

Dental students' perception of a self-preference musical mobile app used as a relaxing tool in the clinical setting

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ABSTRACT

Background: Diverse music activities may reduce stress and enhance well-being. However, using a musical mobile health application (app) as an intervention during dental treatment has not yet been established. Hence, a self-preference musical mobile app (ACOU@PLAY) has been created for use in clinical settings. **Purpose:** This study aims to assess the quality of the ACOU@PLAY app as a relaxing tool for dental students and compare the results with patients' opinions. **Methods:** A total of 53% (n = 38) dental students and 47% (n = 35) patients were recruited to use the self-preference musical mobile app (ACOU@PLAY) for 10 minutes and watch a 5-minute pre-recorded video. Then, an evaluation was performed using a validated tool, the modified user version Mobile App Rating Skill (uMARS), which included a demographic survey. The uMARS questionnaire consists of five domains (engagement, functionality, aesthetics, information, and app subjective quality) using a 5-point Likert scale. **Results:** The average quality score of the app was 3.96 ± 0.509 . The app received its highest rating for the information domains, with a mean score of 4.14 ± 0.577 , and its lowest for subjective quality, with a mean score of 3.63 ± 0.565 . Notable differences were observed in the ratings for engagement ($p = 0.008$) and aesthetics ($p = 0.035$) between dental students and patients, as well as significant differences in ratings based on gender in the domains of engagement ($p = 0.007$), functionality ($p = 0.018$), and aesthetics ($p = 0.021$). **Conclusion:** The self-preference musical mobile app (ACOU@PLAY) is well accepted by dental students and favored by patients with adequate qualities to be used in clinical settings.

Keywords: acceptance; dental anxiety; gag reflex; musical intervention; musical app; medicine

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INTRODUCTION

Dental anxiety is common in people of many ages and pertains to their fear of visiting dentists, undergoing dental procedures, and being exposed to dental instruments or clinical settings. People tend to focus on the negative aspects of the situation, which usually increases the impact of sights, sounds, and sensations they experience.^{1,2} This makes them feel fear whenever they hear or see dental instruments as they only think of how bad the situation would be. Many dental practitioners feel stressed when treating fearful or anxious patients. This is because the patients might express their anxiety through anger, which is unsettling and causes inconvenience to the dentist when treating the patient. Anxiety is also closely associated with

lowering the pain threshold; it impacts dental treatment by causing the patients to experience more sensory and affective distress.² In general perception, this anxious condition leads to avoidance behaviors, resulting in a lack of regular dental care and delay in treatment. A recent study confirmed that people with severe dental anxiety have poor oral health and habits of infrequent tooth brushing, tobacco use, and unhealthy diet, therefore increasing the need for dental treatment and check-ups.^{3,4}

Furthermore, dental anxiety may cause gag reflex and enhance the physiological defense mechanism in stopping foreign materials from entering the trachea, pharynx, and larynx. Some people may have a reduced or absent gag reflex, and some may have a noticeable one. Common features range from mild choking to uncontrolled

retching, which may precede vomiting to protect the upper gastrointestinal tract. Gagging may also present with high saliva, lacrimal, and sweat production, fainting, or, in some patients, panic attacks. According to the literature, there are two main categories for retching patients: somatogenic and psychogenic.⁶ In the somatogenic group, the gag reflex is influenced by physical stimuli when unwanted materials touch the trigger zones. In contrast, in the psychogenic group, the gagging is initiated by psychological stimuli, such as auditory, visual, or olfactory.⁶ Occasionally, the smell of the dental substances and the sight of the dentist or the dental instruments can also trigger the gag reflex.⁶ An elevated gag reflex can lead to many problems for the dentist and the patients.^{7,8}

Distraction and relaxation strategies are effective in managing patients with mild gag reflexes and facilitating brief dental procedures such as impression taking.^{7,9,10} Musical interventions, which merge relaxation and distraction methods, involve purposeful musical activities where listening to music, creating music, or singing plays a central role.^{11,12} The Cambridge Dictionary defines music as a sequence of sounds produced by musical instruments, voices, computers, or their combinations designed to entertain those who listen. Recent research has consistently demonstrated that engaging in various musical activities can alleviate stress and improve overall well-being.^{13–16} Music has a significant impact on stress-induced emotional states such as fear and anxiety because it can influence the brain structures involved in emotional regulation.^{12,13,16} Studies have revealed that music can substantially affect the amygdala, a component of the limbic system responsible for managing emotions, promoting a greater sense of well-being.^{13,15}

The utilization of mobile technology to enhance health quality is experiencing rapid growth, demonstrating its capacity to support self-care practices. Mobile applications (apps), an integral part of consumer health informatics, serve various purposes, including patient education, disease management, self-care, and monitoring treatment progress.^{17–19} Despite this, research on mobile apps as musical interventions in dentistry remains scarce.^{17,19} The ACOU@PLAY app, a self-preference musical mobile app developed in collaboration by the authors and a specialized team, is designed to function as a musical intervention tool to assist in managing dental anxiety among patients undergoing brief procedures.¹⁸ The purpose of this research is to analyze the acceptance of the ACOU@PLAY app as a relaxing tool for clinical management by dental students and patients. The results of this study will offer valuable insights to clinicians regarding the effective integration of self-preference music via mobile apps for patient management purposes.

MATERIALS AND METHODS

This was a cross-sectional study with ethical approval from the Research and Ethics Committee, University Teknologi

MARA (UiTM) (REC/06/2021 [UG/MR/545]). It was conducted in UiTM Dental Centre, Faculty of Dentistry, UiTM Sungai Buloh, Selangor. Potential participants were selected among the dental students and patients from the UiTM Dental Centre.

Based on previous studies, the required participant sample was 32 dental students with experience treating patients with dental anxiety and 32 patients, allowing for a 5%–10% dropout rate with 85% power of study.^{11,17,20} Participants who voluntarily consented to get involved in the study and met the inclusion criteria were enrolled. The study included dental clinical students with experience treating patients with dental anxiety and patients aged 18 and above who had undergone dental treatment and could comprehend written and verbal instructions, with or without the aid of a translator. Patients with a medical history of respiratory, cardiovascular, and neuromuscular disorders or severe profound hearing disabilities were excluded from participation.

The subjects were required to use the preloaded ACOU@PLAY¹⁸ trial app and watch a 5-minute pre-recorded video. A brief description of the Modified Dental Anxiety Scale (MDAS),^{9,21,22} Modified Child Dental Anxiety Scale (MCDAS),^{12,23} Gagging Problem Assessment (GPA)⁸ and Oral Health Impact Profile (OHIP-14)^{9,10,12} were included in the video. Through this, participants were introduced to the ACOU@PLAY app and its contents. The app contents are organized into four sections: 1) Author/Developer – background of each author; 2) Introduction – a brief description of the app 3) Let's Identify You – for patients to self-identify themselves and determine their individual anxiety and gag reflex levels using MDAS and GPA built into the app and 4) Let's Listen – selection of songs based on participants' music preferences that can be played during dental treatment. The app also includes What You Say/Think – an optional section for patients to give feedback (Figure 1).

The acceptance and perception of dental students and patients regarding the ACOU@PLAY app were assessed using the User Mobile Application Rating Scale (uMARS). The scale has an outstanding internal consistency for all subscales, with a Cronbach's alpha of 0.90, and reliability, reflected by an intraclass correlation coefficient of 0.70.²⁴ This 20-item questionnaire covers five domains: engagement (5 items), functionality (4 items), aesthetics (3 items), information (4 items), and subjective app quality (4 items) presented in Table 1. It also includes a perceived impact section with six items to assess the app's influence on users' knowledge, behavior, intentions, and help-seeking habits. The section gauges the app's perceived value for the users, allowing assessing its effectiveness. Participants were asked to complete the questionnaire after experiencing the app and viewing the instructional video. The questionnaire utilizes a 5-point Likert scale ranging from 1 ("Inadequate") to 5 ("Excellent") for responses. The score for each objective domain is calculated by taking the average of its item scores. The total uMARS score is

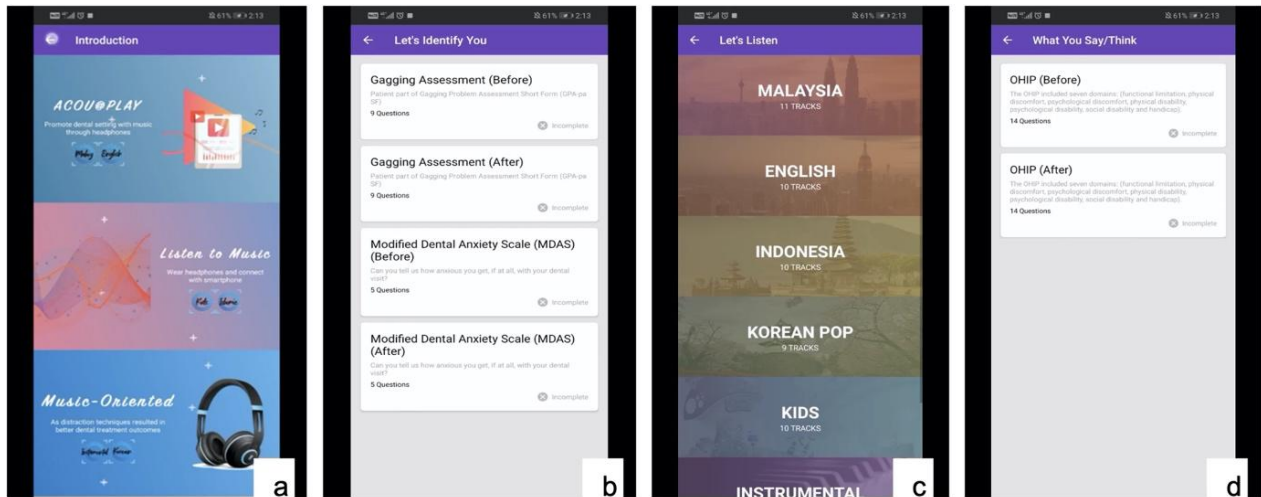


Figure 1. Interface of self-preference musical mobile app (ACOU@PLAY). Introduction – A brief description of the application (a). Let’s identify you – A section for patients to self-identify themselves and determine their anxiety and gag reflex levels using MDAS and GAGs Assessment built into this app (b). Let’s Listen – A section where patients can choose the songs based on their music preferences and listen to them during dental treatment (c). What You Say/Think – A section for patients to give feedback in (d).

Table 1. The uMARS questionnaire included five domains (engagement, functionality, aesthetics, information, and app subjective quality) in addition to the perceived impact

Domain	Questions
Engagement	Entertainment: Is the app fun/entertaining to use? Does it have components that make it more fun than other similar apps?
	Interest: Is the app interesting to use? Does it present information in an interesting way compared to other similar apps?
	Customization: Does it allow you to customize the settings and preferences that you would like (e.g., sound, content, and notifications)?
	Interactivity: Does it allow user input, provide feedback, and contain prompts (reminders, sharing options, notifications, etc.)?
Functionality	Target group: Is the app content (visuals, language, and design) appropriate for the target audience?
	Performance: How accurately/fast do the app features (functions) and components (buttons/menus) work?
	Ease of use: How easy is learning to use the app; how clear are the menu labels, icons, and instructions?
	Navigation: Does moving between screens make sense? Does the app have all the necessary links between screens?
Aesthetics	Gestural design: Do taps/swipes/pinches/scrolls make sense? Are they consistent across all components/screens?
	Layout: Are the arrangement and size of buttons, icons, menus, and content on the screen appropriate?
	Graphics: How high is the quality/resolution of graphics used for buttons, icons, menus, and content?
Information	Visual appeal: How good does the app look?
	Quality of information: Is app content correct, well-written, and relevant to the goal/topic of the app?
	Quantity of information: Is the information within the app comprehensive and concise?
App subjective quality	Visual information: Is the visual explanation of concepts—through charts/graphs/images/videos, etc.—clear, logical, and correct?
	Credibility of source: Does the information within the app seem to come from a credible source?
	Would you recommend this app to people who might benefit from it?
	How many times do you think you would use this app in the next 12 months if it was relevant to you?
Perceived impact	Would you pay for this app?
	What is your overall (star) rating of the app?
	Awareness – This app has increased my awareness of the importance of addressing the health behavior
	Knowledge – This app has increased my knowledge/understanding of the health behavior
	Attitudes – The app has changed my attitudes toward improving this health behavior
	Intention to change – The app has increased my intentions/motivation to address this health behavior
Help-seeking – This app would encourage me to seek further help to address the health behavior (if I needed it)	
Behavior change – Use of this app will increase/decrease the health behavior	

determined by averaging the scores across all sub-domains, with a score of 3.0 or higher deemed as reflective of high quality.

Data were analyzed using the IBM SPSS software package version 27.0. Quantitative data were described using the mean and standard deviation. The independent t-test for normally quantitative variables was used to compare the mean differences between the responses by dental students and patients, as well as male and female respondents. The analysis of variance (ANOVA) procedure was used to compare the mean differences among the patients. The significance of the results obtained was judged at the 5% level of significance.

RESULTS

A total of 73 participants were recruited for this study. Based on our demographic data (Figure 2), 52% ($n = 38$) of our respondents were clinical dental students and 48% ($n = 35$) patients. Of those two groups, 81% ($n = 59$) were

female and 19% ($n = 14$) male respondents, with the mean age of respondents being 23.

Figure 3 presents the total and mean scores for each domain in the uMARS questionnaire. Overall, the app quality mean score was 3.96 ± 0.509 . The information domain had the highest mean score of 4.14 ± 0.577 , while the app subjective quality domain had the lowest mean score of 3.63 ± 0.565 . An independent t-test was conducted to compare the mean score of each domain along with the app quality mean score between dental students and patients. Patients gave a higher score to app quality, with a mean score of 4.07 ± 0.480 , compared to dental students (3.86 ± 0.520). Based on the bar chart (Figure 4), there was a statistically significant difference in the mean score for engagement by dental students (3.74 ± 0.636) and patients (4.13 ± 0.566) with $p = 0.008$. There was also a statistically significant difference in the dental students' (3.89 ± 0.621) and patients' (4.18 ± 0.544) mean scores for aesthetics with a p -value of 0.035. However, there was no statistically significant difference between dental students and patients in the mean scores for functionality,

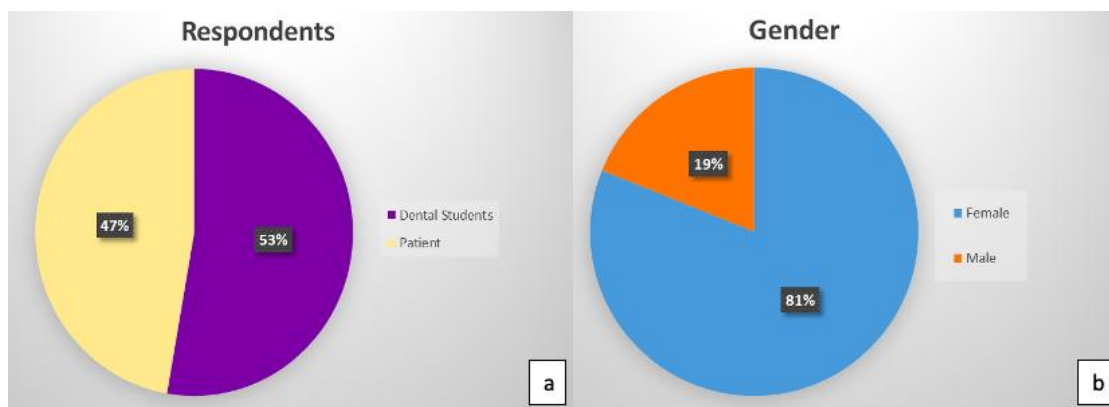


Figure 2. Demographic data: distribution of participants (a) and gender (b).

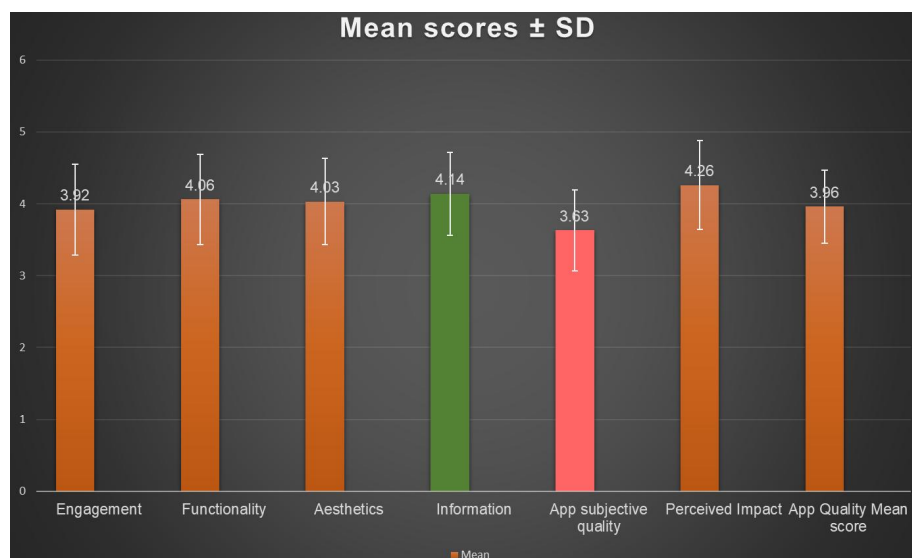


Figure 3. The total mean score of each domain in uMARS and the app quality mean total score.

information, app subjective quality, perceived impact, and app quality mean score ($p > 0.05$).

Another independent t-test was conducted to compare the mean scores for each domain and the app quality mean scores between males and females. Overall, males recorded a higher app quality mean score (4.18 ± 0.409) than females (3.90 ± 0.518). Figure 5 displays a statistically significant difference in the mean scores for engagement by males (4.33 ± 0.547) and females (3.83 ± 0.614), with $p = 0.007$. There was also a statistically significant difference between the mean scores for functionality by male (4.41 ± 0.387) and female (3.97 ± 0.644) participants, with $p = 0.018$. For the aesthetics domain, there was a statistically significant difference in the mean scores of males (4.36 ± 0.497) and females (3.95 ± 0.600), with $p = 0.021$. However, there was no statistically significant difference between male and female respondents' mean scores for information, app subjective quality, perceived impact, and app quality domains ($p > 0.05$).

Table 2 reveals that there was a statistically significant difference in the mean scores for engagement between at least two groups ($F(3,31) = [7.147], p = 0.001$). The Tukey's HSD test for multiple comparisons concluded that the mean scores for engagement were significantly different for non-anxious and fairly anxious patients ($p = 0.002, 95\% \text{ C.I.} = [0.11, 1.50]$) and slightly anxious and fairly anxious patients ($p = 0.001, 95\% \text{ C.I.} = [0.24, 1.70]$). The one-way ANOVA indicated that there was a statistically significant difference in the app quality mean scores between at least two groups ($F(3,31) = [4.500], p = 0.010$). For multiple comparisons, Tukey's HSD test revealed that the app quality mean scores were significantly different between non-anxious and fairly anxious patients ($p = 0.022, 95\% \text{ C.I.} = [0.69, 1.14]$) and slightly anxious and fairly anxious patients ($p = 0.013, 95\% \text{ C.I.} = [0.12, 1.24]$). However, it was statistically not significant for the mean scores for functionality, aesthetics, information, app subjective quality, and perceived impact on the patients' anxiety levels ($p > 0.05$).

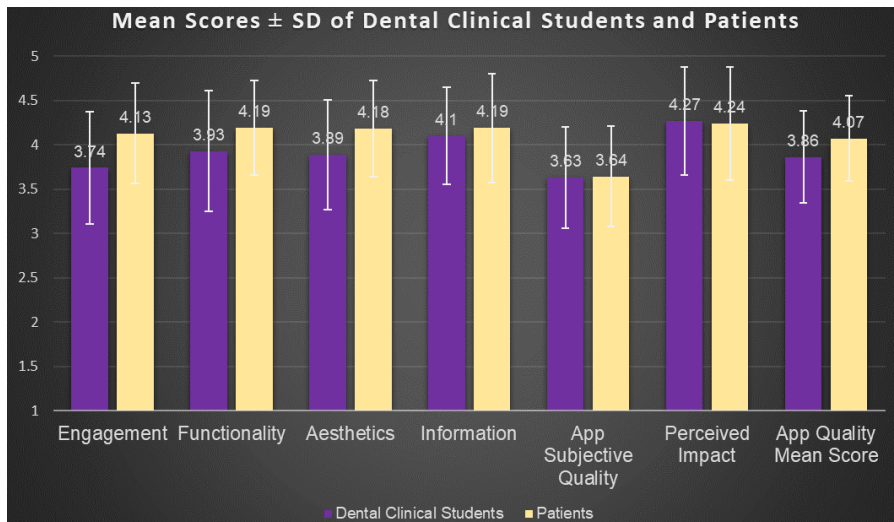


Figure 4. The mean score of each domain in uMARS and app quality mean score between dental clinical students and patients.

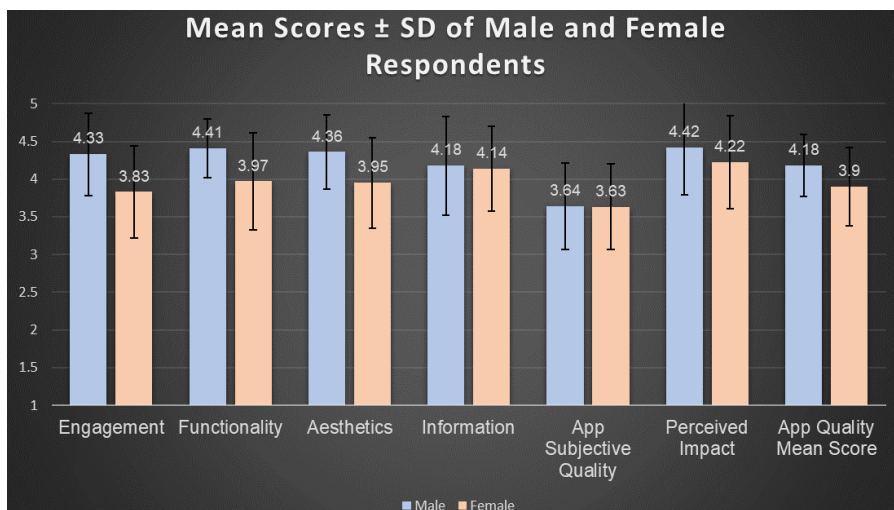


Figure 5. The mean score of each domain in uMARS and app quality mean score between males and females.

Table 2. uMARS: to compare the patients' anxiety levels and their mean scores for each domain

Domain	Patient's anxiety level	Mean \pm SD	F	P
Engagement	Not anxious	4.32 \pm 0.404	7.147	0.001*
	Slightly anxious	4.42 \pm 0.520		
	Fairly anxious	3.49 \pm 0.474		
	Very anxious	3.92 \pm 0.415		
Functionality	Not anxious	4.33 \pm 0.413	2.675	0.064
	Slightly anxious	4.38 \pm 0.604		
	Fairly anxious	3.75 \pm 0.577		
	Very anxious	4.10 \pm 0.285		
Aesthetics	Not anxious	4.28 \pm 0.468	2.824	0.055
	Slightly anxious	4.43 \pm 0.589		
	Fairly anxious	3.76 \pm 0.535		
	Very anxious	4.00 \pm 0.333		
Information	Not anxious	4.38 \pm 0.555	2.067	0.125
	Slightly anxious	4.35 \pm 0.699		
	Fairly anxious	3.89 \pm 0.476		
	Very anxious	3.80 \pm 0.542		
App subjective quality	Not anxious	3.73 \pm 0.401	2.725	0.061
	Slightly anxious	3.85 \pm 0.709		
	Fairly anxious	3.14 \pm 0.497		
	Very anxious	3.65 \pm 0.418		
Perceived impact	Not anxious	4.24 \pm 0.576	0.277	0.842
	Slightly anxious	4.37 \pm 0.680		
	Fairly anxious	4.07 \pm 0.871		
	Very anxious	4.20 \pm 0.506		
App quality mean score	Not anxious	4.21 \pm 0.330	4.500	0.010*
	Slightly anxious	4.29 \pm 0.570		
	Fairly anxious	3.61 \pm 0.400		
	Very anxious	3.89 \pm 0.259		

A one-way ANOVA was performed. *Statistically significant at $p \leq 0.05$

DISCUSSION

The primary aim of this study was to obtain dental students' opinions on using self-preference musical apps as an intervention in dental settings. According to Shim et al.,²³ dental anxiety occurs in almost half of children and adolescents and up to 20% of adults. Dental anxiety often leads individuals to avoid seeking dental care, which can result in considerable deterioration of oral health, subsequently increasing dental care costs.^{23,25–27} Moreover, anxiety during dental procedures may prolong the duration of appointments, further impacting overall dental care.²⁷ Based on the result of our study, 16.9% of patients were reported to be fairly anxious, 7.7% were very anxious, and only 1.5% were extremely anxious. The results of this study are consistent with prior research with notably low levels of extreme dental anxiety.²² However, it is crucial to note that to generalize these findings to the entire Malaysian population, a study with a more comprehensive demographic representation reflecting ethnic proportions would be required.^{22,27}

Musical intervention is one of the ways to manage patients with dental anxiety, as it uses distraction and relaxation techniques during short and simple dental procedures. Several studies report that listening to self-preference music decreased the patients' intraoperative anxiety, and they were observed to become more relaxed.^{11,12,28–30} The music can be searched using any music streaming service or app according to one's own preferences. A music streaming service offers a range of features, primarily focusing on providing extensive libraries of songs and albums through an internet connection.²³

Jiang et al.,³¹ highlight that music preference significantly impacts music's ability to affect mood, particularly in terms of tension and relaxation. Their findings suggest that sedative music is more effective than stimulative music in reducing tension and enhancing relaxation.³¹ Furthermore, listening to preferred music notably decreases tension compared to unpreferred music, though relaxation levels do not differ significantly between the two.^{32,32} Dental-related apps had been developed to compensate for the need and usage for clinical, educational, and diagnostic settings; however, they were non-related to musical intervention and implementation.^{19,34} Music can offer relaxation and distraction for patients undergoing dental procedures; given its proven beneficial effects on physiological functions, we developed the ACOU@PLAY app.¹⁸ A literature search uncovered a deficiency in reviews pertaining to musical mobile apps designed for managing dental patients. Instead, recent reviews have predominantly focused on techniques such as dental simulation games and relaxing videos, specifically on helping children.^{34,35}

Numerous studies have pointed out the link between oral health and overall well-being, indicating that individuals with heightened dental anxiety often report lower Oral Health-Related Quality of Life.^{9,12,27} This connection may arise from avoiding dental care, leading to significant deterioration in oral health and impacting daily functioning. To our knowledge, no personalized assessment is integrated into any mobile app. To address this, the ACOU@PLAY app integrates with a shortened version of the OHIP, a self-administered questionnaire covering various domains such as functional limitations, discomfort, disability (both physical and psychological),

social impairment, and handicaps. What sets ACOU@PLAY apart are its integrated assessment tools, which allow patients to evaluate anxiety and gag reflex levels before selecting personalized music. This feature aids both patients in self-assessing and clinicians in tailoring management strategies during dental procedures.^{12,18,22} For example, the app incorporates the MDAS, featuring several questions specifically addressing concerns about receiving local anesthesia. The MDAS provides a range of answers from “not anxious” to “extremely anxious,” with associated scores from 1 to 5 indicating progressively higher degrees of dental anxiety. These responses are compiled into a Likert scale, resulting in scores ranging from 5 to 25, with a score of 19 or above indicating extreme anxiety, similar to dental phobia.²² Additionally, the app features a condensed version of GPA, a Likert-type questionnaire with nine questions offering four answer choices each. The outcomes from this assessment categorize gagging severity into no or mild, moderate, and severe gagging; severe gagging may hinder the completion of dental treatments.^{8,9} All integrated assessments can play a comprehensive role as pre-treatment assessment, during treatment advice, and post-treatment evaluation.

The uMARS stems from the original MARS, a validated tool extensively employed to evaluate the quality of medical apps.^{24,35} The MARS was created as a framework for researchers, professionals, and clinicians to effectively classify and assess mHealth applications. However, a more user-friendly version of the MARS was made due to the need for specialized training and expertise in mHealth and relevant disciplines.¹⁸ Each domain’s questions were structured to collect user feedback on mobile app quality during the development and testing, leading to overall quality enhancements.^{17,24} Therefore, we reported the information domain to have the highest mean score as it contributes to the high app quality mean score and the lowest in app subjective quality. The low mean score of the app’s subjective quality domain relates to the low mean score of the willingness to pay for this app, for which 58.4% of the respondents rated this app 3 out of 5. In a competitive landscape where free alternatives abound, the perceived value in terms of price plays a significant role in users’ decision to purchase, as they weigh the benefits of the technology against its monetary cost.^{17,35,36} The engagement domain had the second lowest mean score, where 43.2% of the respondents rated it 3 out of 5, with basic customization to function adequately. There was a comment from the subjects that through this app, they hoped for some customization of the patients’ preferred playlists so that they could be created, saved, and played whenever the patient visited the dentist. Another comment suggested more accessibility options, such as customizable language and fonts. However, the target group scored the highest means, rating the app 4 and 5; this implies that regardless of their groups, all participants agreed that this app is designed for the target audience: patients with dental anxiety with minor issues. In the information domain, this

app’s quantity of information received predominantly high scores, with more than half of the subjects rating this app 4 and 5. This indicates that the app offers a broad range of information, including detailed content.

The findings of our study indicate that patients rated the app’s quality with a higher average score of 4.07 compared to dental students. The scoring by dental students is related to the focus of the apps that are intended for use by patients. However, they rated the quality of these apps as good. They recognized their potential to positively influence patients’ knowledge, attitudes, and intentions to change, along with the likelihood of actual behavioral changes in the patients.^{17,19} Regarding the correlation between patients’ anxiety levels and their app quality ratings, those categorized as slightly anxious provided the highest average score. In contrast, individuals classified as fairly anxious gave the lowest score. Music distraction was identified as the most effective management technique for moderately anxious participants.^{31–33} Listening to music is likely to reduce physiological arousal that rises during stress, as shown by decreased cortisol levels or heart rate and blood pressure.^{10,12,14} During acute stress events, such as before an examination or while waiting for a medical procedure or surgery, it has been discovered to effectively reduce anticipatory anxiety.¹⁰ Nonetheless, for patients experiencing high levels of anxiety, merely listening to music as a form of distraction might not suffice, as such situations demand active engagement strategies to foster a greater sense of control.²⁸ Gender and age are identified as significant factors associated with dental anxiety, with females being more commonly affected within the dentally anxious population.^{11,27,28} While our study primarily consisted of female participants, it was discovered that males tended to give slightly higher mean scores for app quality, although this difference was not clinically significant. This discrepancy may stem from variations in socioeconomic backgrounds, personal characteristics, and past dental experiences, suggesting a possible tendency to have higher expectations among female participants.^{11,27,28}

The engagement domain assesses how fun, engaging, customizable, and interactive the app is, while the functionality domain focuses on its performance, ease of learning, navigation, flow logic, and gesture design. The aesthetics domain evaluates the app’s graphic design, visual appeal, color scheme, and stylistic consistency.^{17,20,24} Future versions aim to enhance both aesthetics and subjective quality. Our findings indicate that all domains received ratings above 3 stars, reflecting the app’s superior quality. Numerous studies support the relationship between aesthetics and engagement, showing that attractive design enhances user engagement and perceived usability.^{17,19,36} Additionally, apps designed for behavior modification often achieve higher engagement scores, as their effectiveness largely depends on successfully engaging users.^{17,24} To further enhance the app, identifying its weaknesses and offering recommendations based on qualitative data from

user interviews can provide valuable insights into specific areas for improvement.

Notably, the app's perceived impact score was marginally higher than that of the information domain, with "awareness" having the highest mean rate in this domain. The respondents believed this app had increased their awareness of the significance of addressing health behavior, which in our case would be dental anxiety. Based on the high mean score, the ACOU@PLAY app can impact the users' intention to change, help-seeking habits, and behavior changes toward dental anxiety. The perceived impact rating of the app implies that it is on track to meet its objectives effectively.^{17,19} However, the primary goal of this evaluation was to collect data on the app's quality in its final form rather than demonstrating a behavior improvement. Therefore, the perceived impact domain was not included in calculating the app quality mean score as it is only used to obtain information on the user's intentions related to the target health behavior. A second evaluation phase is necessary to determine whether there was an increase in users' awareness, knowledge, and attitudes toward dental anxiety, motivation for behavioral change, encouragement for seeking help, or actual changes in behavior.

The study's limitation lies in its convenience sample from a single clinic center and the absence of in-depth subgroup analysis to evaluate the musical app's impact. This may result in a sample not adequately representing the general population. Therefore, additional multicenter, large-sample, high-quality randomized controlled trials are essential to validate the findings and provide more trustworthy clinical evidence. We intend to conduct a comprehensive study utilizing the ACOU@PLAY app on a larger participant pool, introducing it to clinic patients prior to dental treatment. This will enable an in-depth understanding of the effectiveness of the ACOU@PLAY app as a musical intervention.

In conclusion, the ACOU@PLAY app has the potential to serve as a self-preference musical intervention for patients in clinical settings. With its commendable quality score, we have determined that the app is of adequate quality, and its usability and utility as a musical intervention tool are satisfactory. Therefore, the ACOU@PLAY app may be used in dental practices for patient identification, music listening, and enhancing patient behaviors.

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