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Original Article

Dentistry Section

# Comparison of Two Brushing Methods- Fone's vs Modified Bass Method in Visually Impaired Children Using the Audio Tactile Performance (ATP) Technique

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## ABSTRACT

**Background:** To evaluate the effectiveness of two brushing techniques - Fone's method Vs Modified Bass method in visually impaired children using the Audio Tactile Performance (ATP) technique.

**Settings and design:** Eighty institutionalised visually impaired children, aged between 4-15 y were randomly selected.

**Materials and Methods:** Baseline plaque scores were recorded using Silness and Loe plaque index. The subjects were then randomly divided into two groups of which, 40 were trained with Fone's method and and other 40 with Modified Bass method using the ATP technique. Plaque scores were evaluated again after two months. The effectiveness of oral hygiene maintenance in these children were analysed and evaluated statistically.

**Statistical analysis:** Data was analysed using Wilcoxon signed rank test and paired t-test.

**Results:** Both Fone's and Modified Bass method showed reduction in plaque which was statistically significant. There was an increase in the frequency of tooth brushing following training.

**Conclusion:** The Fone's method and the Modified Bass method of tooth brushing showed a significant improvement in the oral hygiene of visually impaired children when taught using an effective communication tool, the ATP technique.


**Keywords:** Dental care, Dental plaque, Disability, Oral hygiene

## INTRODUCTION

Dental plaque plays an important role in the aetiology of dental caries, gingivitis and its progression to periodontitis. Regular removal of dento-gingival plaque is crucial for the maintenance of periodontal health [1]. Mechanical cleaning is recognised to be potentially useful in controlling supra gingival plaque, but expecting that each individual will maintain a good standard of oral hygiene seems to be beyond most people's capabilities [2].

A number of factors have been suggested as playing a role in motivating the patients for performing effective oral hygiene procedures. Most important amongst these factors are patient's recognition of the oral problems and the awareness of various preventive oral hygiene measures [3].

The most important criteria to consider when working with special children is the need to emphasise the importance of preventive dental care [4]. Certain modifications to behaviour management approaches based on degree of disability, psychological development and social integration may facilitate the provision of dental treatment [5].

WHO 1980 has defined handicapped person as "one who over an appreciable period is prevented by physical or mental conditions from full participation in the normal activities of their age groups including those of social, recreational, educational and vocational nature" [6].

From 2002 WHO survey, the estimated number of visually impaired children below the age of 15 y is almost 1.4 million.These children tend to have poorer oral hygiene than sighted children [7,8]. The absence of visual stimuli prevents the child from rapid learning and thereby it poses a great challenge for the dentist in teaching them toothbrushing techniques [3].

Providing comprehensive dental care for the visually impaired children is not only rewarding but also a community service that dentists are obligated to fulfil in their career [9]. The normal typical techniques used to show the dental deposits cannot be used in these children [10]. The visually impaired depend much more on noise, speech and touch to orient themselves to a situation [1].

Adaptation to new oral hygiene measures using manual tooth brush requires a medium of communication for these special children as the normal eye to eye level of contact cannot be established with them. As institutionalised school children are relatively accessible and already in a learning environment, dental health education in such settings are most effective. (Zickert et al., Albandar et al., Morishita et al.,) [11-13].

## ATP TECHNIQUE

Visually impaired children are challenged in learning everyday skills, maintaining proper oral hygiene being one [13]. They require a special health education method by which they could easily master the correct brushing technique. 'Audio tactile performance technique' (ATP), a health education method that is specially designed, is a very effective communication tool to educate these children regarding oral hygiene maintenance. Keeping this in mind, the present study was aimed to evaluate the effectiveness of two brushing methods using the ATP technique.

## MATERIALS AND METHODS

Eighty visually impaired children between ages 4-15 yrs were randomly selected from 'The School for the Blind' Palayamkottai, Tamil Nadu, India. The school provides education upto the 10$^{th}$ standard. Among the 80 children, 51 were males and 29 were female children; 41 were partially blind and 39 were totally blind. Verbal and written consent was obtained from the school authorities before the start of the study. Institutional ethical committee clearance was also obtained.

On the first day, there was an interactive session wherein, a good rapport was established with the children in a very friendlier atmosphere. The personal details of the children were recorded on a proforma which also included the details about their tooth brushing habits.

On the second day, there was a verbal session where the importance of teeth and oral hygiene maintenance was explained to the children. A demonstration of the correct method of toothbrushing was given to the school teachers with a brushing model. On the third day, the baseline plaque scores of the children were recorded for full mouth using The Silness and Loe plaque index [14]. The children were examined at their school, two hours after breakfast, seated on an ordinary chair, under visible daylight using a pen torch, sterile mouth mirror and CPI probe. Protective cross infection control measures with disposable gloves and mask were all taken.

The plaque score for full mouth was calculated. The children were categorised based on their oral hygiene status with their overall plaque scores as excellent, good, fair or poor. Tooth brushes with numbers on them and tooth pastes were given to the children. The children were randomly divided into two groups, such that 40 were taught Fone's method and the other 40 were taught Modified Bass method of toothbrushing using the ATP technique.

The ATP technique incorporates three components namely, Audio, Tactile and Performance. The children were first verbally informed about the importance of teeth and method of brushing (AUDIO). They were made to feel the teeth on a large sized model (TACTILE). The children were then taught to brush on the model with assistance. They were asked to feel their own teeth with their tongue and deposits if present was identified with the feeling of roughness. The children were taught to brush their own teeth with assistance. (PERFORMANCE).

This training continued until each child could brush his/ her own teeth independently with confidence, with the appropriate brushing method that was taught to them. The children were also taught about the amount of tooth paste to be used. The teachers were asked to supervise the children daily during tooth brushing. They constantly motivated the children regarding the importance of oral hygiene and the correct method of tooth brushing.

After two months, a follow up was done and the plaque scores were recorded to evaluate the improvement in the oral hygiene status. The children were asked what they could recollect from the earlier session. They were asked how they had brushed their teeth during the two months and they were asked to show it on a model. The tooth brushes of the children were also evaluated to find out if it had been used or not. Flared bristles were suggestive that the numbered tooth brushes that were distributed to the children had been used by them. The teachers who were with the children at the residential blind school were asked if proper brushing was done by the children.

All the data obtained was entered in excel sheets and statistical analysis was done using the Wilcoxon's sign rank test and paired t-test. The difference in plaque scores before and after health education was noted. The statistical significance was evaluated to determine the effectiveness of ATP in training visually impaired children and the efficacy of Fone's method & Modified Bass method was compared.

## RESULTS

Out of the 80 subjects in the study, 51 were males and 29 were females. Of these, 39 were totally blind and 41 were partially blind.

[Table/Fig-1a,1b] show distribution of the study population according to method and frequency of tooth brushing. [Table/Fig-1a] shows that 77 subjects used tooth brush and tooth paste to clean their teeth at baseline. A slight increase in number to 80 was observed post-health education which was not statistically significant (p=0.30)

[Table/Fig-1b] shows that there were 68 subjects who brushed twice daily after health education compared to only 10 subjects before health education. The difference was statistically significant (p<.0001).

The distribution of subjects according to plaque scores is shown in [Table/Fig-2]. There were 3, 68 and 9 subjects respectively in good, fair and poor categories at baseline. After health education 72, 8 and 0 subjects respectively were categorized as in good, fair or poor. The difference was statistically significant (p< 0.0001 with p= -9.54).

Mean plaque scores are shown in [Table/Fig-3]. Mean plaque scores pre- and post-health education were 1.499375(+/- 0.30) and 0.687(+/- 0.26) respectively. The difference was statistically significant (p<.0001).thus the ATP technique is a very effective health education method.

Mean plaque scores of the children taught with Fone's technique are shown in [Table/Fig-4]. Mean plaque scores pre- and post-health education were 1.498125 and 0.6804575 respectively. The difference was statistically significant (p<.0001) showing that Fone's technique was an effective method for improving oral hygiene in visually impaired children.

Mean plaque scores of the children who were taught Modified Bass method of tooth brushing are shown in [Table/Fig-5]. Mean plaque scores pre- and post-health education were 1.476875 and 0.6935875 respectively. The difference was statistically significant (p<.0001) showing that Modified Bass method brought about a significant improvement in oral hygiene.

Mean plaque scores of the partially blind children are shown in [Table/Fig-6]. Mean plaque scores pre- and post-health education

| | Prehealth education frequency | Posthealth education frequency | Mc Nemar's Chi-square p-value |
|---|---|---|---|
| Tooth brush & Tooth paste | 77 | 80 | p =0.30 |
| Finger & Tooth paste/ Powder | 3 | 0 | |

**[Table/Fig-1a]:** Distribution of children according to material used in oral hygiene practise

| | Prehealth education frequency | Posthealth education frequency | Mc Nemar's Chi-square p-value |
|---|---|---|---|
| Twice daily | 10 | 68 | p = <.0001 |
| Once daily | 70 | 12 | |

**[Table/Fig-1b]:** Distribution of children according to frequency of tooth brushing

| | Prehealth education frequency | Posthealth education frequency | Wilcoxon signed- rank test p-value |
|---|---|---|---|
| Excellent: 0 | 0 | 0 | -9.54 p<.0001 |
| Good: 0.1- 0.9 | 3 | 72 | |
| Fair: 1- 1.9 | 68 | 8 | |
| Poor: 2-3 | 9 | 0 | |
| Total | 80 | 80 | |

**[Table/Fig-2]:** Distribution of children according to their oral hygiene status

| | Mean Pre Plaque | Mean Post Plaque | Mean Difference ± Std. Deviation | Sig (2 tailed) |
|---|---|---|---|---|
| Pre Plaque- Post Plaque scores | 1.499375 (+/- 0.30) | 0.687 (+/- 0.26) | 0.812375 ± 0.28 | <.0001 |

**[Table/Fig-3]:** Comparison of pre and post mean plaque scores in the group of visually impaired children

| | |
|---|---|
| Mean Pre Plaque score | 1.498125 |
| Mean Post Plaque score | 0.6804575 |
| Mean difference | 0.8176675 |

**[Table/Fig-4]:** Mean difference in the plaque scores of the children who were taught Fone's technique

were 1.439 and 0.60589 respectively. The difference was statistically significant (p<.0001). The ATP technique was effective in improving the oral hygiene of partially blind children.

Mean plaque scores of the totally blind children are shown in [Table/Fig-7]. Mean plaque scores pre- and post-health education were 1.538 and 0.7723 respectively. The difference was statistically significant (p<.0001). The ATP technique was effective in improving the oral hygiene of totally blind children.

The comparison of mean post plaque scores of visually impaired children who were taught with Fone's method and Modified Bass method of tooth brushing is given in [Table/Fig-8]. The mean post plaque score of the children who were taught Fone's technique is 0.680458. The mean post plaque score of the children who were taught Modified Bass technique is 0.693588.The difference was not statistically significant. Though both Fone's method and Modified Bass method brought about a significant improvement in the oral hygiene of the visually impaired children when taught using the ATP technique, on comparing both these methods, none was superior to the other.

The comparison of mean post plaque scores of partially blind and totally blind children is given in [Table/Fig-9]. The mean post plaque score of the partially blind children is 0.616813. The mean post plaque score of the totally blind children is 0.759956. The difference was statistically significant showing that partially blind children mastered better tooth brushing when compared to the totally blind children.

| | |
|---|---|
| Mean Pre Plaque score | 1.476875 |
| Mean Post Plaque score | 0.6935875 |
| Mean difference | 0.7832875 |

**[Table/Fig-5]:** Mean difference in the plaque scores of the children who were taught Modified Bass method

| | |
|---|---|
| Mean Pre Plaque score | 1.439 |
| Mean Post Plaque score | 0.60589 |
| Mean difference | 0.83311 |

**[Table/Fig-6]:** Mean difference in plaque scores of the partially blind children before & after teaching them tooth brushing

| | |
|---|---|
| Mean Pre Plaque score | 1.538 |
| Mean Post Plaque score | 0.7723 |
| Mean difference | 0.7657 |

**[Table/Fig-7]:** Mean difference in plaque scores of the totally blind children before & after teaching them tooth brushing

| | Mean ± Standard deviation | p-value |
|---|---|---|
| Fone's technique | 0.680458 ±0.262369 | 0.821243 |
| Modified Bass technique | 0.693588 ± 0.267314 | Not Significant |

**[Table/Fig-8]:** Comparison of the post plaque scores b/w the Fone's technique & Modified Bass method

| | Mean ± Standard deviation | p-value |
|---|---|---|
| PB | 0.616813 ± 0.194281 | 0.010332 |
| TB | 0.759956 ± 0.307663 | Significant |

**[Table/Fig-9]:** Comparison of the post plaque scores b/w the totally blind & partially blind children

## DISCUSSION

Visual impairment is the loss of vision that varies in degree between individuals. It results from disease, trauma, congenital malformations or degenerative conditions. The highest degree of visual impairment is that which cannot be corrected by conventional means, such as medication, refractive correction or surgery [15].

The degree of blindness varies in visual impairment. Some individuals who may be considered blind may not be totally without sight. They may be able to distinguish images, light, colours and even be able to read large prints. Low vision is different from legal blindness and covers a wide range of conditions. Visual impairment can interfere with the person's ability to perform everyday activities including tooth brushing [15].

Visually impaired people deserve the same opportunities for oral health maintenance as those who are healthy. But unfortunately the greatest unattended health needs of visually impaired people are the maintenance of their oral health. They only express concern about the functional aspect of their oral cavity and pain is the only factor responsible for seeking dental care. They understand the functional importance of the teeth and mouth though they are unable to see. The aesthetic aspect of oral cavity is less relevant to these individuals [Maciel et al.,] [16].

Visually impaired children are challenged in learning everyday skills, maintaining proper oral hygiene being one amongst them. These children have been found to have poorer oral hygiene as compared to their sighted peers. Adequate instructions towards proper care of the teeth and oral tissues are essential in these children [17,18].

Effective tooth brushing enables the maintenance of good oral hygiene and thereby the additional burden of oral diseases on the visually impaired children is reduced. Motivating these special children is a very challenging task for the dentist [10]. Many a times, fear, lack of experience, lack of time and lack of financial resources hinders the dentist in serving these children.

Communication and exchange of information between the patient and the dentist is not only essential for good clinical practise but also to establish a good rapport and trust with the child [15]. This eye level effective communication is not possible in the visually impaired children. So the ATP technique was advocated to teach them tooth brushing.

Since the children in the present study were in an institutionalised setting, it was easy for them to learn the brushing technique. Moreover, as the teachers were also given a demo about tooth brushing, they were able to provide a positive reinforcement to the children everyday about the importance and the correct method of tooth brushing. The importance of positive reinforcement in improving the oral health status was similarly suggested by Hebbal et al., [3] from his study. He reported that, meticulous training and reinforcement by health educators leads to success of oral health programs.

Before the start of the study, only 10 children brushed their teeth twice daily. With the introduction of the ATP technique, the frequency increased to twice daily. During the follow up, at the end of two months, 68 children had brushed their teeth twice daily. Positive reinforcement to brush the teeth twice daily was done by the teachers who motivated the children every day.

There was a significant improvement of the oral hygiene status of the children from poor and fair categories to the good category. Most of the children were in the good category of oral hygiene following health education. At the baseline, only three children were in the good category of oral hygiene. At the end of health education, 72 children moved into the good category of oral hygiene with significant reduction in the plaque scores and significant improvement in the oral hygiene status.

This was similarly reported in the 9 month follow-up study done amongst 96 visually impaired children aged 6-18 yrs by Hebbal et al., [3]. He reported that, imparting oral health education through the ATP technique increased the frequency of tooth brushing and most of the children entered into the good category of oral hygiene from the poor and fair categories.

In the present study, the efficacy of the Modified Bass and the Fone's method was compared using the ATP technique. The modified Bass technique is superior in cleansing the interproximal areas & gingival 3rd of tooth surfaces as reported by Apiwan Smutkeeree et al., [19,20].

Fone's method brought about a clear advantage in terms of gingivitis and hygiene skills and it was easier to remember after a single training session as reported in Research by Dental Tribune International. So, both these brushing methods were compared in the present study.

Fone's method was easily understood and remembered by the children during the follow up after two months in the present study. The children also enjoyed brushing their teeth using the Fone's method and this was in accordance with the study done by Daniela Harnacke et al., [21]. Modified Bass technique is more difficult to integrate into everyday life.

In the present study, the motivation and the meticulous training provided by the school teachers has led to the success of the oral health program. 'Audio tactile performance technique' (ATP), is an effective tool in educating the visually impaired children for maintaining good oral hygiene.

This was similar to the results of a study conducted by Yalcinkaya and Atalay [22]. They evaluated the oral hygiene status among 65 visually impaired students between 7 & 17 y of age and a verbal questionnaire was also developed to determine their knowledge and awareness about the importance of oral hygiene. From the follow up results of the study, it was suggested that, with an appropriate programme, the oral health status and knowledge of visually impaired students could be improved.

In the present study partially blind children mastered better tooth brushing when compared to the totally blind children with significant reduction in the plaque scores. This was in accordance with the study done among 159 visually impaired children aged 5-17 y by Krishna kumar et al., [23] who suggested that partially blind children had better oral health status when compared with the totally blind children.

Motor activity affects the development of language & perception. The present study showed that the use of manual tooth brush was effective with improved manual dexterity by the introduction of the ATP technique.

## LIMITATIONS OF THE STUDY

Children at ages 4-, 7-, 12- and 15 differ in their cognitive ability and manual dexterity to perform tooth brushing. Since tooth brushing is a fine motor activity younger children cannot perform it completely without assistance. In addition motivation for younger children differs from that used for 15-year-old with more developed cognitive abilities which explain the limitation of the present study. The time taken by each child for tooth brushing everyday differs, which can also be considered as a limitation of the present study.

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## CONCLUSION

Both Fone's method and Modified Bass method of tooth brushing were very effective in improving the oral hygiene of visually impaired children when it was taught using an effective communication tool, the ATP technique. The present study showed that effective health education could alter the brushing method and frequency effectively.

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