

# Oral Hygiene Indirect Instruction and Periodic Reinforcements: Effects on Index Plaque in Schoolchildren

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*The aim of this study was to evaluate the effectiveness of the indirect instruction and the influence of the periodic reinforcement on the plaque index in schoolchildren. Forty schoolchildren aged from 7 to 9 years old were selected from a public school. After determining the initial O'Leary Plaque Index all schoolchildren were submitted to a program for oral hygiene through indirect instruction – “The Smiling Robot”. The schoolchildren were divided into 2 groups: with and without motivation reinforcement. The index plaque exam was performed in both groups after 30, 60 and 90 days of the educational program. Comparing the groups, the plaque index decreasing could be observed in the group with reinforcement with statistically significant difference. For the group with reinforcement, statistically significant difference among the evaluations was found. For the group without reinforcement, significant decrease in the plaque index was found after 30 days when compared to the first, third and fourth evaluations. The indirect instruction with “The Smiling Robot” promoted a positive initial impact on the decrease of plaque index in the schoolchildren. The periodic reinforcements showed more suitable results and significant reduction of the plaque index in the course of the evaluations.*

**Keywords:** School based preventive programs, Motivation, Dental plaque, Oral hygiene.  
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## INTRODUCTION

Dental caries and periodontal diseases are still considered the most frequent oral ailments and may result in dental loss if not properly managed. Regular con-

trol of supragingival plaque is considered important for dental health, because it provides preservation of dental structures and tissues.<sup>1,2</sup>

To provide acceptable levels of dental plaque, patients must be both educated in dental care and motivated to provide it. Teaching efficient toothbrushing techniques and correct use of dental floss would not be valid while patients were not stimulated about the importance of these procedures for conserving the integrity of their health.<sup>3</sup>

Toothbrushing as well as other habits of hygiene, is acquired during the socialization process of the child<sup>4</sup> and integrated in the daily routine with positive reinforcement.<sup>5</sup> However, when working with schoolchildren, the motivation methods, apart from being efficient, lasting and easy to use, must be attractive and arouse children's attention. In public health, when educational-preventive programs are applied, the indirect motivation must be stimulated in order to reach a greater number of people at the same time.

Nevertheless, after the conclusion of the proposed programs, oral hygiene levels returned to initial values,<sup>6,7</sup> which demonstrates the necessity of the programs to be periodic. In other study, it was observed a behavioral change in patients submitted to participative methodology with periodic motivation.<sup>8</sup>

Rodrigues *et al*<sup>9</sup> comparing different motivation methods (direct and indirect) obtained considerable results in plaque decrease when he used one indirect method for oral hygiene

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instruction. This may be an advantage mainly in public health, in order to promote a decrease in plaque index, improve oral health and reach higher numbers of children at the same time.

The aim of this study was to verify the influence of one indirect oral hygiene instruction method and its periodic reinforcement on plaque index in schoolchildren.

### Study population and methodology

This study was approved by the Research Ethics Committee of the School of Dentistry, São Paulo State University (UNESP), Araraquara, Brazil (FAPESP grant #00/01775-6). For the present study, 40 schoolchildren of both genders, aged from 7 to 9 years, were selected from a public elementary school of Araraquara, São Paulo State, SP, Brazil. To select the school, it was taken into account the socio-economic level (lower-middle class), so that the sample would be homogeneous and show similar features. According to the Research Ethics Committee, only children whose parents had signed the consent form were included in this study. The patients' parents or guardians were free to withdraw their children from the trial without justification at any stage and any time of the evaluation.

After determining the initial plaque index level,<sup>10</sup> all schoolchildren were submitted to an educational and motivating program for oral hygiene through indirect instruction ("The Smiling Robot"), employing the same message for 15 minutes.<sup>9</sup>

The proposed educational resource was a robot specially designed to resemble a science fiction android, named "The Smiling Robot," whose movements and sounds were remotely controlled, as shown in Figure 1.

This robot emitted previously recorded messages by means of audio resources incorporated into it. The audio equipment is constituted by a cassette player with power amplifier, normally used in sound equipment of cars and loudspeakers. This set is fed by an electric battery (12V) also used in cars, which is recharged from a domestic electric net (127/220V), when necessary.

The elaborated message was recorded in a cassette tape, using the following resource: the voice of the speaker was recorded and digitally saved in a magnetic disk by a computer (Intel – Pentium 200 MHz), equipped with a multimedia plate, kind SoundBlaster. Using the resources of signals processing available in the Gold Wave software, the recorded voice was metallized, in order to simulate the voice of the robot. Sequentially, sonorous and musical effects were added. Once the message was recorded in the tape, we tested the synchronism of the sounds emitted by the robot and the movements that it performed.

The etiology and development of dental caries and periodontal disease, fluoride use, appropriate feeding habits, toothbrushing technique and dental floss use were carefully approached. The time spent for each message was approximately 15 minutes.

One experimental group and one control group were included.

### Group I (20 schoolchildren) – "The Smiling Robot" with motivation reinforcement.

After initial plaque index exam and motivation the schoolchildren were re-motivated in each return (after 30 and 60 days) using the same method. The plaque index exam was repeated after 30, 60 and 90 days.

### Group II (20 schoolchildren) – "The Smiling Robot" without motivation reinforcement (control).

These schoolchildren were initially examined and motivated as the group I but they did not receive any motivation afterwards. The plaque index exam was repeated after 30, 60 and 90 days.

The first message, transmitted to both groups, contained general information of prevention, as etiology of dental caries and periodontal disease, toothbrushing techniques, dental floss use, diet and fluoride. The second message, transmitted only to group I, contained more detailed information regarding dental caries, toothbrushing, diet and fluoride. The third and last message transmitted important aspects about periodontal disease and dental floss use.

The evaluation method used in this study was the O'Leary Plaque Index,<sup>27</sup> scored before and 30, 60 and 90 days after the application of the program. To disclose the dental plaque, tablets were given to children whose were instructed to hold it in mouth for 1 minute, spit it out and



Figure 1. "The Smiling Robot."

then, provide a mouthwash diluted in water.

The obtained results were submitted to statistical analysis by Mann-Whitney test to verify the difference between the experimental groups, and Wilcoxon test to observe differences among the evaluations.

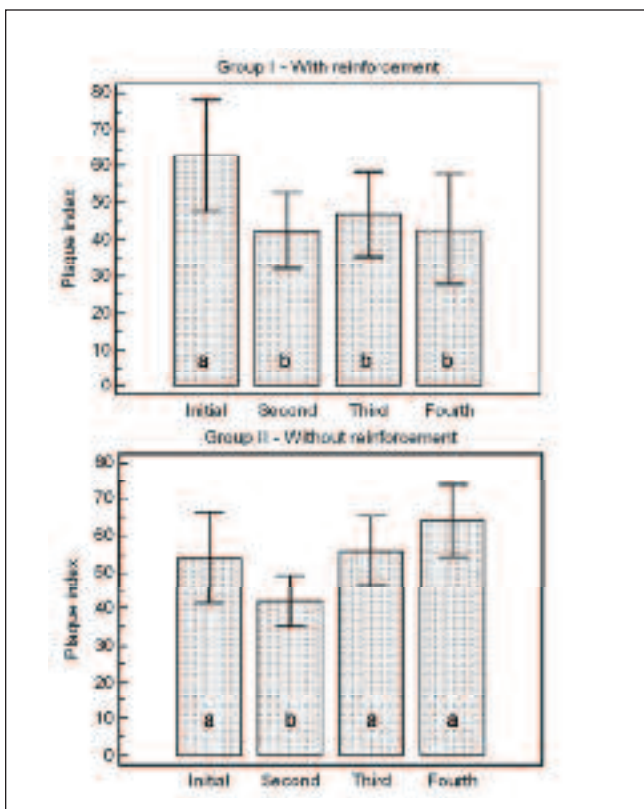
**RESULTS**

The data distribution is shown in table 2 as well the 95% of confidence interval for both groups. Comparing the groups, the plaque index decreasing could be observed in the group with reinforcement with statistically significant difference (Table 1,  $p < 0.05$ ).

For the group with reinforcement (group I), there was significant difference among the evaluations. The second, third and fourth evaluations showed significant lower plaque index (Wilcoxon,  $p < 0.01$ ) than the first evaluation, but there was no difference among them.

**Table 1.** Means (%) and standard deviations in the studied groups. Significant differences are represented by different upper case letters, considering the same column (Mann-Whitney test,  $p < 0.05$ ).

GROUP	EVALUATIONS			
	Initial	Second	Third	Fourth
I – with reinforcement	62.95a (± 28.51)	42.38a (± 19.64)	47.00a (± 21.42)	42.71a (± 28.38)
II – without reinforcement	53.86a (± 26.62)	42.20a (± 14.99)	55.91b (± 20.09)	63.91b (± 20.81)



**Table 2.** Averages of plaque index values obtained in the different evaluations and 95% of confidence interval for both groups. Significant differences are represented by different letters (Wilcoxon test,  $p < 0.05$ ).

For the group without reinforcement (group II), significant decrease in the plaque index (Wilcoxon  $p < 0.05$ ) was found 30 days after the application of the program (second evaluation) when compared to the first, third and fourth evaluations. No difference was found between the third and fourth evaluations. Moreover, after 90 days, the plaque index was statistically higher than the evaluation carried out before the application of the program.

**DISCUSSION**

In dentistry, motivation and education are procedures employed with the aim of promoting an increase in the level of knowledge of the patient and stimulating behavioral changes – mainly those concerning oral hygiene. Some studies point out the extreme importance of these educational-preventive programs that are applied with this intent.<sup>2,11-13</sup>

In an earlier investigation, the authors observed that the indirect method proposed may be effective, mainly concerning children motivation. It is interesting to notice that “The Smiling Robot” is an indirect motivation method and should be employed as an auxiliary motivation resource. The direct instruction is the main motivation resource and should be applied when the objective is to promote behavioral change.<sup>9</sup>

Dental practitioners know the difficulty of changing oral hygiene behavior. If a patient has had a lifelong history of poor oral hygiene, it is almost impossible to change that person into someone who meticulously cleans his or her teeth. This same difficulty is present in any behavioral change situation in all aspects of life. Behavioral change is affected primarily by education, and this must be a major part of any attempt to change oral hygiene. If patients understand the reasons for suggested changes in oral hygiene behavior, and the consequences of continuing poor oral hygiene conditions, the potential for behavioral change is greatly improved.<sup>14</sup>

The guiding principles found in health behavior models provide useful methods to the oral health care providers in promoting effective individual client behaviors. Theories provide explanations about observable facts in a systematic manner. Research regarding health behavior has explored the effectiveness and applicability of various health models in oral health behavior modification. The Health Belief Model, Transtheoretical Model and Stages of Change, Theory of Reasoned Action, Self-Efficacy, Locus of Control, and Sense of Coherence are examples of models that focus on individuals assuming responsibility for their own health. Understanding the strengths of each and their applicability to health behaviors is critical for oral health care providers who work with patients to adopt methods and modify behaviors that contribute to good oral health.<sup>15</sup>

The education and motivation are procedures employed with the intent of promoting an increase in the patients’ level of knowledge and stimulating behavioral changes, mainly concerning oral hygiene. In this way, to obtain the expected results the dentist must resort to appropriate methods compatible to the target public.<sup>9</sup>

Indirect methods for motivating oral health care, spe-

cially regarding oral hygiene, are very useful, both as one auxiliary motivation resource as a main motivation. When working with the infantile population, verbally repeated instruction may be monotonous and tedious, depressing the learning and becoming anti-motivating. The use of one attractive method arousing children's attention should be stimulated.

In this study, data showed a positive correlation between the method of motivation and reinforcement and plaque index decreasing, in agreement with Okada *et al*<sup>16</sup> and Leal *et al*.<sup>2</sup> It was observed in this study that "The Smiling Robot" showed a positive initial impact on children of both groups. This positive effect can be attributed to the characteristics of the android, which presents sounds and movements remotely controlled, transmitting educational messages with metallized voice and sound effects, apart from singing a song that teaches how to brush the teeth. This may have excited the children's interest and aroused their creativity, turning the learning process into a pleasant activity.

Leal *et al*<sup>2</sup> reported that the preschool children improved their performance in brushing their teeth after the methods of motivation were applied, in accordance with the present study. Concerning this aspect, it could be affirmed that motivation and education are some of the most important factors in ensuring plaque control.<sup>17</sup>

However, it could be observed that this initial impact was dissipated with the time, when motivation was not continuously applied, as it happened to group II, in which "The Smiling Robot" was used without periodic reinforcement. In this group, which received the motivation session once time, there was a significant reduction in the plaque index in the second evaluation, while in the subsequent evaluations the plaque index increased. In the fourth and final evaluation, the plaque index values were superior to the first evaluation, accomplished before the application of the program. This fact demonstrates that, if applied once isolated time, the educational program does not present effect, and children behave as if they had not been educated and motivated.

Data also evidenced in the present work a statistically significant reduction in the plaque index of the group that received periodic reinforcement with "The Smiling Robot", showing that the continuous motivation is able to promote change of habits and to maintain appropriate oral hygiene levels.

Similar results were also observed in earlier investigations,<sup>18,19</sup> which stood out the effectiveness of the continuous motivation and the necessity of periodic reinforcement in an attempt to remain a good oral health. Besides, Axelsson *et al*<sup>1</sup> also noticed behavioral change in patients periodically motivated. Buich *et al*,<sup>20</sup> also obtained significant reduction in the plaque index of schoolchildren, suggesting that educational-preventive programs applied continuously in schools may guide the students to practice an appropriate oral hygiene.

The findings of the present work suggest that when the educational process is continuously applied, behavioral changes and improved oral health are easier achieved.

## CONCLUSIONS

The indirect oral hygiene instruction with "The Smiling Robot" showed a positive initial impact on the reduction of the plaque index in the analyzed children. The group that received periodic motivation reinforcements showed more suitable results at long term with significant reduction in the plaque index in the course of the evaluations.

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