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"USABILITY APPROACH TO THE DEVELOPMENT OF AN ORAL HYGIENE INSTRUCTION AND MOTIVATION MOBILE APPLICATION FOR ORTHODONTIC PATIENTS."

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ABSTRACT: Introduction: Several interventions to improve oral hygiene compliance, such as verbal instructions, written instructions, illustrations using catalogues, videos, telephone calls, text messages, chat groups, and oral hygiene mobile applications, have been reported in patients undergoing fixed orthodontic treatment. This study aimed to develop and validate a mobile application based on a usability engineering framework from an end user perspective. Methods: The app design has a user end for patients. The description/screens of the graphic user interface (GUI) for users include registration, sign-in, home screen, setting screen, timer screen, and user profile. The approach involves the collection of data from 25 participants who underwent fixed orthodontic appliances and were recruited to interact with the mobile application to validate its usability. The methodology was considered in the context of the mobile app using a post study system usability questionnaire, which was applied to the users after 12 weeks of interaction. **Results:** A mobile application called the IFEORTHOCARE mobile app was developed with a user-end that illustrates or al hygiene instruction using a validated video, reminds patients about their oral health compliance with the aid of a push button alert, and empowers patients and clinicians to monitor oral hygiene compliance using feedback support in the form of a graphical display of the daily duration of toothbrushing. The mean PSSUQ score for all participants was 2.68 out of a maximum of 7.00, indicating a high degree of performance and satisfaction. Conclusion: The IFEORTHOCARE app was developed, and its usability has received strong overall satisfaction. In addition, there was a greater reduction in biofilm accumulation with the aid of this application.

Keywords: Dental health, Oral hygiene, Mobile application, Technology adoption, Usability, Orthodontic patients.

INTRODUCTION

The maintenance of good oral health status before and during fixed orthodontic treatment is extremely important (Palomares et al, 2012) because the appliances used could be a risk factor for plaque retention and could also increase the difficulty of teeth brushing (Aryeetey, 2024). It is therefore crucial to constantly remind patients of the importance of oral hygiene for the protection of periodontal tissues to obtain optimal and satisfactory results. According to Al-Jewair and Suri (2011), a decline in oral hygiene compliance due to difficulty with brushing has been observed in many orthodontic patients. Several motivation methods for oral hygiene have been used in dental health promotion and education and have affected treatment outcomes (Boyd, 1983; Yeung, Howell, & Fahey, 1989).

Follow-up with patients to ensure they adopt and maintain beneficial oral health behaviors is one of the most difficult problems facing dental teams (Asimakopoulou & Daly, 2009). Educational methods are generally classified as verbal (Boyd, 1983; Huber, Vernino, & Nanda, 1987; Yeung et al., 1989), written (McGlynn, LeCompte, Thomas, Courts, & Melamed, 1987) or visual-based (Lees & Rock, 2000). With technological advances, other motivational oral hygiene methods such as telephone calls (Cozzani et al., 2016), short message service (SMS) (Cozzani et al., 2016; Eppright, Shroff, Best, Barcoma, & Lindauer, 2013; Schluter et al., 2015), and mobile applications (Alkadhi et al., 2017) have been found to improve the oral hygiene status of patients.

Aryeetey (2024) also agreed that constant follow-up procedures through text messages, calls, or face-to-face meetings provide encouragement and reassurance and have been found to improve post-procedural pain and anxiety as well as oral hygiene compliance in orthodontic patients.

Studies have tried to identify the best methods for providing oral hygiene instructions and maintaining patient compliance during orthodontic treatment (Eppright et al., 2013; Lees & Rock, 2000). The use of verbal instruction, written instruction, illustrations with catalogues, videos, telephone calls, text messages, chat groups, and oral hygiene mobile applications have been reported (Alkadhi et al., 2017; Cozzani et al., 2016; Eppright et al., 2013; Lees & Rock, 2000; Schluter et al., 2015). Lee and Rock (Lees & Rock, 2000) reported the use of video to teach oral hygiene compliance among orthodontic patients. They compared this with verbal and written instructions and found a reduction in the Gingival Index in the video group. Eppright et al (2013) reported the use of weekly text message reminders to improve oral hygiene compliance among patients undergoing fixed appliance therapy at Virginia University and found a reduction in the Bleeding Index and the Marginal Gingival Index. Cozzani et al. (2016) compared the effect of structured telephone calls with structured text messages to monitor oral hygiene compliance among orthodontic patients and reported no significant difference in the Plaque Index score. Alkadhi et al (2017) investigated the effect of using mobile applications with active reminders to improve oral hygiene instructions among orthodontic patients and found a significant reduction in the plaque index and gingival index scores of patients using the application compared with the verbal instruction group.

The different approaches have shortcomings, such as a lack of post-treatment reminders for verbal instructions and catalogues (Cozzani et al., 2016). Studies using text messages to improve oral hygiene limited their participants to patients who read only English (Eppright et al., 2013; Jejurikar, Nene, Kalia, Gupta, & Mirdehghan, 2014), whereas phone calls are inappropriate for people with hearing disabilities or those who require interpreters for communication. The use of telephone calls placed additional responsibility on clinicians.

The use of mobile applications with self-reminder and visual illustrations serves the dual purpose of oral health education among orthodontic patients and as a reminder to perform oral hygiene instruction.

A mobile application is usually a small, specialized program downloaded to a mobile device (Baheti & Toshniwal, 2014). The term "app" is a shortened form of the term "software" (Gupta & Vaid, 2017). It has become very popular, and the American Dialect Society in 2010 listed it as the "Word of the Year" (Gupta & Vaid, 2017). The ability to download custom-built software applications (apps) has created new opportunities for orthodontists to integrate technology into clinical practice and for patients to gather information about orthodontics and assist them during their treatment. Following the increasing use of smartphones and handheld technology, the use of apps in various aspects of orthodontic practice management has become established (Gupta & Vaid, 2017).

Several mobile apps have been developed for orthodontics, but their usability has not been validated (Singh, 2013). Alkadhi et al. (2017) developed a mobile app for patients undergoing orthodontic treatment at the Riyadh College of Dentistry and reported its effect on oral hygiene compliance. The mobile app illustrates oral health education and has an active reminder that alerts the patient about their oral health and leads to a reduction in the plaque index and gingival index scores. However, the details of the app are ambiguous, which limits subsequent reliability tests on the app and its further use by other researchers. This application also did not provide feedback to help patients measure their oral hygiene performance.

The need for continuous oral hygiene instruction in patients undergoing fixed orthodontic appliance therapy cannot be overstated. This study aimed to develop a mobile application within the context of use in Nigeria called the IFEORTHOCARE mobile app that will illustrate oral education using a validated video and remind patients on their oral health compliance with the aid of a push button alert to empower the patient and clinicians to monitor oral hygiene compliance using feedback support in the form of a graphical display of the daily duration of tooth brushing; also, the usability of the app was validated by patients undergoing orthodontic treatment and to determine the effect of the app on the oral hygiene of patients using the orthodontic plaque index.

MATERIAL AND METHODS

Study Design

This prospective clinical study was conducted at the Orthodontic clinic of Obafemi Awolowo University Teaching Hospital, Ile-Ife, Nigeria.

Material

This prospective clinical study was approved by the Research and Ethics Committee of Obafemi Awolowo University Teaching Hospital, Ile-Ife, Nigeria (ERC/2019/10/08). Informed consent was obtained from each participant. The inclusion criteria were patients with malocclusion requiring fixed orthodontic therapy, aged 12-35 years, and who owned smart mobile phones. The exclusion criteria were physical and mental disabilities

Methods

Patients who met the inclusion criteria were recruited for this study from consecutive patients who presented to the orthodontic clinic of Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria to assess the usability of the app.

The app was conceptualized to overcome the problem of poor oral hygiene associated with fixed orthodontic appliance therapy (Alkadhi et al., 2017; Baheti & Toshniwal, 2014; Singh, 2013). The concept of the mobile app was discussed with a developer to create to health care mobile application that would hence be called IFEORTHOCARE APP. A healthcare mobile application intended to improve patient compliance with predetermined dental prescriptions by helping patients (referred to as users) improve their tracking and log of their

day-to-day toothbrush sessions. Log entries were analysed and fine-tuned to emphasize essential metrics, as well as provide feedback to the orthodontist in-charge in a format that was viewed in near real-time via a centralized dashboard.

The usability of the app will be validated using a modified post-study system usability questionnaire after 12 weeks of use.

Pilot Study

A pilot study was carried out on 11 patients undergoing fixed orthodontic appliance therapy using a questionnaire. This study was conducted to understudy the feasibility and ensure patient input in the development of the IFEORTHOCARE app for patients undergoing fixed orthodontic appliance therapy using the questionnaire. As part of the 16-item questionnaire, an additional open-ended question was also administered to the participants for suggestions on improving the app to validate the user-cantered design approach. Table 1 presents the categorization of the participants' responses to the open-ended questions.

Fable 1: Classification of participant	s' responses to open-ended questions
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Response Sub-Scale	Freq (%)
Modification of System Quality	6 (54.5)
Modification of Information Quality	4 (36.4)
Modification of Interface Quality	1 (9.1)
Total	11(100.0)

Eleven participants (100%) made suggestions; six (54.5%) suggested how to improve the system quality, four (36.4%) made suggestions on information quality, and only 9.1% made suggestions on interface quality.

These responses were categorized based on the following subscale:

System quality: The reminder should have a different and appealing tone; improvement in the log-in session is needed, and the app messenger should be used to communicate more effectively between the patients and their orthodontists.

Information quality: There should be more than one video for each brushing session. Others wanted the video to show how to clean the tongue and the use of dental floss by orthodontic patients.

Interface quality: The synchronization of information from offline to online should be adjusted. Some of these requests were considered in the final development of the mobile app.

Data Analysis

The statistical program SPSS version 20.0 (SPSS®, Chicago, Ill, USA) was used for data management and analysis.

3. **RESULTS AND DISCUSSIONS**

3.1. Sociodemographic characteristics of the respondents





Figure 1 shows the sociodemographic characteristics of the participants. A total of 25 participants were recruited. The participants were selected randomly from adolescents 13(52%) and 12 (48%) with a mean (\pm S.D.) age of 18.64 (\pm 5.21) years. The gender distribution was 8 (32%) male and 17 (68%) female. The level of education of participants had 9 (36%) secondary schools and 16 (64%) tertiary institutions.

In this study, there were more female participants, which is in agreement with other studies that recorded a higher number of females seeking orthodontic treatment (Little & Spary, 2017; Otuyemi, Umweni, da Costa, & Fatusi, 2000; Souza, Oliveira, Pinheiro, Cardoso, & Magnani, 2013). This may be a result of greater concern for esthetics and appearance in the female population than in the male population (Lagorsse & Gebeile-Chauty, 2018). Studies of orthodontic treatment needs and other epidemiologic studies have found few sex differences in the incidence or severity of malocclusions between boys and girls, yet orthodontic practices typically have substantially more females receiving treatment than males (Harris & Glassell, 2011; Stenvik, Espeland, Berset, Eriksen, & Zachrisson, 1996; Willems, De Bruyne, Verdonck, Fieuws, & Carels, 2001). Girls are not only more likely to receive orthodontic treatments but are also perceived to need orthodontic treatment more than boys by their parents and referring dentists (Liepa, Urtane, Richmond, & Dunstan, 2003). Therefore, there are social and cultural differences in the subjectively perceived need for treatment, with an obvious lower threshold for girls (Wheeler, McGorray, Yurkiewicz, Keeling, & King, 1994). This observation has been corroborated by several studies in Nigeria showing that more females seek orthodontic treatment than their male counterparts (Ajavi & Azodo, 2014; Ndukwe, Utomi, Umeh, & Umeizudike, 2020; Onveaso, 2004). However, this observation is contrary to the findings of Adeyemi and Otuyemi (2016), who reported more males in their study. There were more adolescent participants in this study. This is similar to the findings of Jejurikar et al., (2014) and Abdaljawaad (2016) in their respective studies. This could be due to a growing awareness of malocclusion in our culture, and parental and guardian acceptance of orthodontic treatment. Another explanation could be that teenagers assume that fixed orthodontic appliances will improve their appearance. Other potential causes include adolescent status, peer pressure, and parental use of the device previously (Alkadhi et al., 2017) 3.2. Oral Hygiene Instruction and Motivation as a Mobile Application for Orthodontic Patients

The most important contribution of this study to the existing literature is the development of an Android-based oral hygiene smartphone app called IFEORTHOCARE APP. The app has both a user end for patients (https://ifeorthocare.com.ng/ife-ortho-care.apk) and an administrative end for Orthodontists to monitor their

patients (https://ifeorthocare.com.ng/super/login). The user end of the app consists of an offline, short oral hygiene care video feature that demonstrates oral hygiene practices for orthodontic patients. This video is similar to the one by Alkadhi et al. (2017). The video differs from the Brush DJ app video, which links the app to videos published on YouTube that demonstrate how to effectively use a toothbrush, dental floss, or interdental brushes (Farhadifard et al, 2020). The app in this study has several other features, such as setting the screen, messages, and profile. The setting screen allows patients to set a scheduled time for toothbrushing in the morning, afternoon, and evening using a push button. The app notifies users of an alarm at their scheduled time. This is similar to that described by Scheerman et al.,(2020) and Alkadhi et al., (2017). This is contrary to the reminder in the Brush DJ app, which only allows users to set reminders to brush twice daily.

The messaging feature in this study allows the user to compose a message about the challenges encountered while using the app to the orthodontist. In turn, the orthodontist responds by guiding the patient on how to troubleshoot these challenges. Alkadhl et al. (2017) reported a similar messaging app that encourages the practice of oral hygiene instruction. The profile feature was designed to provide a psychological reward for a patient's daily activities by displaying their overall performance on a graphical display. This is contrary to the feedback from the WhiteTeeth app, which provides an assessment of the amount of biofilm present on patients' teeth after uploading a selfie. It then directs the patient on the area to concentrate on; the area that needs attention (Scheerman et al., 2020). The administrative end of the app in this study consisted of a registered patient list, patient performance/overview, and feedback list. This is similar to the backend of the StrojCHECK app described by Thurso, Kurilova and Varga(2021) in Slovakia, which consists of system activation, doctor activation and patient activation.

The app's graphic user interface (GUI) has several features, including a user registration page, sign-in page, home screen, settings screen, timer screen, and user profile, some of which are shown in Figure 2(A-F)





Figure 2: The interface of the IFEORTHOCARE App. (A) Screenshot of the app's login page requesting the generated patient ID supplied by the administrator and patient's self-generated password. (B) Screenshot of the home screen showing a calendar to track the 90 days' duration of the study. Time-labeled circles below to start guide/timer screen and status bar at the base showing icons of home, profile, message, and setting. (C) Guide/Timer's screen of the App showing a 2 min 46 s oral care video; a timer and save session button. (D) Screenshot of the Settings screen of the app showing a scheduled time for tooth brushing in the morning, afternoon, and evening. (E) Screenshot of the Profile Page showing the name of patients, patient ID, and daily graphical representation of saved brushing time in the morning, afternoon, and evening (F) Screenshot of the app showing a conversation about the app's functionality between a patient and the administrator.

Patient ID Generation and Registration

Creation of a new user: the orthodontist would initially send the IFEORTHOCARE APP link (https://ifeorthocare.com.ng/ife-ortho-care.apk) to the intended user. Following installation of the software, a login dialog box was generated requesting patient ID and password. The administrator uses the patient's bio-data to generate a unique patient ID for the user, which is sent to the user to allow login.

The patient's ID provided allows for account activation. This takes the user to their login page, which enables the user to enter a secured password to protect their data. The login page is shown in Figure 2(A). The protection of user information was ensured by using the same phone number. The orthodontist requested the user to generate the patient ID, while the phone number, in this case, helped to verify that the patient was indeed the same user.

Sign In

Signing in to the app required a user ID and password for users who had already authorized their account. The user's data were downloaded from the central server to the app after signing in.

Home Screen

Figure 2(B) presents the home screen for logged users. It shows an average daily analysis of the user's brushing status in the morning, afternoon, and evening sessions as well as a general overview of their performance based on the number of days since they were recruited as a patient. The home screen has a status bar consisting of the profile, message, and setting.

Guide/Timer Screen

After signing in, a full-timer screen was displayed to show a detailed well-written English tutorial video on how to properly brush teeth with braces in situ, as shown in Figure 2(C). The content of the scripted video consisted of the following information: the orthodontist and the orthodontic patient; motivation was demonstrated by displaying oral health problems like gingivitis, gingival hyperplasia, and white spot lesions that may arise from poor oral hygiene practice in orthodontic. The instructor demonstrated preventive measures for such complications for the patient using an appropriate mechanical cleaning aid on a typodont while using the appropriate tooth brushing technique, and the patient was asked to repeat the procedure on himself/herself; the duration of each cleaning session and the frequency of daily cleaning was emphasized by the video instructor. English was used throughout this video because as most of our target patients had moderate to high socioeconomic status. The duration of the video was confined to 3 minutes to prevent burnout among patients. The video was an offline video so that patients could access it easily on the app. The scripted video was subjected to validation by dentists and patients using the following questionnaire:

- 1. Is the content of the video consistent with oral hygiene care for patients wearing suspenders?
- 2. Is the language on the video compatible with the intended patient's condition?
- 3. Is the information in the video clear?
- 4. Do you think you can repeat an oral hygiene demonstration on yourself?
- 5. Is the video duration too long?

A timer that displays the brushing duration is also activated simultaneously. A rough estimation of the user's brushing time will be made using the timer.

Settings Screen

For user convenience, a settings screen was provided where users can set a scheduled time for toothbrushing in the morning, afternoon, and evening, as shown in Figure 2(D). This schedule was used to notify users when their scheduled time was due. If a user chooses 5:30 a.m., 2:00 p.m., or 8:00 p.m. as his or her favourite brushing time, that user will be reminded at those times by reminding them that it is time to brush.

User Profile

The profile provided the user's current streak (Figure 2(E)). The streaks were measured to determine how long they have been complying with the prescription, that is, the number of days

time for tooth brushing plan in the morning, afternoon, and evening. In addition, the user is shown their data for all days since they have installed the app on a day-by-day basis. This helped put their overall performance in a more detailed perspective and provided the psychological reward of seeing their daily progress improve.

Messages

The message button is provided on the status bar. This enables the user to compose a message to the orthodontist in charge, thereby providing a good follow-up and feedback mechanism. It was designed to communicate any difficulties or challenges encountered while using the proposed app, as shown in Figure 2(F). The orthodontist then receives a notification of such messages when he/she logs into his/her dashboard and responds to help

troubleshoot such challenges. It also enabled the orthodontist to scrutinize the compliance of users and, after careful monitoring of user records, decide whether or not to intervene using messages to communicate the user's compliance status and need for improvement.

Registered Patients list

The orthodontist can access all registered patients at a glance with basic information such as full names, email addresses, and patient ID. To view additional information about a single patient, the administrator can click on a single patient's name.

Feedback List

The feedback list provides a unified list of feedback received by the orthodontist and the originating user. The orthodontist then responds directly to the individual feedback.

3.3. Participants' responses to the post-study system usability questionnaire (PSSUQ)

Table 2 presents the results of the analysis of respondents to the IFEORTHOCARE App usability questionnaire adopted from the Post Study System Usability Questionnaire (PSSUQ). The mean PSSUQ score for all participants was 2.68 out of a maximum of 7.00 (the lower the score the higher the satisfaction and vice versa), indicating a high degree of performance and satisfaction. However, the mean values for items 10 (Was the video too long?) and 11 (Was the video too short?) were 4.88 and 5.48, respectively, out of the maximum of 7.00, which indicates low satisfaction.

Category	No	Item	Mean	S.D.
SysUse	1	Did you find the app easy to install?	2.08	1.50
	2	Was the application functional on your Android device?	1.44	0.65
	3	Did the app reminder work accordingly?	2.48	1.45
	4	Did the app timer work appropriately?	2.44	1.73
	5	Did the saved session save the timed session?	2.32	1.80
	6	Did you receive graphical feedback of your timed sessions daily?	2.36	1.44
	7	Was it easy to learn and operate the app's functions?	1.76	1.13
	8	Did you find the app useful?	1.68	1.03
InfoQual	9	Did you find the video content useful for your home care?	1.72	1.06
	10	Was the video too long?	4.88	1.60
	11	Was the video too short?	5.48	1.19
	12	Was the video duration accurate?	2.48	1.36

Table 2: Participant responses to the Post-Study System Usability Questionnaire (PSSUQ)

		Total	2.68	
Overall	16	Overall, I was satisfied and will use it in the future.	2.24	1.39
		longer periods?		
	15	Did the feedback display encourage users to brush for	2.48	1.61
	14	Were you able to easily move from one page to another?	2.04	1.40
IntQual	13	Did you find the app interface visually appealing?	2.52	1.16

SYSUSE: Sum of System Quality; INFOQUAL: Sum of Information Quality; INTQUAL: Sum of Interface Quality and S.D: Standard deviation

The results for the subscales associated with PSSUQ are presented in Figure 3. The subscales of the questionnaire are grouped into three, as indicated in the following:

1. System Usefulness (SysUse). The table shows the mean of the responses from items 1 to 8, which constitute this subscale, at 2.07 (SD = 0.82). This indicates a superb usefulness level.

Quality of information (InfoQual): The results show the mean of the responses of items 9 to 12, which are indicators of information quality, as = 3.64 (SD = 0.50). This also somewhat indicates good-quality information.
Interface Quality (IntQual): Furthermore, the average of the responses from items 13-16, which are indicators of interface quality, was 2.32 (SD = 1.11). This also demonstrates excellent interface quality.



Figure 3: Bar chart showing PSSUQ subcategories

The result of the analysis of respondents to the IFEORTHOCARE App usability questionnaire adopted from the PSSUQ shows that the mean score of the PSSUQ for all participants was 2.68 out of a maximum of 7.00. This indicates a high level of performance and satisfaction. Pinem Jeon and Park (2015) and Ribeiro et al. (2015) found a similar app with overall satisfaction.

In a more detailed analysis, the items that obtained the lowest score (better performance) within the system quality (SysQual) sub-scale were "Was the App able to function on your Android device?" (1.46 out of 7.00), "Did you find the App useful?" (1.54 out of 7.00), and "Was it easy to learn and operate the App's functions?" (1.75 out of

7.00). This is in agreement with the participants' expressed overall satisfaction with the usefulness of the application, which had a mean score of 2.07 out of 7.00. The overall information quality (InfoQual) score was 3.64 out of 7.00, while the item that obtained the lowest score within the information quality sub-scale was "Did you find the video content useful for your home care?" with 1.67 out of 7.00. This shows that although the respondents agreed that the information content provided by the application was useful for their home care, they were, however, dissatisfied with the items on the duration of the video, "Was the video too short?" (4.88 out of 7.00) or "Was the video too long?" (5.48 out of 7.00). The overall InfoQual mean score further demonstrates that all participants were mainly undecided about the quality of the information (video) provided by the appl.

In the interaction of respondents with the application, which was measured using the interface quality (IntQual) score, the items that obtained the lowest scores were "Are you able to move easily from one page to the other?" (2.00 out of 7.00) and "I was satisfied with the interface" (2.00 out of 7.00). The overall IntQual mean score was 2.32 out of 7.00, which indicates that all participants were satisfied with the performance of the application's interface.

The pattern of weak ratings for InfoQual relative to IntQual in this study does not indicate a conclusion about a poor documentation or an effective interface. In addition to reporting on the first iteration of this usability study and a probable redesign focused on improving the quality of information, if any significant decline is observed between InfoQual and IntQual, it is suggestive of a successful intervention.

The usability of IFEORTHOCARE app, (https://ifeorthocare.com.ng/ife-ortho-care.apk) developed for this study, was validated using a sixteen-item questionnaire. The questionnaire was adapted from the Poststudy System Usability Questionnaire (PSSUQ), version 3. The PSSUQ is a standardized validated questionnaire with a Cronbach's alpha of 0.96 that is used to determine user satisfaction with the system usefulness (Lewis & Sauro, 2021). The PSSUQ has an advantage over other customized questionnaires; it is a license-free instrument that facilitates better communication and results generalization. A similar instrument was used by Scheerman et al. (Scheerman et al., 2020) in the Netherlands. The System Usability Scale (SUS) questionnaire was used to assess the usability of the WhiteTeeth app (Scheerman et al., 2020). This is in contrast to a customized four-item questionnaire developed by Deleuse et al. (2020) in Belgium that was used to assess patient satisfaction with the smartphone application.

CONCLUSION

The IFEORTHOCARE App used in this study was specifically developed for the oral hygiene motivation of orthodontic patients, and its usability has shown strong overall satisfaction. In addition, there was a greater reduction in biofilm accumulation with the aid of this application.

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CONFLICT OF INTEREST

There are no conflicts of interest. **REFERENCES**

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