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Impact of Music Tempo on Brushing Time Among Young Adults: A Cross-Sectional Study

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Abstract **Background:** Toothbrushing is a key self-care practice for preventing dental caries, gingivitis and periodontal disease. Despite clear recommendations, many young adults fail to meet optimal brushing duration guidelines. Music, known to influence mood, attention and perception of time, may provide a low-cost strategy to enhance oral hygiene behaviours, but its effect on toothbrushing remains underexplored. **Aim:** To examine the association between music tempo and toothbrushing duration, plaque control and gingival health among dental students aged 18-30 years. **Methods:** A cross-sectional observational study was conducted among 100 dental students at Saveetha Dental College, Chennai, India. Participants self-reported their music listening habits during brushing and were grouped into slow-tempo (60-80 bpm), fast-tempo (120-140 bpm) or no music. A structured questionnaire assessed demographics, brushing habits and perceived effects of music, while oral hygiene was evaluated using the Silness and Loe Plaque Index (PI) and Loe and Silness Gingival Index (GI). Independent t-tests compared music vs. no music groups and one-way ANOVA with post-hoc Tukey tests compared tempo groups. **Results:** Participants who brushed with music had significantly longer brushing durations (2.7±0.7 min) than those without music (2.0±0.6 min; $p<0.001$) and lower PI (0.8±0.3 vs. 1.1±0.4; $p<0.001$) and GI scores (0.6±0.2 vs. 0.8±0.3; $p<0.001$). Slow-tempo music yielded the longest brushing duration (2.9±0.7 min) and lowest PI (0.7±0.3) and GI (0.5±0.2) scores compared to fast-tempo and no music (all $p<0.05$). Effect sizes were large ($\eta^2 = 0.12$-0.15). **Conclusion:** Listening to music, particularly slow-tempo music, was associated with longer brushing time and improved plaque and gingival scores among dental students. While promising, these results are based on self-reported habits and a non-experimental design, limiting causal inference and generalisability. Controlled trials with objective measurements are recommended to evaluate music as an adjunctive tool for promoting oral hygiene.

Key Words Toothbrushing, Music Tempo, Oral Hygiene, Plaque Index, Gingival Index, Young Adults

INTRODUCTION

Oral health is a vital component of general well-being, contributing to nutrition, speech, social confidence and overall quality of life [1,2]. Among the many preventive measures, effective toothbrushing remains one of the simplest and most important self-care practices for maintaining oral hygiene and preventing conditions such as dental caries, gingivitis and periodontal disease [3,4]. Despite clear recommendations from professional bodies-typically advising brushing twice daily for at least two minutes-research shows that a considerable proportion of young adults do not meet these guidelines, often brushing for shorter durations or using suboptimal techniques [5,6].

The young adult age group (18-30 years) represents a transitional life stage, where individuals take full responsibility for their daily habits without parental oversight. While they may possess better theoretical knowledge than children, especially those in professional courses such as dentistry, practical adherence to oral hygiene recommendations can still be inconsistent [7]. Exploring new, relatable and low-cost ways to motivate this demographic toward better brushing habits is therefore of interest to both clinicians and public health professionals.

Music is a nearly universal part of modern life, frequently accompanying activities such as commuting, exercising, studying and performing routine chores. Its ability

to influence mood, arousal, attention and perception of time has been documented in fields ranging from psychology to occupational performance [8,9]. For example, fast-tempo music can enhance alertness and create a sense of urgency, while slower tempos can promote calmness and extended engagement with a task [10-12]. These properties make music an intriguing, yet underexplored, factor that might influence toothbrushing behaviour.

Unlike physically demanding or competitive activities, toothbrushing requires controlled, repetitive motion and even coverage across all tooth surfaces. This introduces both potential benefits and risks if music is used-slower tempos and fast tempo might encourage longer brushing, but could also reduce pace, might also energize brushing but risk hurried or uneven cleaning. There is also the possibility of distraction if music captures attention away from the task.

In the context of music psychology, slow-tempo music is typically defined as 60-80 beats per minute (bpm) and fast-tempo music as 120-140 bpm [13]. These definitions allow for more objective categorization and comparison between groups. However, to date, very few studies have investigated whether these tempo variations influence toothbrushing duration, quality or the user's subjective experience.

The present study aims to examine whether listening to different music tempos during toothbrushing influences brushing duration and perceived brushing quality among dental students aged 18-30 years. The choice of dental students provides a readily accessible group with a baseline understanding of oral hygiene principles, though this limits generalizability to the broader population. This cross-sectional comparison includes participants brushing with slow-tempo music, fast-tempo music or no music, allowing for the identification of potential differences between these conditions.

Understanding whether something as accessible and inexpensive as music can shape brushing habits could offer a novel approach to oral health promotion for young adults. While this study is exploratory and cannot establish causation, it can provide preliminary evidence to guide further controlled trials that may test music as an adjunctive tool for improving oral hygiene practices.

METHODOLOGY

Study Design

A cross-sectional observational study was conducted to investigate the association between music tempo and toothbrushing habits among young adults.

Study Setting and Population

The study was carried out at Saveetha Dental College, Chennai, India. Participants were dental students aged 18-30 years. This population was chosen for convenience and accessibility; however, as they may possess greater oral health knowledge than the general public, the findings may not be directly generalizable.

Sampling and Sample Size

A total of 147 participants were recruited using convenience sampling. Following data screening, 47 participants were excluded due to incomplete questionnaires, missing oral examination data or inconsistent responses. The final analysis included 100 participants.

Volunteer and Selection Bias

Participation was voluntary, which may have introduced selection bias, as individuals more interested in music or oral health may have been more likely to participate. This was acknowledged as a study limitation.

Inclusion Criteria

- Age between 18 and 30 years
- Habitual morning toothbrushing
- Willingness to participate and provide informed consent

Exclusion Criteria

- Ongoing extensive dental treatment
- Exclusive use of electric toothbrushes (excluded to maintain brushing motion consistency, as electric brushes may influence duration and technique differently from manual brushes)
- Medications affecting oral hygiene needs (e.g. anticholinergics causing dry mouth)

Grouping Criteria

Participants self-reported their usual music tempo while brushing:

- Slow tempo: 60-80 bpm
- Fast tempo: 120-140 bpm
- No music
- Tempo definitions were explained with audio examples to improve accuracy; however, grouping was based on participant self-choice rather than direct observation

Questionnaire

A structured, validated questionnaire collected data on:

- Demographics (age, gender, year of study)
- Brushing frequency, average duration, technique
- Music listening habits while brushing (tempo, genre, artist, listening duration)
- Perceived impact of music on brushing motivation, duration and enjoyment

The questionnaire was piloted among 10 students to ensure clarity.

Confirmation of Music Exposure

The study relied on self-report of music listening habits. No controlled music playback occurred during brushing sessions and therefore actual tempo and duration could not be directly verified.

Oral Examination

Oral hygiene was assessed using the Silness and Loe Plaque Index (PI) and Loe and Silness Gingival Index (GI). Examinations were conducted in the college's preventive dentistry clinic under natural and artificial lighting. Two calibrated dental professionals (Cohen's kappa ≥ 0.85) performed all assessments using sterile mouth mirrors and explorers, ensuring consistency across participants.

Data Collection Consistency

All participants completed the questionnaire prior to the clinical examination. Data were collected during morning clinic sessions over a four-week period to minimize variation in daily oral conditions.

RESULTS

The bar chart illustrates the distribution of study participants based on their gender, music listening habits during toothbrushing. Out of the total 100 participants, 45 males, 50 females, 5 preferred not to say, 60 individuals reported that they listen to music while brushing, whereas 40 participants do not. Among those who listen to music, 35 participants indicated a preference for fast-tempo music, while 25 preferred slow-tempo music. The chart highlights that the majority of participants incorporate music into their daily oral hygiene routine, with a notable inclination towards faster-paced music. This visual representation supports the study's objective to investigate whether the tempo of music can influence brushing behaviour and oral hygiene outcomes among young adults (Figure 1 and 2).

The comparison of mean outcomes between participants who brushed their teeth while listening to music and those who did not reveals statistically significant differences across all measured variables.

Participants who listened to music demonstrated a longer mean brushing duration (2.7±0.7 minutes) compared to those who brushed without music (2.0±0.6 minutes). This difference was statistically significant ($t(98) = 5.12$, $p<0.001$), suggesting that music may serve as a motivating factor that encourages individuals to brush for an extended period.

For oral hygiene indices, the mean Plaque Index score was lower among the music group (0.8±0.3) than the no music group (1.1±0.4), indicating better plaque control among participants who brushed with music. This difference was significant ($t(98) = -4.02$, $p<0.001$) (Table 1).

A one-way ANOVA was conducted to examine whether the tempo of music listened to during toothbrushing was associated with differences in brushing duration and oral hygiene indices among participants.

The mean brushing duration was highest in the slow-tempo group (2.9±0.7 minutes), followed by the fast-tempo group (2.5±0.6 minutes) and the group that did not listen to music (2.0±0.6 minutes). The difference among these groups was statistically significant ($F(2, 97) = 8.45$, $p<0.001$), indicating that music tempo may influence the length of brushing time.

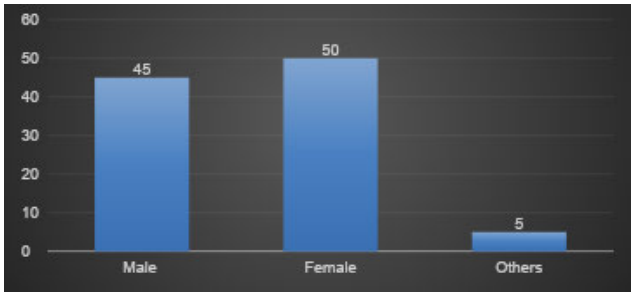

Figure 1: Descriptive Statistics - Gender Distribution of the Study Participants

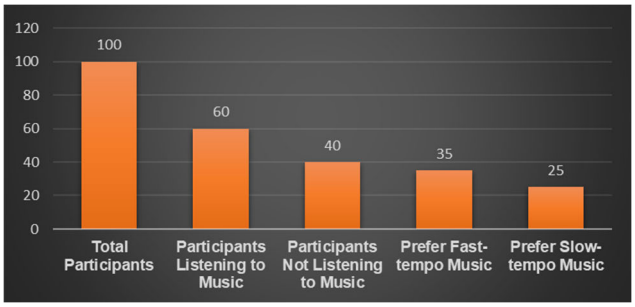

Figure 2: Descriptive Statistics - Participant Profile and Music Preferences

Table 1: Independent Samples t-test- Comparing the differences in Oral Hygiene Scores Between Participants Listening to Music and Those Not Listening to Music"

Outcome	Music Group (Mean±SD)	No-Music Group (Mean±SD)	t-value	df	p-value
Brushing Duration (min)	2.7±0.7	2.0±0.6	5.12	98	<0.001
Plaque Index	0.8±0.3	1.1±0.4	-4.02	98	<0.001
Gingival Index	0.6±0.2	0.8±0.3	-3.75	98	<0.001

Table 2: One-Way ANOVA - Comparison of Oral Hygiene Measures Across Music Tempo Groups

Outcome	Slow-tempo (Mean±SD)	Fast-tempo (Mean±SD)	No Music (Mean±SD)	F-value	df	p-value
Brushing Duration (min)	2.9±0.7	2.5±0.6	2.0±0.6	8.45	2, 97	<0.001
Plaque Index	0.7±0.3	0.9±0.3	1.1±0.4	7.20	2, 97	0.001
Gingival Index	0.5±0.2	0.7±0.2	0.8±0.3	6.85	2, 97	0.002

Regarding plaque accumulation, the mean Plaque Index was lowest among participants who listened to slow-tempo music (0.7±0.3), compared to the fast-tempo group (0.9±0.3) and those who brushed without music (1.1±0.4). The observed difference was statistically significant ($F(2, 97) = 7.20$, $p = 0.001$), suggesting improved plaque control with slower-paced music.

Similarly, the mean Gingival Index was lowest in the slow-tempo group (0.5±0.2), followed by the fast-tempo group (0.7±0.2) and the no music group (0.8±0.3). This difference was statistically significant ($F(2, 97) = 6.85$, $p = 0.002$), indicating better gingival health among participants who brushed while listening to slower music (Table 2).

A one-way ANOVA compared oral hygiene outcomes across slow-tempo, fast-tempo and no-music groups (Table 3). For brushing duration, there was a significant difference between groups, $F(2, 97) = 8.45$, $p<0.001$, $\eta^2 = 0.15$ (large effect). Post-hoc Tukey analysis indicated that participants in the slow-tempo group brushed significantly longer than those in the no-music group ($p<0.001$) and the fast-tempo group ($p = 0.041$), while the fast-tempo group also brushed longer than the no-music group ($p = 0.033$). For the Plaque Index, differences were significant, $F(2, 97) = 7.20$, $p = 0.001$, $\eta^2 = 0.13$ (large effect), with post-hoc tests showing lower scores (better plaque control) in the slow-tempo group compared to the no-music group ($p<0.001$) and the fast-tempo group ($p = 0.047$) and in the fast-tempo group compared to the no-music group ($p = 0.029$). For the Gingival Index, differences were also significant, $F(2, 97) = 6.85$, $p = 0.002$, $\eta^2 = 0.12$ (large effect). Post-hoc analysis revealed lower scores (better gingival health) in the slow-tempo group compared to the no-music group ($p<0.001$) and the fast-tempo group ($p = 0.043$), as well as in the fast-tempo group compared to the no-music group ($p = 0.038$).

DISCUSSION

The results provide evidence that listening to music while brushing can positively influence both the duration of brushing and clinical oral hygiene outcomes, specifically plaque and gingival health.

The findings revealed that participants who brushed while listening to music spent significantly more time brushing than those who did not, with mean brushing times of 2.7±0.7 minutes versus 2.0±0.6 minutes, respectively. This suggests that music may serve as a simple behavioural cue that encourages individuals to brush for longer periods, potentially making the activity more engaging and less tedious. Adequate brushing time is critical for effective plaque removal and the significant difference observed in Plaque Index and Gingival Index scores supports the practical benefit of this behavioural intervention.

Notably, the tempo of the music also appeared to play a role in oral hygiene outcomes. The one-way ANOVA showed that participants who listened to slow-tempo music had the longest brushing duration and the lowest plaque and gingival scores. This could be explained by the calming and steady rhythm of slow-tempo music, which may help maintain a consistent brushing pace and reduce hurried brushing. Fast-tempo music, while still beneficial compared to no music, did not yield as pronounced an improvement. This indicates that not just music alone, but its characteristics such as tempo can shape health behaviours.

Thakare *et al.* [16] examined whether music affects submaximal exercise in young, untrained adults. Fifty participants (25 males, 25 females) completed standard submaximal exercise sessions with and without music. Resting and maximum heart rates and total exercise duration were recorded. The average exercise time was significantly longer with music (37.12±16.26 min) than without (22.48±10.26 min); males exercised longer than females when music was played. Maximum heart rate was also higher with music, but no significant link was found between heart rate changes and exercise duration. Overall, music appears to help extend exercise time and endurance in both sexes.

Thoma *et al.* [17] stated that waiting for medical or dental treatment often causes significant anxiety. Music has been shown to help reduce anxiety in clinical settings. This study tested whether listening to music could lower pre-treatment anxiety in patients awaiting dental hygiene care. In a randomized trial, 92 patients either listened to music for 10 minutes or waited in silence. Results showed that state anxiety dropped significantly more in the music group than in the control group. The findings suggest music can help reduce anxiety before routine dental procedures.

Hallam *et al.* [18] discussed how musical abilities can benefit other areas when similar skills are involved. Evidence shows that learning music can positively influence language skills, reading, math, intelligence, academic achievement, creativity, motor coordination, focus, self-confidence, emotional awareness, social interaction, teamwork, self-discipline and relaxation. However, these benefits depend on music being taught in an enjoyable and fulfilling way, highlighting the importance of high-quality teaching.

Trahan *et al.* [19] surveyed 651 people about their musical habits, sleep and why they use music at bedtime. About 62% said they listen to music to help them sleep, mentioning 14 genres and 545 artists. Analysis showed that stress, age and music use all predicted sleep quality, with younger, more musically engaged people more likely to use music as a sleep aid. Four main reasons emerged: music promotes sleep, is part of a routine, creates a restful state or blocks unwanted noise or thoughts. The findings show that people use a wide range of music for varied, personal reasons to improve sleep.

de Filippis and Al Foysal 2025 explored links between music listening habits and mental health conditions like anxiety, depression, insomnia and OCD through a cross-sectional survey. Results showed that people with higher mental health concerns often listen to music longer, possibly as a coping strategy, while genre preferences varied by condition [20].

CONCLUSIONS

In this cross-sectional study of dental students, listening to music while brushing was associated with longer brushing times and more favourable plaque and gingival scores compared to brushing in silence. Although slow-tempo music appeared to coincide with the most favourable outcomes, music tempo was not experimentally controlled, so these findings should be interpreted cautiously. The study design does not allow for conclusions about whether music directly changes brushing behaviour and the results may not be generalisable beyond the dental student population. Future research should replicate this work using larger, more diverse samples, objective measurements of brushing and controlled manipulation of music tempo to

determine whether such an approach is effective and practical in real-world settings.

Limitations

This study has certain limitations that should be addressed in future work. Several limitations must be considered, including unequal group sizes that were not addressed statistically, reliance on self-reported brushing times rather than objective measures, lack of standardisation for music type and volume, restriction of the sample to young adults and short-term assessment without examining whether any changes in behaviour persist over time. Overall, while the findings suggest that listening to music particularly slower tempo may be associated with improved oral hygiene outcomes, future research should employ controlled, longitudinal designs with objective measurements, experimentally manipulate tempo and include diverse populations to determine whether music can be an effective and generalisable strategy to enhance tooth brushing habits.

Conflicts of Interest

No conflict of interest declared among the authors

Ethical Statement

Ethical approval obtained from Saveetha Dental College and Hospitals; informed consent was obtained prior to the start of study.

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