therefore only focuses on the first two layers of the model.

The Behavior Change Wheel incorporates 19 factors impacting behavioral change identified via systematic literature review



SOURCES OF BEHAVIOUR
Opportunity, Motivation, Capability

INTERVENTION FUNCTIONS
Education, Persuasion, Training & more

POLICY CATEGORIES
Guidelines, Communication / Marketing, Service provision & more

Figure 1: The Behavior Change Wheel
(adapted from Michie et al., 2014)



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UNDERSTANDING “CAPABILITY, OPPORTUNITY AND MOTIVATION” IN THE COM-B MODEL

The first and central layer of the behavior change wheel aims to identify and understand the sources of someone’s behavior. This is also the starting point for behavioral change: **analyse your patients and identify which components of behavior need to be targeted in order to successfully change their behavior.** This central layer is represented by the COM-B model, which stands for the Capability, Opportunity and Motivation Behavioral model (figure 2).

The models suggests that **the way the three core components interact with each**

other results in a certain behavior, and thereby offers a corresponding target for a behavioral change intervention.

Let’s use interdental cleaning behavior as an example to extrapolate this model of behavioral change to the dental setting:

- **Capability (C)** means a patient has the physical and psychological skills to perform the desired behavior. In our case, this means the patient is able to receive, comprehend and remember (repetitive) information about why it is important to clean interdentally, and what tools are appropriate for them. Clearly, capability is one of the crucial factors oral care professionals consider in modulating behaviors.

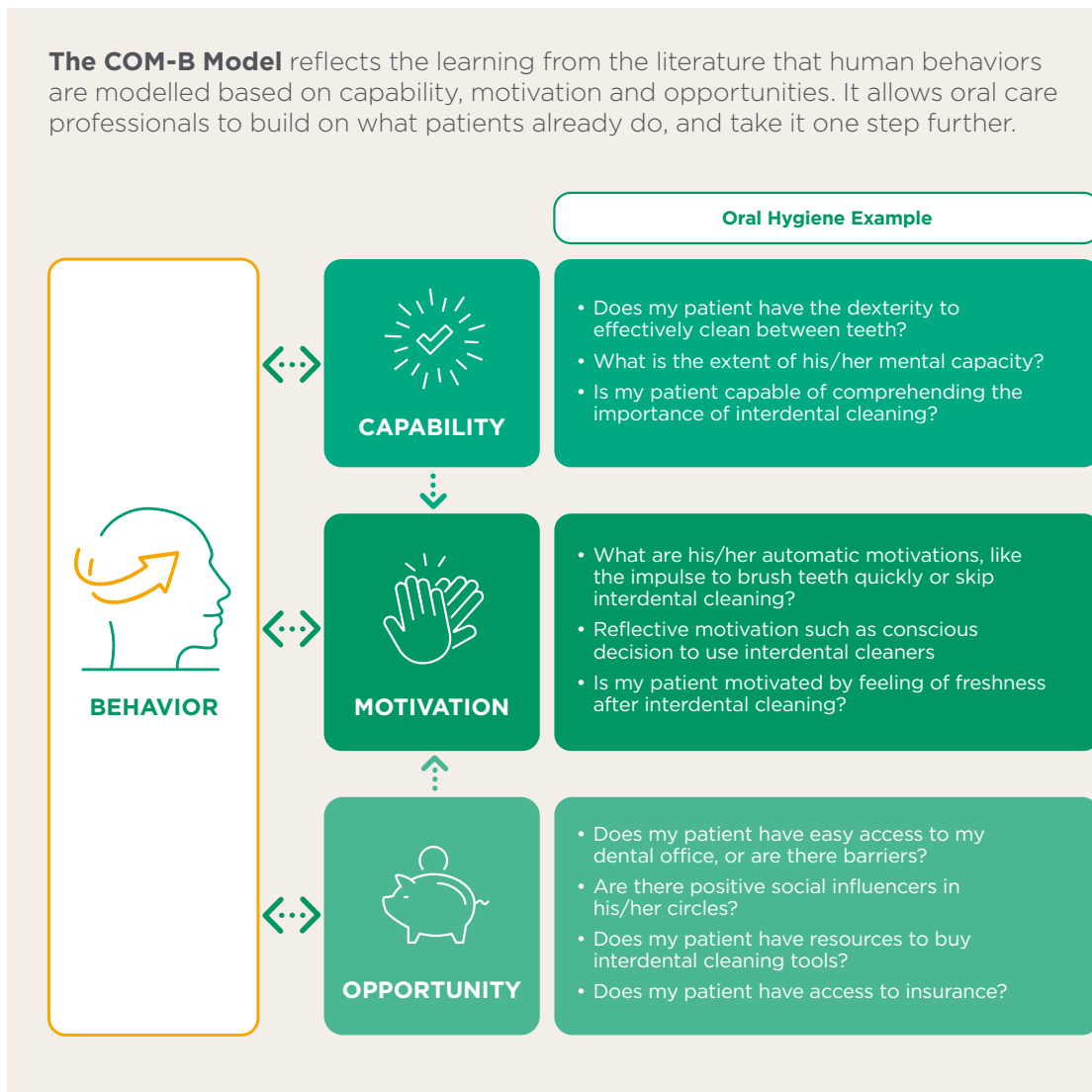


Figure 2: Capability, Motivation and Opportunity in the COM-B Model



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- **Opportunity (O)** encompasses the physical and social environment of the patient required for the behavior in question. In our case, physical opportunity means having access to a dental office to receive education and instructions, and the financial resources to buy interdental cleaning tools, and/or have access to dental insurance and the like. The social opportunities encompass interpersonal influence and exposure to ideas, cultural norms, social cues etc. Essentially, is the patient surrounded by people who could influence him or her to undertake the new behavior? For example, if someone's entire household is committed to interdental cleaning as an evening bathroom routine, adoption is facilitated. Another example is the fact that interdental cleaning is better integrated in societal habits in certain regions compared to others. Obviously, these physical and social opportunities are difficult to influence directly as an oral care professional, but they are important, nonetheless.
- **Motivation (M)** in this model again consists of two components: an automatic and a reflective. Automatic motivation refers to someone's impulses, desires, emotional reactions whereas reflective motivation involves planning, evaluating and conscious decision making, etc. In our interdental cleaning example, a patient's automatic motivation could include the feeling of instant gratification when performing interdental cleaning thanks to the feeling of extreme cleanliness. Reflective motivation could be explained as the patient's plan, intention and/or decision to start interdental cleaning.

It's important to note that capability, opportunity and motivation do not stand on their own, but instead influence each other. For example, someone's motivation is likely to increase when certain capabilities and opportunities are present or improving. Moreover, it is postulated by the authors that capabilities and opportunities act as "gates" between motivation and behavior, and that for motivation to result in behavior change, these "gates" should be open (West & Michie, 2020). Finally, the COM-B model contains positive and/or negative feedback loops, in which a certain behavior can positively or negatively influence capability, opportunity and motivation. Think for example about how engaging in interdental cleaning behavior can improve someone's capability over time, simply by a learning effect.

BEHAVIOR IS AN INTERPLAY BETWEEN CAPABILITY, OPPORTUNITY AND MOTIVATION





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INTERVENTION FUNCTIONS IN THE COM-B MODEL

The next layer in the behavioral change wheel describes the so-called *intervention functions* that target one or more components of the COM-B model.

Table 1 below provides the required definitions, directly adapted from the original publication, as well as interdental cleaning examples.

Which intervention function is appropriate for each patient depends on which component of the COM-B model requires the most attention.

On www.behaviorchangewheel.com, you can play with the behavioral wheel to learn which intervention functions can be used to address each COM-B component. Although the COM-B model is research based and make a lot of sense, its adoption in dental practice and research has been very limited. A narrative review from 2021 found that so far, only two studies employed the model, and in both cases, it was in combination with two other behavioral change concepts (Buchanan et al., 2021). Nevertheless, the COM-B model has a lot of potential, and future research should point out its clinical effectiveness.



INTERVENTION FUNCTIONS	DEFINITION	ORAL HYGIENE EXAMPLE
Education	Increasing knowledge or understanding	Providing the patient with information about the importance of interdental cleaning
Persuasion	Using communication to induce positive or negative feelings or stimulate action	Using visual brand assets for interdental cleaning tools to demonstrate the benefit of using interdentals
Incentivisation	Creating expectation of reward	Convincing the patient of the long-term rewards of interdental cleaning
Coercion	Creating expectation of punishment or cost	Explaining that the lack of interdental cleaning may result in the development of oral conditions that are much more expensive to treat than to prevent
Training	Imparting skills	Repeating hands-on training in the dental chair to increase quality of interdental cleaning
Enablement	Increasing means/reducing barriers to increase capability (beyond education and training) or opportunity (beyond environmental restructuring)	Providing professional prophylaxis to support the patient's interdental cleaning efforts
Modelling	Providing an example for people to aspire to or imitate	Directing your patient to an influencer on social media devoted to interdental cleaning
Environmental restructuring	Changing the physical or social context	Creating a nice and comfortable space in your dental office and discussing with your patients
Restrictions	Using rules to increase the opportunity to engage in the target behavior (or reducing the opportunity to engage in competing behaviors)	Introducing rules to your patient like: staying in the bathroom without distraction of mobile phones when performing their oral hygiene routine, including interdental cleaning; trying to stick to a fix oral care routine; timing the time they spend for their oral care routine; using engaging app to drive more compliance

Table 1: COM-B model definitions and examples of intervention functions (adapted from Michie et al., 2011)



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OTHER BEHAVIORAL CHANGE TECHNIQUES

The behavioral change wheel has allowed us to put behavior change in a broader context, so that we have a better understanding of the sources of behavior which our oral hygiene interventions can targeted. As mentioned earlier, there is a plethora of behavioral change techniques available with many overlapping components, making it impossible to include them all in this white paper in a concise manner. Nevertheless, this section takes you through a few of the most common behavior change techniques and concepts, and dives into the scientific literature to explore if and how we can use them to understand and modulate our patients' oral health related behavior for everyone's benefit.

MOTIVATIONAL INTERVIEWING (MI): A PRACTICAL APPROACH

THE MODEL AT A GLANCE

- The most popular and well-known behavioral influence method in dentistry
- Core contribution rests in asking appropriate questions which can act as a powerful source for behavioral change; individuals are motivated to change when change is connected to something they value
- Its 3 key principles are collaboration, evocation and autonomy (see figure 3)

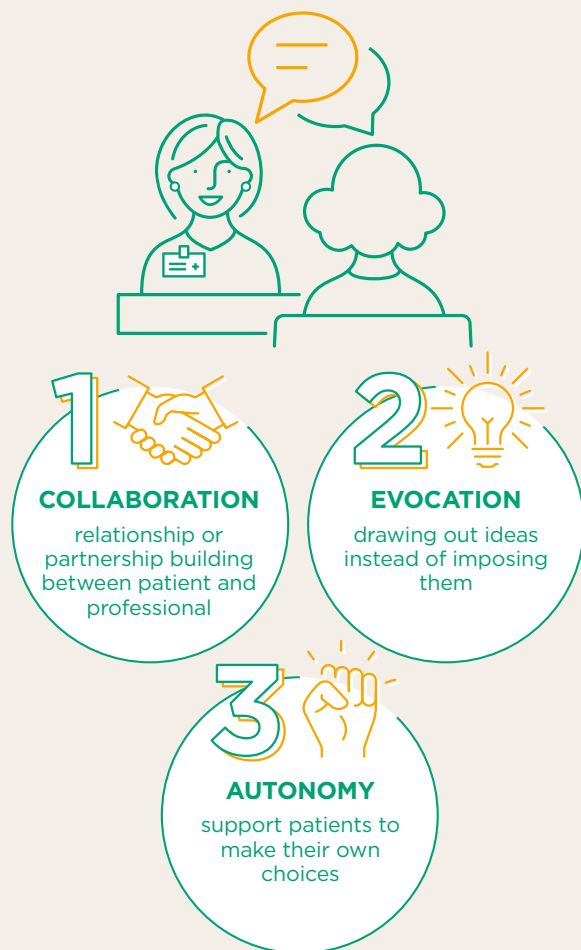
Communication with your patient is crucial to change their behavior, and arguably the most popular and well-known behavioral influence method in dentistry is motivational interviewing (MI). According to Catley et al., "MI is based on the assumption that individuals are motivated to change when change is connected to something they value" (Catley et al., 2010). **Central to MI are three core elements:**

- **collaboration (i.e. relationship or partnership building between patient and professional)**
- **evocation (drawing out ideas, instead of imposing them)**

- **autonomy (support patients to make their own choices, emphasizing that the driver for change should come from within themselves)** (Miller & Rollnick, 2012).

When applying MI, it is all about expressing empathy, explore and resolve ambivalence (where are we now, and where do you want be after the change?), avoid arguing, and support self-efficacy by accentuating strengths and boosting

MOTIVATIONAL INTERVIEWING IS BASED ON 3 KEY PRINCIPLES:



MI is about making patients talk and express themselves rather than telling them what to do

MI is intended to facilitate the conversation between oral health professionals and their patients, allowing patients to **self determine what they value and what change (goals) they want to set**, emphasizing that the driver for change should come from within themselves

Figure 3: Motivational Interviewing



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confidence and beliefs in one's own capabilities. When we extrapolate MI to the behavioral change wheel and COM-B model, it is evident that they are strongly connected to the *motivation* component, and particularly to the reflective aspect. Could MI therefore be an appropriate method to tackle COM-B's motivational component? What does the evidence say?

While MI as intervention to elicit behavioral change in dentistry has been extensively researched over the years, evidence for its effectiveness is quite conflicting, and often not of the highest quality. A few systematic reviews on MI in dentistry have been published in the last decade. For example, the review by Gao et al. from 2014 showed that for periodontal



MI could support oral hygiene behavioral change, but more research is needed.

health, five out of seven publications found MI superior for improving oral hygiene, compared to conventional health education (Gao et al., 2014). Another systematic review, published in 2017, included 5 studies that investigated the effect of MI as an adjunct to periodontal therapy on clinical periodontal parameters and psychological factors related to oral hygiene (Kopp et al., 2017). Two of those studies showed a benefit of MI on bleeding and plaque values (Jönsson et al., 2010; Jönsson et al., 2009), while another article suggested improvement of self-efficacy in interdental cleaning (Woelber et al., 2016). In contrast, two articles included in the systemic review could not demonstrate a beneficial effect of MI (Brand et al., 2013; Stenman et al., 2012). The authors therefore concluded that MI as an adjunct to periodontal therapy might have a beneficial effect, but recommend that further research is needed to solidify that conclusion. This is supported by Newton and Asimakopoulou, who, in their respective 2015 and 2018 reviews suggest that most studies on motivational interviewing in dentistry have serious pitfalls, such as a short duration (mostly 20 minutes) or a low number of sessions (mostly just a single one). They acknowledge that MI could improve

oral health, but in many cases, a quality assessment of the MI delivered was lacking, making it unclear which element of the intervention yielded this health benefit (Newton & Asimakopoulou, 2015; Newton & Asimakopoulou, 2018). This observation was shared by Carra et al. in their systematic review that was part of the S3 Level Clinical Practice Guideline by the European Federation of Periodontology. Carra et al. similarly conclude that MI may improve oral hygiene in patients with periodontal diseases, but that the evidence was inconclusive regarding its clinical efficacy in terms of plaque and bleeding reductions (Carra et al., 2020). In conclusion, although MI could support oral hygiene related behavior change, fundamental differences in both study designs and execution prevent us from drawing definitive conclusions about their effectiveness.

THEORY OF PLANNED BEHAVIOR

THE MODEL AT A GLANCE

- Health-related behavior is predicted by the intention to perform that behavior
- Patient intention is central, and is influenced by 3 factors: attitude, subjective norms, and perceived behavioral control.

Another widely used and researched classic behavioral change model is the **theory of planned behavior** (Ajzen, 1991).

This model consists of a few important constructs, as can be seen in figure 4, with the central concept being that health-related behavior is predicted by the intention to perform that behavior. Usually, the stronger the intention, the more likely it is that someone will actually demonstrate the behavior. The intention itself is influenced by three major factors:

- **attitude**
- **subjective norms**
- **perceived behavioral control.**

Let's try to explain this concept by taking the example of interdental cleaning. By **attitude**, we mean all positive and negative feelings, knowledge, preconceptions, etc. when thinking about performing interdental cleaning. For example, someone might say "I resent



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having to clean between my teeth every day” or “I think it is super important to perform interdental cleaning regularly”.

Subjective norms could be explained as “peer pressure”, namely someone’s perception of what influential people in their lives think they should or should not do. In our example, that could be: “I think my dental hygienist thinks it is crucial to use interdental cleaning tools twice per day” or “my friends think interdental cleaning is useless”. Note that these subjective norms are very much overlapping with the social opportunities’ component of the COM-B model discussed earlier.

Finally, this model includes **perceived behavioral control**, namely someone’s perception of their capabilities to perform certain behavior. In our example, that could be: “I think I will manage to use an interdental brush daily”.

In terms of the theoretical construct of the theory of planned behavior the question now is: **how effective is it to improve oral hygiene behavior?** One study from Scandinavia found that the components belonging to the model explained more than half of the variance in gingival outcomes of the course of 12 months (Jönsson et al., 2012). Interestingly, self-efficacy, an important component of perceived behavioral control, appeared to have the strongest link with oral hygiene behavior, in this case interdental cleaning. In other words, if someone is very confident that they can perform interdental cleaning on a daily basis, that is a strong indication that it will actually result in that behavior.

More recently however, the theory of planned behavior has come under scrutiny, even deemed obsolete by some experts (Asimakopoulou & Newton, 2015). According to a 2018 systematic review, the theory of planned behavior does not predict behavior very well (Newton & Asimakopoulou, 2018). The authors explain that, while the model can predict intention to a certain extent, that intention isn’t as closely related to behavior as believed. According to a systematic review from the Cochrane database, **only 20-30% of actual oral hygiene behavior could be explained by the components of the model** (Renz et al., 2007), a figure that was more or less confirmed by another study (Buunk-Werkhoven et al., 2011). This essentially means that if you aim to change someone’s behavior by influencing his or her attitudes, subjective norms and perceived behavioral control, it’s not likely that you will be very successful. This is also reflected in the conversations oral care professionals often have with their patients about changing behavior. Quotes such as the following are heard more often than not: “I know interdental cleaning is important, I know I should do it, but it is not easy for me”. Most likely, **the model underestimates the complexity of human behavior**, and is prone to overlooking environmental and social factors that influence behavior (Asimakopoulou & Newton, 2015).

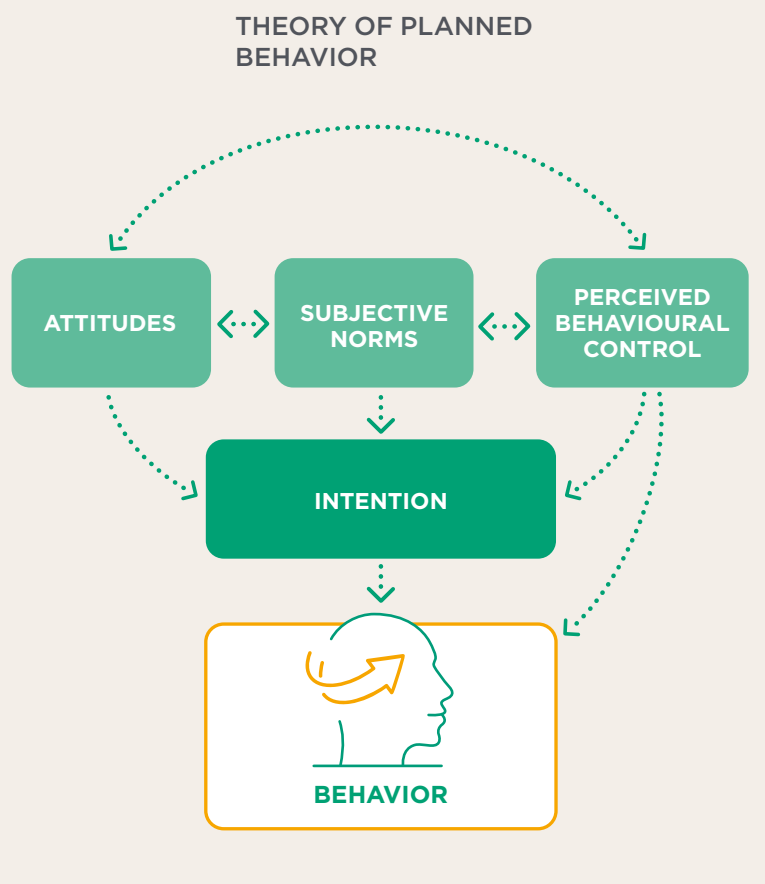


Figure 4: Theory of planned behavior (Ajzen, 1991)



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GOAL SETTING, PLANNING, AND SELF-MONITORING (GPS)

Some of the behavioral models described above may seem exceedingly theoretical and complex, which may in part explain their limited success in practice. There have been attempts to a more simple approach, however. A systematic review from 2015 listed 15 studies that looked at the relationship between compliance to oral hygiene instructions and several behavioral change interventions based on psychological models (Newton & Asimakopoulou, 2015). They again found a large number of different models applied, but one interesting finding stood out. **Regardless of which theoretical framework was applied, interventions that used goal setting, planning and self-monitoring (GPS) as elements of that intervention seemed to be successful in changing behavior.** This nicely circles back to the behavioral change wheel that we discussed before, whereby bundling multiple theories into one framework is perhaps preferable to relying on one specific theory to explain all human behaviors.

Two studies from Sweden reviewed in the Motivational Interviewing (MI) section include elements of MI plus goal setting and self-monitoring (Jönsson et al., 2010; Jönsson et al., 2009). Interestingly, they found this combination yielded significantly higher improvements in gingival and plaque indices and bleeding on probing compared with a standard oral health educational programme. A randomized controlled trial from 2019 employed GPS more concretely as a behavioral intervention, and demonstrated that it can significantly improve interdental cleaning behavior and periodontal health (by reducing plaque and bleeding scores) (Asimakopoulou et al., 2019). Other studies demonstrated that an intervention including planning and self-monitoring improved adherence to flossing (Suresh et al., 2012; Zhou et al., 2015). **The big advantage of the GPS concept is its simplicity,** while in fact, all its components are theoretical constructs that have their basis in validated psychological models. The GPS model could easily be projected on the behavioral change wheel for example. This potential was underlined by the fact that, in their 2015 workshop on

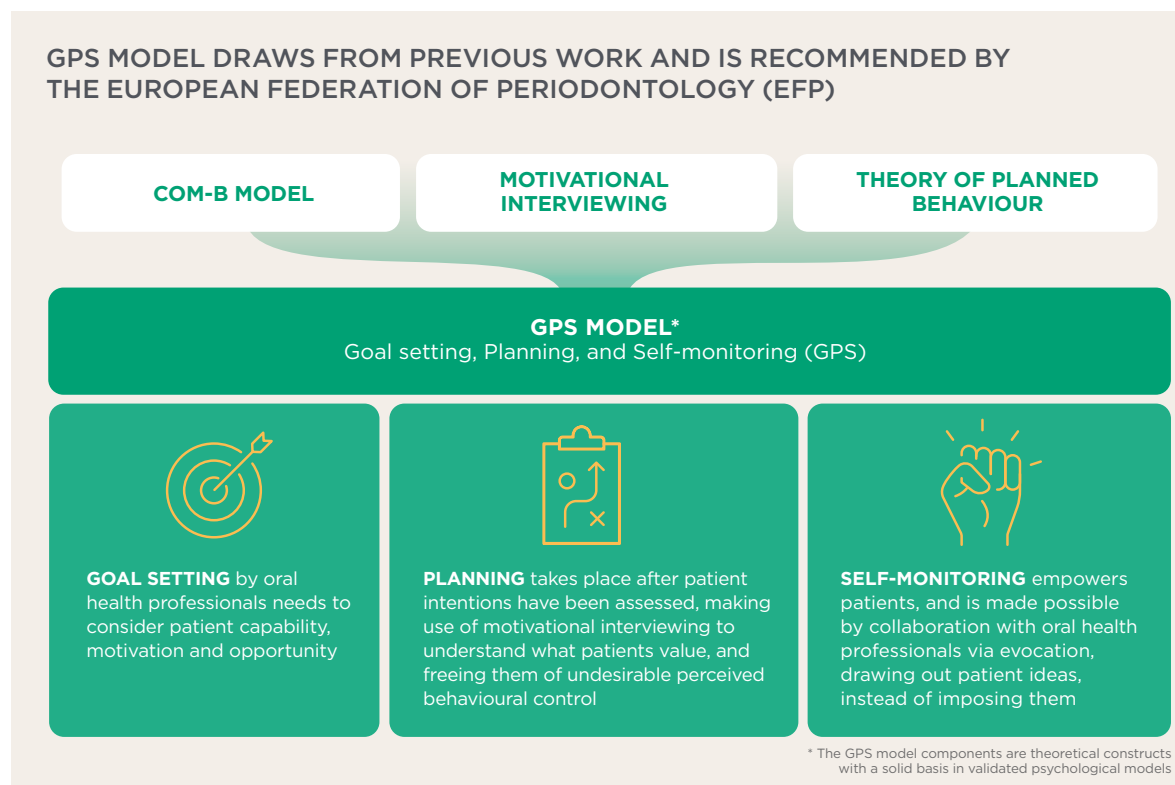


Figure 5: GPS model draws from evidence-based behavioral change models



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prevention of periodontal diseases, the **European Federation of Periodontology (EFP) advocated the adoption of the GPS principle** to facilitate oral hygiene behavioral change (Tonetti et al., 2015).

PUTTING GPS INTO PRACTICE

To put GPS into practice, start with **a baseline assessment**, asking where the patient is currently in terms of oral hygiene behavior. Questions like “What do you currently do”, and “how much time do you dedicate to oral hygiene?” can help to form a picture of the current situation. Such a baseline assessment is crucial for the first step in GPS: goal setting. **Important here is for the patient and the oral care professional to set these goals together.** What do patients really want, and what is really important to them? Similarity it is recommended for the hygienist to undertake the same process of understanding their own goals as an oral care professional. **Try to find common ground, so that you and your patient have one or more shared goal(s)** you can start working towards. As a result

of the GPS patient conversation, you have identified a **discrepancy between current and target behavior, which illustrates the changes that need to be made.** Next comes the **planning**, another crucial part of GPS. Again, work together with your patient to **decide the when, where and how of behavior change.** For example, use concrete questions like “When do you want to buy the necessary products and start interdental cleaning?” and “How do you intend to use these interdental cleaning products?” In the final stage of GPS – self-monitoring – you encourage the patient to self-assess (after a certain period) how the changed behavior relates to the goals set earlier, by for example asking “How did it go, have you reached the goal?”, “Do you believe you will reach it with a bit more time?” or “How do you feel about the goal: do we need to change the goal, make it either more or less ambitious?” This process can be done together during a consultation where the oral care professional can provide feedback, but it could theoretically also be done by the patient independently via self-assessment.

The GPS model provides dental hygienists with an easy to use conversational approach to implement oral health interventions to gain patient commitment – importantly, a commitment patients make themselves (or not) at the end of the conversation



1. Newton JT, Asimakopoulou K. Behavioral models for periodontal health and disease. *Periodontol* 2000. 2018 Oct;78(1):201-211. doi: 10.1111/prd.12236. PMID: 30198131.

Figure 6: Implementing GPS in oral health interventions

EXPLORING EVIDENCE-BASED BEHAVIORAL
CHANGE STRATEGIES TO IMPROVE ORAL HYGIENERESEARCH SPOTLIGHT
EXPLORE THE EVIDENCE BEHIND GPS**“Managing oral hygiene as a risk factor for periodontal disease: a systematic review of psychological approaches to behaviour change for improved plaque control in periodontal management”**

The aim of this study was to determine the role that psychological constructs play in adherence to oral hygiene instruction in patients with periodontal disease.

Study: a systematic review. Studies were grouped according to the study design, and appraised using an appropriate methodology.

Results: fifteen published studies were identified. Understanding the benefits of behavior change and the seriousness of periodontal disease are important predictors of the likelihood of behavior change. Specification of the psychological interventions applied in these studies was generally poor.

Key Takeaway: despite the poor specification and heterogeneity of models studied, the use of goal-setting, planning and self-monitoring are effective in improving oral health-related behavior.

principle investigator**Jonathon Timothy Newton**

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Newton, J. T., & Asimakopoulou, K. (2015). *Managing oral hygiene as a risk factor for periodontal disease: a systematic review of psychological approaches to behaviour change for improved plaque control in periodontal management*. *Journal of clinical periodontology*, 42, S36-S46.

“The effectiveness of an individually tailored oral health educational programme on oral hygiene behavior in patients with periodontal disease: a blinded randomized-controlled clinical trial (one-year follow-up)”

Gothenburg's individually tailored oral health educational programme:

- Considers oral health status
- Is based on cognitive behavioral principles
- Allows for individual tailoring for each participant, based on participants' thoughts, intermediate, and long-term goals

Study: a randomized, evaluator-blinded, controlled trial comparing 2 treatments in 113 subjects (60 females and 53 males) randomly allocated to an experimental or a control group

Comparison: experimental group: Elements of motivational interviewing (MI) plus goal setting and self-monitoring (what came to be known as GPS)

Control group: standard treatment

Results: at 12-month follow-up, the MI/GPS group improved more than the control group on all three measures: Gingival Index (GI), Global Plaque Index (PII), Bleeding on Probing (BoP) scores

Key Takeaway: patients in the MI/GPS group reported a higher frequency of daily interdental cleaning and were more certain that they could maintain the attained level of behavior change.

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Jönsson, B., Ohrn, K., Oscarson, N., & Lindberg, P. (2009). *The effectiveness of an individually tailored oral health educational programme on oral hygiene behavior in patients with periodontal disease: a blinded randomized-controlled clinical trial (one-year follow-up)*. *J Clin Periodontol*, 36(12), 1025-1034. <https://doi.org/10.1111/j.1600-051X.2009.01453.x>



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CONCLUSION

Plaque control is essential for both prevention and effective treatment of the most prevalent oral conditions, such as periodontal diseases and caries. Whether patients exhibit proper plaque control or not is mostly a function of their behavior. One thing this white paper has clearly shown is that the complexity of human behavior, combined with the abundance of psychological models designed to change that behavior, make it difficult for oral health professionals to adopt a concise, evidence-based approach. Only a few models were discussed, while there are many others, such as the Health Action Process Approach (Schwarzer, 2008),

Cognitive Behavioral Therapy (Beck, 1970) and the transtheoretical model (Prochaska & DiClemente, 1983). Significantly, many aspects of these established foundational models are represented in the behavioral change wheel and the GPS model, both of which appear to be quite straightforward approaches to understanding your patient's behaviors and then modulating it in a relatively simple way. Finally, we want to emphasize that behavioral change is not something that can be achieved overnight. It takes time and commitment. While theoretical models can guide you to a certain extent, the relationship with your patient is always the foundation of everything you do.





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APPENDIX I

GPS MODEL - SAMPLE QUESTIONS TO GET STARTED

GPS MODEL STEP	DISCUSSION QUESTION TYPE	
0 BASELINE ASSESSMENT	<p>Assess current situation</p> <p>Ask what your patient does now in terms of oral hygiene</p>	<ol style="list-style-type: none"> 1. What does your oral hygiene routine look like today? 2. What oral health / interdental cleaning tools are you already using? 3. How often do you use them? 4. How much time do you spend on oral hygiene every day?
1 GOAL SETTING	<p>Ask what is important for your patient and yourself</p> <p>Try to find common ground and identify shared goals</p>	<ol style="list-style-type: none"> 1. Do you feel that your oral hygiene is as good as it can be? 2. How important is it for you to have healthy teeth? 3. How important is it for you to have fresh breath? 4. How important is it for you not to lose teeth and get dentures? 5. Have bleeding, tender gums ever bothered you? 6. Has the problem of bad breath ever bothered you? 7. Do you have an idea about the link between periodontal diseases and general health? 8. How much more could you achieve in your day if you did not invest 5 min. on your oral health in the morning and 5 min. at night?
2 PLANNING	<p>Tackle the discrepancy between current and target behaviour</p> <p>Decide the what, when, where and how of behavior change</p>	<ol style="list-style-type: none"> 1. Which tools are you going to use? 2. When do you want to buy the necessary products? 3. When are you going to start?
3 SELF-MONITORING	<p>Stimulate self-assessment</p> <p>Compare the newly adopted behavior to the goals that were set</p> <p>Adjust goals if necessary</p>	<ol style="list-style-type: none"> 1. Do you still notice bleeding when brushing? 2. How many interdentals do you use on average per week? 3. How often do you clean between teeth? 4. Has your bad breath problem been resolved? 5. Do you use a timer when you brush? 6. Do you think your situation has improved since your last visit? 7. Are we approaching the goals we set earlier? If yes, is that the result of what was planned? And if no, what was the reason? 8. Do you feel the goal and planning we decided upon earlier are still realistic? Should we try a different oral hygiene tool, another technique, etc.?



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