

Aural feedback for oral hygiene

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Researchers in Japan have discovered that how effectively we clean our teeth and how satisfied we are with the brushing job we do depends a lot on the sound of the bristles scrubbing against the enamel. In trials with volunteer teeth cleaners, the team has used a tiny microphone in a modified toothbrush to 'sample' the sound being made in the mouth during brushing and to modulate it and then feed that sound back to the volunteer via headphones to see what effect it would have on cleaning efficacy and satisfaction. They describe details in the *International Journal of Arts and Technology*.

Taku Hachisu and Hiroyuki Kajimoto of The University of Electro-Communications, in Chofu, Japan explain how modulating the brush sound affects brushing efficacy and satisfaction. The [team](#) found that if they manipulated the pitch, or frequency and loudness, of the brushing sound they could alter the volunteers' perception of comfort and accomplishment. They also showed that if they gradually increased the frequency as [teeth](#) cleaning progressed, the volunteers felt like the process was more comfortable and that their teeth were cleaner at the end of the process.

"Tooth brushing provides a 'negative reward' for users as they brush their teeth to avoid developing caries," the team explains. Many people find the task boring. "Subsequently, users do not consider the impact of omitting the action until suffering from caries or other [dental diseases](#)," the team adds. Their results show that it is possible to motivate users by interactively manipulating the frequency of brushing sounds, so that the task becomes more satisfying. Importantly, the system can tell, through a

built-in force sensor, whether a person is brushing too hard, which can damage the gum line, and so give them aural feedback to encourage them to clean their teeth more gently.

The prototype system requires the teeth cleaner to wear headphones, which is impractical in real life. However, there are bone conduction speaker systems that might be incorporated into the smart toothbrush so that the amplified feedback loop is created in one's mouth. The team will next recruit volunteers to test the system in their comfort of their own bathrooms.

More information: Hachisu, T. and Kajimoto, H. (2015) 'Modulating tooth brushing sounds to affect user impressions', *Int. J. Arts and Technology*, Vol. 8, No. 4, pp.307-324.

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