

# The effect of right or left handedness on caries experience and oral hygiene

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## ABSTRACT

**Background:** There is an indisputable relationship between tooth decay and oral hygiene. Caries can only be prevented by keeping tooth decay at bay. In several prophylactic methods, brushing is the most important. Brushing efficiency is directly related to an individuals' manual dexterity. **Objective:** To investigate whether there were differences in oral hygiene and caries prevalence between right- and left-handers. **Materials and Methods:** Forty-six elementary school students were included in the study. The subjects were 30 males and 16 females, ranging in age from 11 to 13 years. Handedness was ascertained by using the Edinburgh Handedness Scale. All students were examined intraorally. During this examination, the necessary values to determine oral hygiene status and to determine caries prevalence were recorded. **Results:** It was observed that subjects who used their right hands were in a better position in terms of oral hygiene than those using the left ( $P < 0.01$ ). In terms of caries prevalence, however, averages for right-handed individuals were lower than those for left-handed subjects, although the difference was not statistically significant. **Conclusions:** It can be stated that the right-handed individuals have better oral hygiene and the lower incidence of caries because of their better manual dexterity and brush efficiency. So, dentists should consider better manual dexterity and brush efficiency in right-handed individuals before treatment planning. However, future well-designed neurologic studies involving larger numbers of subjects will be necessary to confirm the findings of this study and to understand more about the effects of handedness on oral hygiene performance.

**Key words:** Caries experience, handedness, oral hygiene

## Introduction

The essential caries process involves demineralization of tooth enamel, and likely also of root surfaces, by high concentrations of organic acids produced by bacteria in dental plaque from dietary carbohydrates.<sup>[1]</sup> Dental plaque plays a major role in caries formation. Plaque acids may act on the subsurface region with the assistance of ultrastructural enamel defects. They first dissolve easily soluble magnesium and carbonates, followed by less soluble calcium and other ions. This is then followed by cavitations.<sup>[2]</sup> Plaque and caries formation has a negative

effect on oral hygiene; number of decayed, missing, and filled teeth (DMFT) and simplified oral hygiene index (OHI-S) are two indexes that determine oral hygiene and caries prevalence. These indexes are complementary and mutually supportive. All protective activities against dental plaque formation, brushing in particular, also reduce caries formation and improve oral hygiene.<sup>[3]</sup> The correlation of brushing efficiency with an individual's motor ability is important. Grossman *et al.* stated that effective plaque control of the primary dentition can be particularly difficult to achieve because of problems with motivation and manual dexterity in some children.<sup>[4]</sup> It has been reported that right-handed medical students performed better with either hand in terms of error rate and first-time accuracy compared with left-handed ones for endoscopic manipulations.<sup>[5]</sup>

In the present study, we investigated whether there were differences in oral hygiene and caries prevalence between right- and left-handers.

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## Materials and Methods

Forty-six elementary school students were included in the study. The subjects were 30 males and 16 females, ranging in age from 11 to 13 years. Handedness was ascertained by using the Edinburgh Handedness Scale,<sup>[6,7]</sup> and this generated scores from 100 to -100. Subjects having handedness scores from -75 to -100 were considered to be left-handed; those with scores from 75-100 were considered to be right-handed. Mixed-handed subjects (handedness scores from -75 to 75) were not included in this study. Three dental experts (an expert oral diagnosis, two experts in conservative dentistry) in this study evaluated the subjects with respect to oral hygiene status and caries prevalence. All students were examined intraorally. During this examination, the necessary values for OHI-S to determine oral hygiene status and for DMFT to determine caries prevalence were recorded. Following World Health Organization criteria, the state of dentition and level of dental caries in all individuals were determined by the same researcher using the DMFT (D = decayed; M = missing; F = filled) index. The OHI-S index (debris index + calculus index) was utilized to determine the state of oral hygiene. Both methods were calculated according to [www.whocollab.od.mah.se](http://www.whocollab.od.mah.se).<sup>[8]</sup> Means and standard deviations were calculated. Data were analyzed using Student's *t* test with SPSS version 10.0. In order to determine the reliability of the used method, the weighted kappa test was performed. The intra- and interobserver agreement was analyzed with the weighted kappa test.

## Results

It is well known that the higher DMFT values mean the greater level of caries and its consequences. The mean DMFT for right-handed individuals was 3.00 and it for left-handed subjects was 3.81. The mean DMFT for right-handed individuals were lower than those for left-handed subjects. The difference was not statistically significant ( $P > 0.05$ ). Similarly, the lower the OHI-S values, better the oral hygiene. The mean OHI-S was lower for right-handed subjects (0.935) than those for

left-handers (2.50) and the difference was statistically significant unlike DMFT values ( $P = 0.001$ ) [Table 1]. The weighted kappa values for intraobserver reliability were calculated as 0.87, 0.82, 0.93 for the first, second, and third observer, respectively. The weighted kappa values for interobserver reliability between the 1-2, 2-3, and 1-3 observers were calculated as 0.86, 0.84, and 0.92, respectively.

## Discussion

In dentistry, some precautions taken by individuals are thought to improve oral hygiene. The most important of these are activities requiring manual dexterity, such as brushing and flossing.<sup>[9]</sup> It was stated that both manual dexterity and motivation are very important in providing oral hygiene.<sup>[10-12]</sup> It was found that left-handers have better oral condition in several studies, but this finding was not statistically significant.<sup>[11,13-15]</sup> However, Ozgoz *et al.*<sup>[11]</sup> suggested that brushing habits of the patients were related with the severity of cervical wear and that no statistically significant relationship was found between hand preference and tooth brush abrasion in their study. In the present study, we founded that right-handed individuals have the better oral hygiene and the lower incidence of caries. Many factors could be responsible for this finding, including patient population, patient selection criteria, mouth breathing, occlusion abnormalities, bruxism, cariogenic diet, mastication and deglutition dysfunction, abnormal tension of facial muscles, reduced salivary flow and effects from medications, nature of teeth, socioeconomic status, and tooth brushing behavior.<sup>[16]</sup> In studies regarding gender and brushing habits in left- and right-handed individuals, it was found that women had better oral hygiene condition with respect to men, and this was statistically significant.<sup>[11,17]</sup> It was stated that hand-skills is genetic. However, it was showed that it can be improved with some exercises and motor-learning.<sup>[18]</sup> Electric toothbrushes are recommended for handicapped individuals or those with poor dexterity.<sup>[19]</sup> It is expected that individuals with better manual dexterity will clearly also brush efficiently. It has also been maintained that dexterity is important for physicians as well as for patients and patients with limited manual dexterity are compromised due to their inability to practice the necessary oral and prosthesis hygiene measures.<sup>[20]</sup> A correlation was observed between knowledge of oral hygiene (as measured by the multiple choice test) and several of the oral hygiene scores. These correlations were less significant than that observed between dexterity and oral hygiene. In addition, manual dexterity of the right or preferred hand exhibited significant statistical

**Table 1: Means and standard deviations of DMFT and OHI-S values in terms of handedness**

	Right handed (n=19)		Left-handed (n=27)		T test	P values
	M	SD	M	SD		
DMFT	3.00	2.56	3.81	3.32	0.89	>0.05
OHI-S	0.93	0.50	2.50	1.86	3.5	<0.001

DMFT, Number of decayed, missing, and filled teeth; OHI-S, Simplified oral hygiene index.

correlations with all oral hygiene scores. There was no significant correlation between left or nonpreferred hand on any of the plaque scores.<sup>[10]</sup> In some sports branches left-handed athletes are very successful than right-handed because Geschwind and Galaburda<sup>[21]</sup> have proposed that left-handed persons have a larger right brain hemisphere due to exposure to higher concentrations of prenatal hormones. Left-handers might have an advantage over right-handers, possibly due to superior spatiomotor skills, given the observed relatively high proportion of successful left-handed athletes.<sup>[21]</sup> But, Wood and Aggleton<sup>[22]</sup> claimed that increased proportions of left-handers in various sports is due to the nature of the games themselves, and not to neurological advantages related to handedness. For example, a high proportion of left-handedness among successful athletes was found in baseball,<sup>[23]</sup> tennis,<sup>[24]</sup> fencing,<sup>[25]</sup> and cricket.<sup>[22]</sup> Gursoy<sup>[26]</sup> reported that left-handed boxers were more successful than right-handed boxers. According to Holtzen,<sup>[24]</sup> left-handers may have neuroanatomical advantages in performing visuospatial and gross visuomotor tasks. Dane and Erzurumluoglu,<sup>[27]</sup> reported that the left-handed handball players had faster visual reaction times for the eye-dominant hand and the left eye-left hand; left-handed wrestlers are more successful.<sup>[28]</sup> They suggested that the higher performance and success of left-handers may be due to an intrinsic neurologic advantage.<sup>[28]</sup>

## Conclusion

In this study, the mean OHI-S was lower for right-handed subjects than those for lefthanders and the difference was statistically significant. It can be stated that the right-handed individuals have better oral hygiene and the lower incidence of caries because of their better manual dexterity and brush efficiency. So, dentists should consider better manual dexterity and brush efficiency in the right-handed individuals before treatment planning. However, future well-designed neurologic studies involving larger numbers of subjects will be necessary to confirm the findings of this study and to understand more about the effects of handedness on oral hygiene performance.

## References

1. Van Houte J. Role of micro-organisms in caries etiology. *J Dent Res* 1994;73:672-81.
2. Harris NO, Segura A. *Primary Preventive Dentistry*. New Jersey: Pearson;

2004. p. 52-3.
3. Woodmansey KF. The prevalence of dental caries among international students at U.S. universities. *J Contemp Dent Pract* 2005;6:124-35.
4. Grossman E, Proskin H. A comparison of the efficacy and safety of an electric and a manual children's toothbrush. *J Am Dent Assoc* 1997;128:469-74.
5. Hana GB, Drew T, Clinch P, Shimi S, Dunkley P, Hau C, et al. Psychomotor skills for endoscopic manipulations: Differing abilities between right and left-handed individuals. *Ann Surg* 1997;225:333-8.
6. Oldfield RC. The assessment and analysis of handedness the Edinburg Inventory. *Neuropsychologia* 1971;9:97-114.
7. Tan U. The distribution of hand preference in normal men and women. *Int J Neurosci* 1988;41:35-55.
8. Bayındır YZ, Polat MF, Seven N. Nitric oxide concentrations in saliva and dental plaque in relation to caries experience and oral hygiene. *Caries Res* 2005;39:130-3.
9. Murtomaa H, Turtola L, Rytömaa I. Use of dental floss by Finnish students. *J Clin Periodontol* 2005;11:443-7.
10. Kenney EB, Saxe SR, Lenox JA, Cooper TM, Caudill JS, Collins AR, et al. The relationship of manual dexterity and knowledge to performance of oral hygiene. *J Periodontol Resc* 1976;11:63-73.
11. Özgöz M, Arabaci T, Sümbüllü MA, Demir T. Relationship between handedness and toothbrush-related cervical dental abrasion in left- and right-handed individuals. *J Dent Sci* 2010;5:177-82.
12. Coren S, Porac C. Fifty centuries of right-handedness: The historical record. *Science* 1977;198:631-2.
13. Addy M. Tooth brushing, tooth wear and dentine hypersensitivity are they associated? *Int Dent J* 2005;55:261-7.
14. Tezel A, Orbak R, Canakci V. The effect of right or left-handedness on oral hygiene. *Int J Neurosci* 2001;109:1-9.
15. Tezel A, Canakci V, Cicek Y, Demir T. Evaluation of gingival recession in left- and right-handed adults. *Int J Neurosci* 2001;110:135-46.
16. Tanaka MH, Bocardi K, Kishimoto KY, Jacques P, Spolidorio DMP, Giro5 EMA. DMFT index assessment and microbiological analysis of *Streptococcus mutans* in institutionalized patients with special needs. *Braz J Oral Sci* 2009;8:9-13.
17. Çiçek Y, Arabaci T, Çanakci CF. Evaluation of oral malodor in left- and right-handed individuals. *Laterality* 2009; ahead of print.
18. Springer SP, Deutch G. *Left brain, right brain*. 4th ed. New York: WH Freeman Company; 1993.
19. Van Der Weijden GA, Danser MM, Nijboer A, Timmerman MF, Van Der Velden U. The plaque-removing efficacy of an oscillating/rotating toothbrush: A short-term study. *J Clin Periodontol* 2005;20:273-8.
20. Al Amri MD. The effect of patient manual dexterity on the framework design: A Clinical Report. *Pak Oral Dental J* 2008;28:123-8.
21. Geschwind N, Galaburda AM. Cerebral lateralization. Biological mechanisms, associations, and pathology: I. A hypothesis and a program for research. *Arch Neurol* 1985;42:428-59.
22. Wood CJ, Aggleton JP. Handedness in 'fast ball' sports: Do left-handers have an innate advantage? *Br J Psychol* 1989;80:227-40.
23. McLean JM, Ciurczak FM. Bimanual dexterity in major league baseball players: A statistical study. *N Engl J Med* 1982;307:1278-9.
24. Holtzen DW. Handedness and professional tennis. *Int J Neurosci* 2000;105:101-19.
25. Bisiacchi PS, Ripoll H, Stein JF, Simonet P, Azemar G. Left-handedness in fencers: An attentional advantage? *Percept Mot Skills* 1985;61:507-13.
26. Gursoy R. Effects of left- or right-hand preference on the success of boxers in Turkey. *Br J Sports Med* 2009;43:142-4.
27. Dane S, Erzurumluoglu A. Sex and handedness differences in eye-hand visual reaction times in handball players. *Int J Neurosci* 2003;113:923-9.
28. Ziyagil MA, Gursoy R, Dane S, Yuksel R. Left-handed wrestlers are more successful. *Percept Mot Skills* 2010;111:65-70.

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