# An analysis of methods of toothbrushing recommended by dental associations, toothpaste and toothbrush companies and in dental texts

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RESEARCH

**IN BRIEF**

- Brings attention to the unacceptably wide diversity in recommendations on toothbrushing methods.
- Highlights the methods recommended by toothpaste companies differed from those of dental associations, as did advice in dental textbooks and research-based sources.
- Stresses higher grades of evidence of effectiveness of toothbrushing techniques are required.

**VERIFIABLE CPD PAPER**

**Objectives** To assess the methods of toothbrushing recommended for both adults and children by dental associations, toothpaste and toothbrush companies and professional sources such as in dental textbooks and by experts. Secondly, to compare the advice by source and whether recommendations differed for adults and for children. **Methods** Examination of online material on methods of toothbrushing from dental associations, toothpaste and toothbrush companies and associated organisations providing professional advice; as well as from dental texts. **Results** There was a wide diversity between recommendations on toothbrushing techniques, how often people should brush their teeth and for how long. The most common method recommended was the Modified Bass technique, by 19. Eleven recommended the Bass technique, ten recommended the Fones technique and five recommended the Scrub technique. The methods recommended by companies, mainly toothpaste companies, differed from those of dental associations, as did advice in dental textbooks and research-based sources. There was a wide difference in the toothbrushing methods recommended for adults and for children. **Conclusions** The unacceptably large diversity in recommendations on what toothbrushing method to use should concern the dental profession. Higher grades of evidence of effectiveness of toothbrushing techniques are required to inform professional bodies that develop guidelines on toothbrushing.

## INTRODUCTION

Universally, dentists, dental associations and government bodies recommend regular daily toothbrushing because it is so important for preventing periodontal disease and caries. One would expect some professional consensus on which methods of toothbrushing to recommend. Evaluations on the effectiveness of dental health education indicate that adherence to recommendations on toothbrushing are not good.[1] This may be related to the fact that the methods of toothbrushing recommended are either too difficult to perform or conflict with what patients have learned from other authorities or adverts for toothpastes.

The toothbrushing techniques currently recommended date mainly from the early half of the twentieth century. There are six methods of manual toothbrushing that are recommended by dentists and dental associations. They differ in a number of aspects and are recommended for different age and patient groups. The oldest toothbrushing method was described in 1913 by Fones and is recommended mainly for children.[2,3] The Bass technique places emphasis on the removal of plaque from the area above and just below the gingival margin.[4] It was changed to the Modified Bass where the bristle position and predominantly horizontal brush movements in the Bass method are retained, but vertical and sweeping motions to create circles are added.[5] The Stillman technique[6] is similar to the Bass technique. The vertical motions of the Stillman technique may be combined with the Bass, as prescribed for the Modified Bass. Charters suggested angling the brush head at 45° coronaly to the margin rather than apically. A 'vibratory' and 'slight rotary' movement is then applied before moving to the next group of teeth. The Scrub technique is the simplest of the techniques, with the toothbrush held parallel to the gingiva and horizontal motions used to 'scrub' the gingival crevice in an ordered fashion, before using the same method to clean the occlusal and lingual surfaces.[7] Some techniques have undergone modifications. The Hirschfeld's technique is a modification of the Fone's technique where the circular motion is much smaller and concentrated over the gingival crevice.[3] Frequency and duration of brushing are usually included with recommendations concerning the method of toothbrushing. There appears to be no consensus among professional bodies on the best method of toothbrushing for the general population or for people of different ages or with particular dental conditions. For example, a study of paediatric dental association recommendations on children's oral hygiene in ten countries found that that there was a very wide diversity in advice, particularly on toothbrushing techniques, and the descriptions of the methods were not very helpful.[8] Some dental professional organisations mentioned 'gentle motions', others 'small circular motions', 'short back and forth motions at chewing surfaces', 'avoid flicking and circular motions'. The results of the Dos Santos *et al.*[8] study highlight the difference in general guidelines on toothbrushing between dental associations. Based on the findings by Dos Santos *et al.*[8]

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on toothbrushing methods recommended for children, a larger study was planned with the following objectives: to assess the methods of toothbrushing recommended for both adults and children by dental associations, toothpaste and toothbrush companies and professional dental sources such as in dental textbooks and by experts. Second, to compare the advice by source and whether recommendations differed for adults and for children.

## METHODS

Information on toothbrushing techniques recommended by dental associations, industry sources, textbooks, research articles and other sources were examined. Advice regarding brushing frequency and duration was also collected. The websites of dental associations worldwide were examined for recommendations on toothbrushing. To focus the search, only dental associations in ten countries that were considered to have a significant dental research output were included.[9] They were Australia, Brazil, Canada, Denmark, Finland, Japan, Norway, Sweden, the United Kingdom and the United States of America. The selection of the above countries may risk omission of relevant guidance produced by other countries. However, keeping a standardised inclusion criterion with the Dos Santos study[8] allows for better comparison of results while providing a diverse global sample. Dental association web pages were identified using an Internet search engine (Google). Each dental association's website was navigated to locate resources detailing toothbrushing. Separate guidance regarding both guidance for adults and children were sought, wherever possible. If the website had a search function, the terms 'toothbrushing' 'oral hygiene' and 'brushing' was entered to assist finding the required information. If toothbrushing guidelines were not located in this manner, manual navigation was used. If that did not yield results, the 'advanced search' utility in Google (http://www.google.com/advanced_search) was used with the abovementioned keywords. The websites of dental associations in non-English speaking countries were translated with Google Translate (http://translate.google.co.uk/) to evaluate written guidelines.

Toothbrushing guidelines were sought from toothpaste and toothbrush company sources in a similar manner to those used for dental associations. A list of companies was obtained using the website 'Ranker' (http://www.ranker.com/). In August 2013, the list 'Toothpaste Brands' contained 29 companies[10] and the list 'Toothbrush Brands' contained 31 companies.[11] The same ten country inclusion criteria as outlined for dental associations was used. Therefore, to be included a company must retail dental products including toothbrushes or toothpaste in one of the ten listed countries.

Dental textbooks on various dental subjects in the dental hygiene section in the library of the Eastman Dental Hospital, London, were examined to assess which toothbrushing guidelines they recommended. To supplement this search, 'toothbrushing methods', 'toothbrushing recommendations' and 'toothbrushing guidelines' were entered into Google Books (http://books.google.com/) to identify further sources. The results of these searches were manually browsed to identify which books provided recommendations. To locate guidelines from other countries than the ten included, Google books were accessed in their native language and the translated terms of the above search terms accessed.

There is extensive literature on the subject of toothbrushing methods. Clinical trials, observational studies and opinion articles published in journals describe techniques. The conclusions of studies on toothbrushing techniques and editorial opinions on brushing technique were examined. As different types of research was analysed, a research search engine that included as many published sources in multiple languages was used. The search engine used was Google Scholar (http://scholar.google.com/). As with the search for textbook recommendations, the operating terms used to identify published articles will include 'toothbrushing methods', 'toothbrushing recommendations' and 'toothbrushing guidelines'. Sources that did not fit into any of the above categories are described separately. They include independent health websites offering professional opinions on oral hygiene, dental health campaigns and bodies commissioned to provide healthcare guidelines. These miscellaneous sources were identified using a general search engine such as Google. Again, the terms 'toothbrushing methods', 'toothbrushing recommendations' and 'toothbrushing guidelines' were entered. Results that did not fit into any of the above categories were considered for inclusion under this category, provided the recommendations were from a professional and not a lay source.

Once the data sources were identified, each source was reviewed and information collected. A score sheet was used to record relevant information. Some sources did not recommend a toothbrushing method by a named description, such as Bass or Stillman technique, particularly when issuing guidelines to lay audiences. The advice given was descriptions of movements or positioning of toothbrush bristles. This created a problem for classifying and naming techniques. A system of classification was therefore developed to overcome that problem. Each named technique was used and divided into two main observed components; angulation of toothbrush bristles relative to the gingival sulcus and dimensional movement. Toothbrush movements refers to the direction the toothbrush head should move in the buccal or lingual sulcus. Movements were classified into these three types. Movements moving the brush towards and away from the gingivae in the third plane, such as 'vibratory' movements are described in several formal brushing techniques. Bristle position was classified in a similar manner. Bristle position was recorded as being either 45° apical, coronal or parallel to the long axis of the tooth.

Supplementary information on toothbrushing frequency, duration and powered toothbrushing recommendation was collected. Each item of collected information was assigned a code and entered on to a data capture form. Codes were assigned on a alphanumerical scale to best summarise the guidance given.

Some sources presented pictures or video resources to either supplement or replace recommendations printed in the text. Recommendations in picture or video form may be subject to greater interpretation than text, either because the pictures/videos were unclear. To avoid misinterpretation or bias by a single examiner, pictures and videos were reviewed independently by three dentists and a consensus view was recorded.

## RESULTS

Of 66 sources located, 58 had one or more items of codeable data. Eight sources did not have any useable data. It was not possible to discern a brushing technique from 19 sources.

The Modified Bass technique was the most commonly recommended technique. Nineteen sources recommended it. Eleven sources recommended the Bass technique, ten recommended Fones, five recommended Scrub and two recommended the Stillman technique. None recommended the Charters technique. Nineteen sources did not provide information on brushing frequency. Forty-two sources recommended twice daily brushing. One recommended brushing three times daily. Twenty-five did not provide information on brushing duration, 26 recommended brushing for 2 minutes, 12 recommended brushing for 2-3 minutes and 2 recommended brushing for 3 minutes.

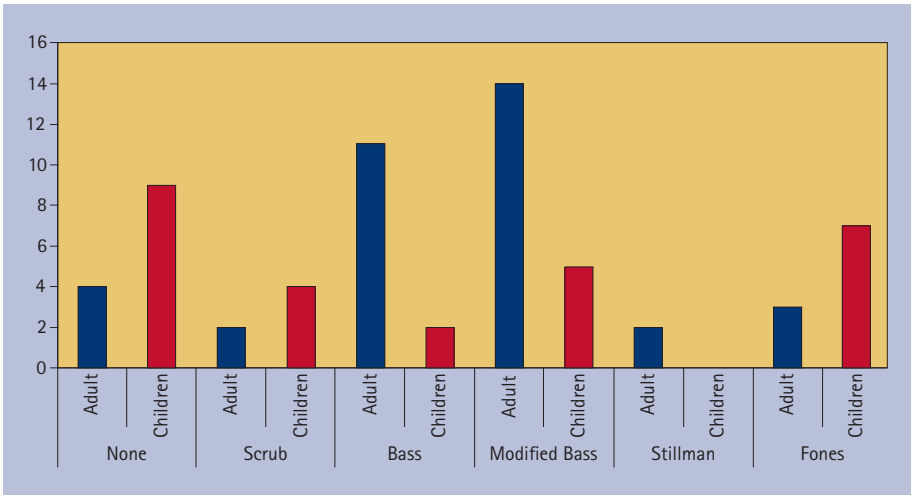


**Fig. 1 Differences in techniques recommended for adults and for children**

One source recommended brushing for more than 3 minutes.

Sources were divided into five categories; dental association, industry, textbook, research and miscellaneous. Of the 17 dental associations, 15 contained one or more guidelines. It was not possible to identify a brushing technique from fivedental associations. Six dental associations recommended the Modified Bass technique, none the Bass technique, three the Scrub and three the Fones technique. None recommended the Stillman or Charters techniques.

Of 16 toothpaste and toothbrush company sources, ten had one or more guidelines and six had no useable information. It was not possible to discern a brushing technique from eight sources. Three sources recommended the Bass technique, three the Fones technique, one the Modified Bass and one the Stillman technique. None recommended the Scrub or Charters techniques.

All ten textbooks reviewed contained one or more toothbrushing methods. Three recommended the Bass technique, three the Modified Bass, one the Scrub and one the Fones technique. None recommended the Stillman or Charters techniques.

Of ten research sources, all contained one or more items of codeable data. Three recommended the Bass technique, four the Modified Bass, two the Fones and one the Stillman technique. None recommended the Charters or Scrub techniques. Of 13 miscellaneous research sources, all contained one or more items of codeable data. Five recommended the Modified Bass technique, two the Bass technique, one each recommended the Scrub and Fones techniques. None recommended the Stillman or Charters techniques.

Recommendations on which toothbrushing method to use for adults differed from those for children (Fig. 1). Thirty-six sources contained codeable adult data on toothbrushing method; 14 recommended the Modified Bass technique, 11 the Bass, 3 the Fones and 2 the Scrub technique. None recommended the Stillman or Charters techniques. Twenty-seven sources contained codeable data for children on toothbrushing method. Seven recommended the Fones technique, five the Modified Bass, four the Scrub and two the Bass technique. None recommended the Stillman or Charters techniques.

## DISCUSSION

The main finding from this study was the wide diversity between recommendations on toothbrushing techniques, how often people should brush their teeth and for how long. The findings from this study broadly agree with those of Dos Santos *et al.*[8] on guidelines for methods for children issued by dental associations. The wide diversity in recommendations should be a matter of concern for the dental profession and dental regulatory bodies. Toothbrushing is the cornerstone of dental health education to prevent caries and periodontal disease. The fact that there is very little unanimity in recommendations on such a basic hygiene procedure from dental professional and toothpaste and toothbrush companies needs to be addressed. The diversity may be due to the sparseness of good research-based data on the effectiveness of a particular manual toothbrushing technique. In an era of evidence-based dentistry, such a gap in knowledge is surprising.

Possible reasons for the high frequency of recommending the Modified Bass technique is that there is some, but not very good evidence, suggesting that the technique is better than other techniques[12] in terms of improved plaque control and reducing gingival inflammation. However, there are few well conducted studies to support such findings. The evidence that does exist usually involves a small number of participants, with a short follow-up, and varying levels of bias. Moreover, another study suggests that other toothbrushing techniques are more effective than the Modified Bass technique.[13]

This study found that toothbrushing technique guidelines were not the only part of oral hygiene advice to be diverse. Recommendations on duration and frequency of toothbrushing differed between dental associations. There is conflicting evidence on what, how often[14,15] and for how long[16,17] people should brush their teeth.[16,17] Frequency has more robust guidelines when combined with recommendations on using fluoride toothpaste, rather than for reducing plaque and gingivitis.[18]

Dental associations varied widely in the method of toothbrushing they recommended. For example, six recommended the Modified Bass technique, three the Scrub and three the Fones method. The methods recommended by companies, mainly toothpaste companies, were poorly presented. Six did not have any useable material on toothbrushing and it was only possible to identify a brushing technique from eight sources. Their recommendations differed from those of dental associations; for example, only one industry source recommended the Modified Bass technique, whereas that method was the most commonly recommended by dental associations.

One would expect that textbooks used by dental students would provide sound clear consistent information on methods of toothbrushing. As with the other sources, there was considerable diversity of recommended methods. There was a similar diversity in recommendations from research-based sources.

Two sources were chosen specifically in the miscellaneous source section: *Delivering better oral health*[19] and *The scientific basis of dental health education*,[20] as they are produced by expert groups and used widely in the UK. *Delivering better oral health* is fully evidence-based wherever possible. It states, 'The patient's existing method of brushing may need to be modified, emphasising the need to systematically clean all tooth surfaces. No particular technique has been shown to be better than another (V).' The grade V evidence is derived from an expert recommendation by Sharma.[21] As previously mentioned, conflicting evidence means lower-grade evidence is the only current means to develop a guideline on the most appropriate toothbrushing method. *The scientific basis of dental health education* has a similar guideline when recommending the Scrub technique. It emphasises its simplicity and the lack of evidence for justifying a more complex and difficult toothbrushing technique.

There were large differences between the techniques recommended for adults and for children. The Bass and Modified Bass methods were most frequently advocated for adults but not for children. On the other hand, the Scrub and Fones techniques were more frequently recommended for children. The more technically simple Scrub and Fones techniques are advocated for children, with the more complex Bass and Modified Bass advocated for adults. Theories in behavioural sciences suggest techniques and behaviours an individual learns in childhood tend to be carried forward into adult life.[22] Health-related behaviour change in adults is more difficult to accomplish.[23] This difficulty is compounded by dental health educational methods being ineffective in leading to long-term individual dental health behaviour change.[24] This presents a dilemma: should a more complex brushing technique be taught at a younger age? Justification for such an approach should be based on evidence of the superiority of the complex techniques, such as the Modified Bass.[12,25] If, and that is a big if, the Modified Bass is the most effective technique for removing dental plaque, then it should be taught earlier in life. A counter viewpoint is that the more complex brushing technique, such as the Modified Bass, is not more effective[13,26] and thus does not merit being recommended over the Scrub or Fones methods techniques commonly recommended for children. Complex techniques such as Modified Bass are technically more demanding compared to simpler techniques such as Scrub or Fones. Therefore, children will find the Modified Bass more difficult to master.

This study has some limitations. First, the selection of sources was based mainly on availability of online sources. It was difficult to examine sources in foreign languages and therefore there were few non-English sources included in the study. Another limitation was that the coding of techniques may have been too broad. However, very few codes did not wholly correspond to described techniques. There were large amounts of missing data in the sources analysed, particularly with regard to the formal techniques. This was potentially unavoidable, however, as many sources only gave vague information.

## CONCLUSIONS

There was unacceptably very wide diversity in recommendations on toothbrushing techniques and on how often people should brush their teeth and for how long. Such diversity in recommendations should be of serious concern to the dental profession. There is an urgent need for research into the comparative effectiveness of brushing methods. Higher grades of evidence are required to inform professional bodies that develop guidelines.


1. Watt R G, Marinho V C. Does oral health promotion improve oral hygiene and gingival health? *Periodontol 2000* 2005; **37:** 35–47.
2. Bhat S S, Hegde K S, George R M. Microbial contamination of tooth brushes and their decontamination. *J Indian Soc Pedod Prev Dent* 2003; **3:** 108–112.
3. O'Toole M T. *Mosby's medical dictionary*. 9th ed. St Louis: Elsevier Health Sciences, 2013.
4. Bass C C. The optimum characteristics of toothbrushes for personal oral hygiene. *Dental Items Interest* 1948; **70:** 921–934.
5. Ganss C, Schlueter N, Preiss S, Klimek J. Tooth brushing habits in uninstructed adults- frequency, technique, duration and force. *Clin Oral Investig* 2009; **13:** 203–208.
6. Stillman P R. A philosophy of treatment of periodontal disease. *Dental Digest* 1932; **38:** 315–322.
7. Phinney D, Halstead J. *Delmar's dental assisting: a comprehensive approach*. New York: Cengage Learning, 2003.
8. Dos Santos A, Nadanovsky P, de Oliveira B H. Inconsistencies in recommendations on oral hygiene practices for children by professional dental and paediatric organizations in ten countries. *Int J Paediatr Dent* 2011; **21:** 223–231.
9. Gil-Montoya J A, Navarrete-Cortes J, Pulgar R. World dental research production: an ISI database approach. *Eur J Oral Sci* 2006; **114:** 102–108.
10. *Ranker: List of toothpaste brands*. Online list available at http://www.webcitation.org/6IzjO4qXJ (accessed June 2014).
11. R*anker: List of Toothbrush brands*. Online list available at: http: /www.webcitation.org/6J8dN03iu. (accessed June 2014).
12. Poyato-Ferrera M, Segura-Egea J J, Bullón-Fernández P. Comparison of modified Bass technique with normal toothbrushing practices for efficacy in supragingival plaque removal. International *Int J Dent Hyg* 2003; **1:** 110–114.
13. Harnacke D, Mitter S, Lehner M, Munzert J, Deinzer R. Improving oral hygiene skills by computer-based training: a randomized controlled comparison of the Modified Bass and the Fones techniques. *PLoS One* 2012; **7:** e37072.
14. Ainamo J. The effect of habitual toothcleaning on the occurrence of periodontal disease and dental caries. *Suom Hammaslaeaek Toim* 1971; **67:** 63–70.
15. Dale J W. Toothbrushing frequency and its relationship to dental caries and periodontal disease. *Aust Dent J* 1969; **14:** 120–123.
16. Tsamtsouris A, White G. The lack of relationship between toothbrushing duration and plaque removal in kindergarten children. *Quintessence int* 1978; **9:** 69–72.
17. Hawkins B, Kohout F, Lainson P, Heckert A. Duration of toothbrushing for effective plaque control. *Quintessence Int* 1986; **17:** 361–365.
18. Marinho V C, Higgins J T, Logan S, Sheiham A. Fluoride toothpastes for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev* 2003; **1:** CD002278.
19. Department of Health, British Association for the Study of Community Dentistry. *Delivering better oral health: an evidence-based toolkit for prevention*. 2nd ed. London: DH, 2009.
20. Levine R, Stillman-Lowe C. *The scientific basis of oral health education*. 6th ed. London: British Dental Journal, 2009.
21. Sharma N C, Galustians J, Rustogi K N *et al*. Comparative plaque removal efficacy of three toothbrushes in two independent clinical studies. *J Clin Dent* 1992; **3**(Suppl C)**:** 13–20.
22. Tennant M. *Psychology and adult learning*. Oxon: Taylor & Francis, 2006.
23. Ashenden R, Silagy C, Weller D. A systematic review of the effectiveness of promoting lifestyle change in general practice. *Family Practice* 1997; **14:** 160–176.
24. Kay E, Locker D. Is dental health education effective? A systematic review of current evidence. *Community Dent Oral Epidemiol* 1996; **24:** 231–235.
25. Saghazadeh, M, Ashayeri M. The comparison between the effectiveness of six different tooth brushing methods on removing dental bacterial plaque. *J Dental Medicine* 2004; **2:** 26–38.
26. Smutkeeree A, Rojlakkanawong N, Yimcharoen V. A 6-month comparison of toothbrushing efficacy between the horizontal Scrub and modified Bass methods in visually impaired students. *Int J Paediatr Dent* 2011; **21:** 278–283.