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Association Between Self-Efficacy and Oral Self-Care Behaviours in Patients with Chronic Periodontitis

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1. Introduction

A number of major health behaviour theories have been academically established and include the Health Belief Model (HBM), Self-efficacy Theory, the Protection Motivation Theory (PMT), the Theory of Planned Behaviour (TPB), Locus of Control, Sense of Coherence, and the Transtheoretical Model. The HBM was originally developed to predict the likelihood of patients' participation in preventive health behaviours (Rosenstock, 1974). The HBM was later modified to incorporate the concept of self-efficacy, which is the strength of an individuals' belief that he or she can successfully enact behavioural change, improving the ability of this model to predict behavioural outcomes (Martin et al., 2010). Rogers (1975) expanded the HBM to include additional factors to improve the conceptual understanding of fear appeals. He further extended his proposed theory, the PMT, to a more general theory of persuasive communication that emphasized the cognitive processes underlying behavioural change (Rogers, 1983).

The TPB (Ajzen, 1991), which is an extension of the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980), targets situations in which individuals lack complete control over a particular behaviour. Similarly to the TRA, the central importance of this theory is not an individual's intention, but rather that behaviour is influenced by attitudes and subjective norms, in addition to perceived behavioural control, which closely resembles the concept of self-efficacy (Martin et al., 2010). Two additional constructs have been developed, the Health Locus of Control (Rotter, 1966) and the Sense of Coherence (Antonovsky, 1987), which evaluate an individual's psychological characteristics with respect to controlling health-related behaviours. Finally, the Transtheoretical Model of Behavioural Change is a model of intentional change that combines the Behaviour Modification Theory and an educational health programme (DiClemente et al., 1991). This model is comprised of five core constructs: stages of change, processes of change, decisional balance, temptation, and self-efficacy.

In this chapter, we describe the relationship between oral self-care and self-efficacy as it relates to chronic periodontitis patients. The self-efficacy theory has several important

features that warrant its examination in this context. First, this theory has strong relationships with numerous health behavioural theories. Second, it has been demonstrated within a theoretical framework that enhancing self-efficacy leads to behaviour modification. Last, due to the simplicity of the self-efficacy theory, it can easily be applied in the daily clinical setting.

2. Self-efficacy theory

Bandura (1977) observed that the actions of individuals are associated with both outcome and efficacy expectations. The former is outcome expectancy related to achieving a desirable outcome by taking an action, whereas the latter is related to the confidence an individual has for performing an action necessary to produce the desired outcome and is termed self-efficacy (Bandura, 1977, 1997; Kakudate et al., 2010a). The existence of both types of expectations is needed for an individual to act (Figure 1). Thus, self-efficacy is an important factor for predicting individual action and controlling subsequent emotional responses.

Self-efficacy relates to the belief in one's general confidence to accomplish the actions necessary to reach a goal. When applied to the clinical setting, self-efficacy refers to a patient's perception of his or her ability to perform the actions needed to improve and maintain their health. Two levels of self-efficacy have been described: general self-efficacy, which reflects an individual's general and stable tendencies, and task-specific self-efficacy, which are beliefs related to a certain task (Sherer et al., 1982; Woodruff and Cashman, 1993; Stanley and Murphy, 1997).

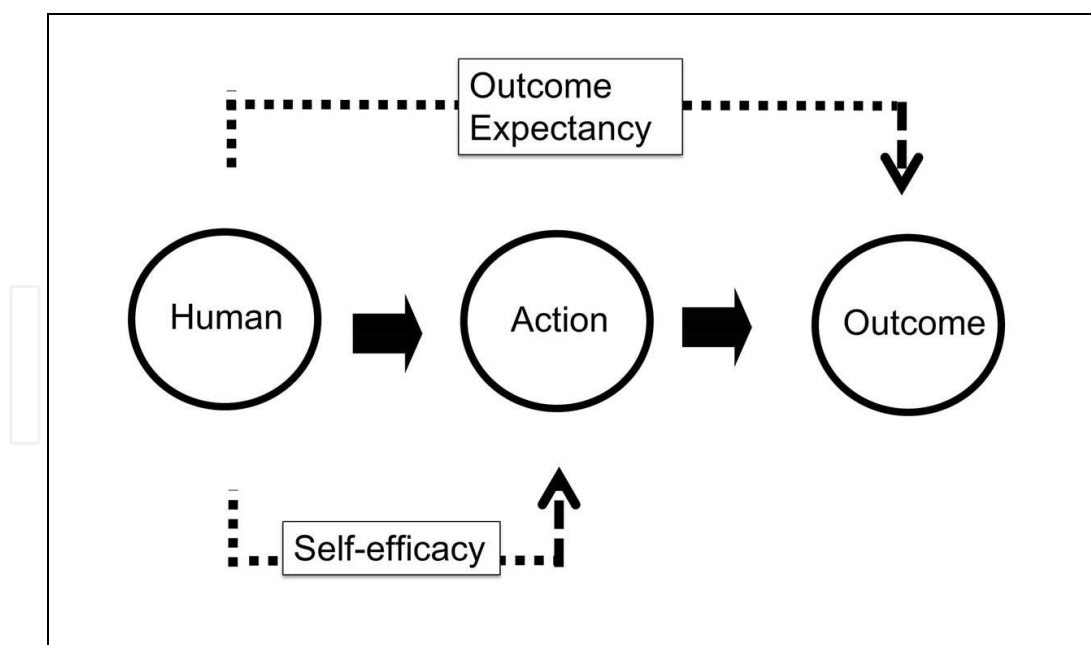


Fig. 1. Relationship between self-efficacy and outcome expectations

Self-efficacy is the belief in the capacity to perform a specific behaviour, whereas outcome expectations are the beliefs that carrying out a specific behaviour will lead to a desired outcome.

3. Self-efficacy in the clinical practice

In the clinical practice, the enhancement of self-efficacy has been shown to improve symptoms of chronic disease, such as diabetes, indicating that self-efficacy represents an antecedent to behaviour modification (Smarr et al., 1997; Wattana et al., 2007). For example, Smarr et al. (1997) examined the relationship between induced changes in self-efficacy following a stress management programme and outcome measures of depression, pain, health status, and disease status in rheumatoid arthritis patients, and found a significant association between self-efficacy modification and the clinically relevant outcome measures.

In the dental field, the relationship between self-efficacy and oral hygiene behaviour, such as toothbrushing or flossing, has been examined in several studies (McCaul et al., 1985; Tedesco et al., 1991, 1992; Stewart et al., 1997; Syrjälä et al., 1999, 2004). McCaul et al. (1985) analysed self-efficacy among college students with respect to brushing and flossing to predict task-related behaviours, and found that the retrospectively self-reported and prospective frequency of the two examined oral care factors were significantly associated with self-efficacy. Subsequently, Tedesco et al. (1991) reported that the addition of self-efficacy variables to the theory of reasoned action variables markedly increased the observed variance in brushing and flossing behaviours. Furthermore, it was demonstrated that cognitive behavioural intervention resulted in a delayed relapse in protective oral self-care behaviour and improved self-efficacy towards flossing (Tedesco et al., 1991). These researchers further analysed the associations between oral health behaviour and self-efficacy and the TRA, and found that linking the variables of the two theories significantly increased the variance in the brushing and flossing behaviours (Tedesco et al., 1992). Syrjälä et al. (2004) performed a comparative analysis to examine the relationships of psychological characteristics related to health behaviours, including intention, self-efficacy, locus of control, and self-esteem, and oral health-care habits, diabetes treatment adherence, number of dental caries and deepened periodontal pockets, and HbA1c (glycosylated haemoglobin) levels. Based on this analysis, only self-efficacy was found to be associated with both oral health-care habits and diabetes adherence.

Several cross-sectional studies have also examined self-efficacy and oral hygiene behaviour. For example, Stewart et al. (1997) measured self-efficacy with respect to toothbrushing and flossing using questionnaires, and demonstrated that self-efficacy scale scores are significantly associated with the frequency of brushing, flossing frequency, and dental visits, in addition to general dental knowledge. Notably, however, clinical periodontal parameters were not surveyed, nor is it clear whether the study participants suffered from periodontal disease. Syrjälä et al. (1999) conducted a cross-sectional survey for 149 insulin-dependent diabetic patients using a self-efficacy scale, which consisted of items related to the self-efficacies of toothbrushing, approximal tooth cleaning, and dental visits, and examined the associations of self-efficacy with oral health behaviour and dental plaque levels. The results of their analyses showed that the scores for all three examined items in the self-efficacy scale were related to self-reported oral health behaviours, and that visible plaque index values inversely correlated with the self-efficacies of toothbrushing and dental visits. However, again, it is unclear whether the study participants, who consisted of only diabetic patients, had periodontal disease.

4. Development of a self-efficacy scale for self-care (SESS) for patients with chronic periodontitis

In the context of periodontal disease, the efficacy of regular professional and patient self-care has been examined in detail (Kressin et al., 2003; Axelsson et al., 2004; Douglass, 2006). The adherence of periodontal disease patients to health-promoting behaviour is considered critical for the prevention and successful treatment of periodontal disease. In an effort to improve oral health-care behaviour, we previously conducted a cross-sectional study consisting of a questionnaire and a clinical assessment to develop a task-specific SESS for periodontal disease patients (Kakudate et al., 2007, 2008). The subjects of the study were 140 patients (64 females and 76 males, 19 to 86 years of age, mean age 51.7 ± 15.7) with mild to moderate chronic periodontitis.

The SESS consists of 15 items that are divided into three sub-scales: (i) self-efficacy for dentist consultations (SE-DC; five items), which relates to treatment adherence and regular dental check-ups (e.g., "I go to the dentist for treatment of periodontal disease"); (ii) self-efficacy for brushing of the teeth (SE-B; five items), which concerns the careful and thorough brushing of teeth (e.g., "I brush my teeth as instructed"); and (iii) self-efficacy for dietary habits (SE-DH; five items), which relates to adopting well-balanced eating and drinking habits (e.g., "I eat my meals at fixed times during the day"). All answers are scored using a five-point Likert scale (Tarini et al., 2007) ranging from 1 (not confident) to 5 (completely confident), and the scores for all 15 items are then summed to give total SESS scores ranging from 15 to 75 for each participant.

The reliability of the SESS was preliminarily verified using conventional methods (Carmines and Zeller, 1980; Syrjälä et al., 1999; Resnick et al., 2000; Travess et al., 2004; Champion et al., 2005; George et al., 2007; Rossen and Gruber, 2007) for both internal consistency (Cronbach's $\alpha = 0.86$) and test-retest stability (Spearman's rank correlation coefficient = 0.73; $P < 0.001$). Based on Spearman's rank correlation coefficient analysis, the test-retest stability scores of the SE-DC, SE-B, and SE-DH components of the SESS were 0.57 ($P < 0.01$), 0.39 ($P < 0.05$), and 0.53 ($P < 0.01$), respectively. Construct validity of the scale was also demonstrated in a cross-sectional study that found periodontal patients with successful maintenance therapy had significantly higher SESS scores (mean value, 60.90 ± 6.64 ; $n = 60$) than those of initial-visit patients who had not received periodontal treatment (mean value, 56.86 ± 7.56 ; $n = 129$) ($P < 0.001$).

5. Predicting loss to follow-up in long-term periodontal treatment using the SESS

As described in Section 3, self-efficacy can be divided into general and task-specific self-efficacy. To compare these two types of efficacy with respect to oral care behaviour, we examined whether our developed SESS and a general self-efficacy scale (GSES) (Sakano and Tohjoh, 1986) could predict short-term compliance (within one year) for active periodontal treatment (Kakudate et al., 2008). The results of our pilot study revealed that only the SESS, particularly the SE-DC subscale, accurately predicted loss to follow-up from active periodontal treatment (Kakudate et al., 2008). As the continued maintenance of periodontal health care is considered critical for preventing relapse after active periodontal treatment, we further evaluated the hypothesis that SESS can predict loss to long-term follow-up

during periodontal treatment by performing a 30-month longitudinal prospective cohort study for patients with mild to moderate chronic periodontitis. In our study, the odds ratios of the loss to follow-up for the middle- (54–59) and low-scoring (15–53) SESS groups were 1.05 (95% confidence interval: 0.36–3.07) and 4.56 (95% confidence interval: 1.11–18.74), respectively, compared to the high-scoring group (60–75) (Kakudate et al., 2010b). We therefore concluded that the assessment of self-efficacy specific to oral health care may allow prediction of loss to follow-up in long-term periodontal treatment. In addition, enhancing self-efficacy through psychoeducational intervention may reduce the number of patients lost to follow-up.

6. The four principal self-efficacy information sources

Self-efficacy beliefs are constructed from four principal sources of information: enactive mastery experience, vicarious experience, verbal persuasion, and physiological and affective states (Bandura, 1977, 1978, 1997). The first information source, enactive mastery experience, relates to an individual's accomplishments, with previous successes increasing expectations of mastery in subsequent tasks and repeated failures serving to lower them. The second source, vicarious experience, is obtained through the learning associated with observing a task or activity being successfully performed by others, and is often referred to as modelling. The third element, verbal persuasion, refers to the use of suggestive language to convince an individual that he or she can successfully perform a specific task. Common forms of verbal persuasion include coaching and evaluative feedback for performance, and help to support (persuade) an individual's belief that he or she possesses a certain capability. The fourth element, physiological and affective states, represents the physiological and emotional states, respectively, which influence an individual's assessment of self-efficacy. Through the effective exploitation of these four sources of information, it is therefore possible to enhance self-efficacy, which may have significant impacts with respect to oral health care in the field of dentistry. For example, Syrjälä et al. (2001) reported qualitative evidence that the sources of self-efficacy proposed by Bandura (1977), namely personal experience, emotional arousal, and modelling, are also supported in the context of oral health behaviour.

7. Enhancement of self-efficacy for self-care through six step method

The six-step method is a systematic approach that was designed to facilitate lifestyle changes in patients including principal self-efficacy information sources (Farquhar, 1987; Albright and Farquhar, 1992) and consists of the following six steps: (i) problem identification; (ii) instilling confidence and commitment; (iii) increasing behavioural awareness; (iv) developing and implementing an action plan; (v) plan evaluation; and (vi) maintaining the behavioural change and preventing relapse. Six-step method has been applied to periodontal dental practice as following steps (Kakudate et al., 2009).

Step 1. Identifying the problem

Knowledge, belief, and the barrier to periodontal self-care were clarified by person-to-person interviews. This information was obtained by asking the patient the following questions:

1. What do you do about self-care?
 - a. How many times and how long do you brush?
 - b. How many times do you perform inter-dental cleaning per week?
 - c. When do you brush?
2. What do you know about self-care?
3. Have you tried to change your behavior in the past?
4. What inhibits the change in your belief? or What are your major barriers to change?

The patients are clearly told what the problems are, and the patients are told that their behaviors are harmful to their health and that modification of this behavior must be made.

Step 2. Creating confidence and commitment

There are many patients who have the conviction that changing their self-care behavior is not possible. Step 2 involves establishing commitment and confidence by conducting the clinical interview to incorporate counseling that assesses the patient's barrier to change his/her behavior. A story of a person who seems to be a model in a similar situation was introduced to raise the patient become aware of his/her assumption. In order to confirm intention and to promote motivation, the patient and the dentist signed a contract to begin working on a particular behavior change after face-to-face counseling.

Step 3. Increasing awareness of behavior

This step leads to increase in the patient's awareness of his or her behavior patterns through self-monitoring. The patients were asked to keep a diary of brushing and inter-dental cleaning every day until the next consultation and to describe their feelings at that time of brushing. The diary is used to determine the internal and external precursors to the behavior that often act as behavioral cues. The diary also helps to identify barriers to behavioral change in oral self-care.

Step 4. Developing and implementing the action plan

Based on the patient's behavior, description in the diary of oral hygiene measures, and oral hygiene states, a short-term action plan is set up by the principle of gradualism. The action plan was concrete, realistic, and achievable. For instance, the action plan includes "Brush twice a day", "Brush for more than three minutes", and "Use dental floss once a day at night" Then an incentive that a patient gives himself/herself when succeeding was decided. Small incentives such as beauty treatment, going to the movie, and shopping are selected. In the setting of the goal and the incentive, the dentist only supported the decision by the patient.

Step 5. Evaluating the plan

Whether or not the patient achieved the action plan is evaluated. Success is acknowledged and supported. When the plan succeeded, the success experience is acknowledged, and the subject is praised. If the patient fail, this is attributed to a failure of the plan, and a new plan that can be achieved is set up.

Step 6. Maintaining change and preventing relapse

Each patient has high-risk situations that might result in relapse. Unexpected long working hours, social events such as parties, and alcohol consumption often make it difficult to

maintain newly acquired behaviors. Therefore, it is important for dentists and dental hygienists to help and encourage the patient to safeguard and reinforce the new behaviors. As in Step 4, incentives might be effective. Incentives can apply to a particular longer period of maintenance.

8. Evidence of behavioural approaches for self-care

According to a systematic review by the Cochrane Collaboration, several studies have suggested that psychological approaches to behavioral management can improve behaviours related to oral hygiene (Renz et al., 2007). This finding supports the use of psychological models in studies aimed at establishing intervention approaches for modifying oral health-related behaviour. In the review, four studies that applied psychological models were selected based on the Cochrane Oral Health Group methods (Renz et al., 2007). However, the reviewers concluded that overall quality of the included trials was low, thus limiting the conclusions that could be drawn, and in addition, the applied intervention was weakly designed and lacked key aspects of the major behavioural theories.

Since 2007, two randomized controlled trials (RCTs) have been conducted to evaluate intervention based on key aspects of the self-efficacy theory. Clarkson et al. (2009) conducted a RCT that was randomized by either patient (Patient) or dentist (Cluster) and included 87 dental practices and 778 adult patients (Patient RCT = 37 dentists / 300 patients; Cluster RCT = 50 dentists / 478 patients). The study patients were subjected to evidence-based intervention that targeted oral hygiene self-efficacy and action plans. After adjustment for baseline differences, patients who received the intervention exhibited improved behavioural (timing, duration, and method), cognitive (self-efficacy and planning), and clinical (plaque and gingival bleeding) outcomes. However, on comparison of the Patient and Cluster RCTs, the clinical outcomes were only significantly improved in the latter, suggesting that the trial design may have influenced the results.

In the second RCT, our group compared the efficacy of a six-step method to enhance self-efficacy with that of conventional oral hygiene instruction (Kakudate et al., 2009; Morita et al., 2010). Our RCT consisted of 38 patients with mild to moderate chronic periodontitis (Control group : Intervention group = 20 : 18) who were receiving periodontal treatment at a private dental clinic located in Sapporo, Japan. In both study groups, all examined variables, including Plaque Control Record (PCR) scores (O'Leary et al., 1972), tooth brushing duration, weekly frequency of interdental cleaning, and self-efficacy scores, significantly improved from the initial to the third clinic visit. Notably, we found that the intervention group, who received oral hygiene instruction using the six-step method, displayed higher self-efficacy than the control group, who were only provided with conventional oral hygiene instructions. In addition, PCR scores, toothbrushing duration, and weekly frequency of interdental cleaning also improved in the intervention group as compared with the control group.

In the two RCTs presented here, the enhancement of self-efficacy and ability to promote behavioural change through behavioural intervention was clearly observed; however, the methodology of intervention has yet to be fully established. Thus, further studies are needed to evaluate the suitability of these intervention methods with respect to oral health care in the clinical setting.

9. Conclusion

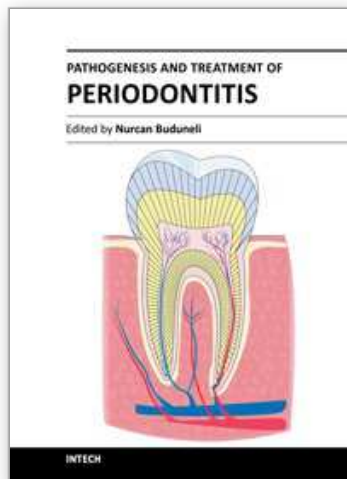
The assessment of self-efficacy towards oral health care is effective for the prediction of oral self-care behaviour in periodontal treatment. Therefore, by addressing low self-efficacy early and providing patient support to enhance self-efficacy in the clinical setting, loss to long-term follow-up during periodontal treatment can be minimized. Although behavioural approaches may enhance the self-efficacy for self-care habits and result in improved oral hygiene status, further research to evaluate the suitability of the specific intervention methodology is required. In addition, it is also important to determine whether applying methods developed based on past research results might provide any disadvantages to periodontal patients.

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