Original Research

UTILIZING WHATSAPP APPLICATION TO VERIFY WIRE BENDING EXERCISES DONE BY UNDERGRADUATE STUDENTS - A PROSPECTIVE SURVEY

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Abstract

Background: E-learning platform can be utilized to improve pre-clinical practical skills. Millions undergraduates are active users of WhatsApp platform and this can be used for learning and evaluation.

Objectives: The study's goals and include using WhatsApp to reinforce pre-clinical wire bending exercises among undergraduate dental students and assessing the effectiveness and acceptability of this platform among them.

Materials and Methods: This prospective study was conducted over a nine-month period and included 79 final-year BDS students from Mansarovar Dental College in Bhopal. The research was divided into three three-month sessions. An examination of similar questions of 10 MCQ and 10 Likert questions was conducted at the beginning and end of each session. A WhatsApp group called "Let's Learn Wire Bending" was formed, and digital images of wire bending exercises with step-by-step instructions and clinical benefits were posted. WhatsApp discussions about each appliance were held for three months, and at the end of the third month, an offline examination was held using the first question paper set, and student progress was evaluated.

Statistical analysis: Shapiro-Wilk's test was applied for evaluating normality of samples distribution, and in non-parametric data obtained from the Likert's score was converted into mid-point data analysis, and comparison between groups. Mann-Whitney U test was applied to assess acceptability.

Results: There was a statistically significant difference between before-session test results and after-session test results with a p-value less than 0.001. Likert feedback questionnaire revealed that students enjoyed this method of teaching.

Conclusions: The present study concluded that teaching pre-clinical wire bending exercises through WhatsApp application reinforces the traditional method of pre-clinical demonstration.

Keywords: *Wire bending, Dental education, WhatsApp, Pre-clinical.*

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Introduction

Orthodontics is a branch of dentistry that focuses on the diagnosis and treatment of dental deformities and malocclusions in the lower to upper jaws. Pre-clinical wire bending has traditionally been taught in dental schools through didactic lectures and pre-clinical wire bending demonstrations on study models.

The specific learning goal of pre-clinical wire bending is for students to be able to identify and label the specific wire bending appliance with its uses, signs, and mode of action.

In general, the pre-clinical demonstration begins with a briefing of the students on the specific wire bending appliance and gauge of wire to be used to serve specific indications, followed by a demonstration using study models. This was followed by a small group of students in the department (student posted in the department), after which students demonstrated wire bending exercises and associated technical difficulties, and doubts were discussed with the faculty. However, this method of learning wire bending has significant drawbacks, such as increased time consumption and decreased student interaction.

Recently, virtual wire bending has been proposed as an alternative method for teaching pre-clinical wire bending. 3-D digital images of wire bending exercises were created in a virtual method of wire bending, and the images were processed using processing software and displayed in sophisticated electronic devices. However, while this method of wire bending is more effective than traditional methods, it is also more cost-effective, which may not be possible in all dental colleges. As a result, there is a need for an essential tool that can address both the cost issue and the issue of student interaction.

WhatsApp is a free messenger app available on all Smartphones (iPhone and Android phones, as well as Windows Phone) that allows free instant communication (messages, videos, and images) between devices.[1] According to a recent study, there are 1.5 billion monthly active users worldwide, with more than 200 million monthly active users in India.[1-2] Furthermore, more than 63% of these users are young people (undergraduates) who spend more than 2 hours per day on this application.[3]

WhatsApp application has been used as an effective teaching tool in a variety of non-medical fields, particularly geography, language writing skills, and mathematics.[4] However, most studies in these fields concluded that using WhatsApp reinforces the traditional method of learning.[1-5]

Few studies on medical education have been conducted; these studies concluded that the use of WhatsApp aids in the development of effective communication and clinical skills between students and teachers.[5] As a result, in pre-clinical orthodontic wire bending demonstrations, WhatsApp application serves as a reinforcement tool for traditional teachings.

The digital steps of each wire bending exercise image can be captured using smartphone devices and captured images can be instantly free of charge circulated to the entire batch of students via the WhatsApp application.[1-6] As a result, the primary goal of our research is to determine the usability and acceptability of WhatsApp as a reinforcement tool in learning wire bending exercises for an undergraduate student.

Materials and methods

This was a prospective follow up study, carried out on final year BDS undergraduate students from June 2017 to March 2018 at the department of orthodontics in Mansarovar dental college, Bhopal.
This study included 85 final-year dental graduate students. (The admission batch was 2017-18, from June 2017 to March 2018.) Six registered students dropped out due to a lack of internet access, so a total of 79 students were considered for the study. The study included students who used smartphones with internet access, and no exclusion criteria were used.

Intervention

Digital images of wire bending exercises (Adam's clasp, Labial bow, 'z' spring) were created using Smartphone mobile camera. Captured images were edited and labeled on each appliance (name of the appliance, various parts, indication, and mode of activation).
The final edited images with notes were posted on the WhatsApp group, and students were instructed to study this material before engaging in a thorough discussion with the specific appliance every day. This style of instruction was given three times a week for nine months.

Method of minimizing error

To reduce errors during image editing, senior most Professors with more than 18 years' experience were included to guide this study, and Assistant Professors with more than 5-year experience were included in the administrator panel.

Data collection

The information gathered from each session (before start of session and at the end of session). An offline examination was conducted, with 5 marks for MCQs, 5 marks for wire bending, and 10 marks for feedback questions. Before the start of each session, a traditional method of teaching, wire bending demonstration, and pre-test were performed in the classroom. Later, for three months, standard edited wire bending images were posted on WhatsApp and discussed in a WhatsApp group; at the end of the third month, a post-session (end of session) offline exam with similar questions was held. This procedure was repeated for each term and consecutively for all three periods (Figure 1).
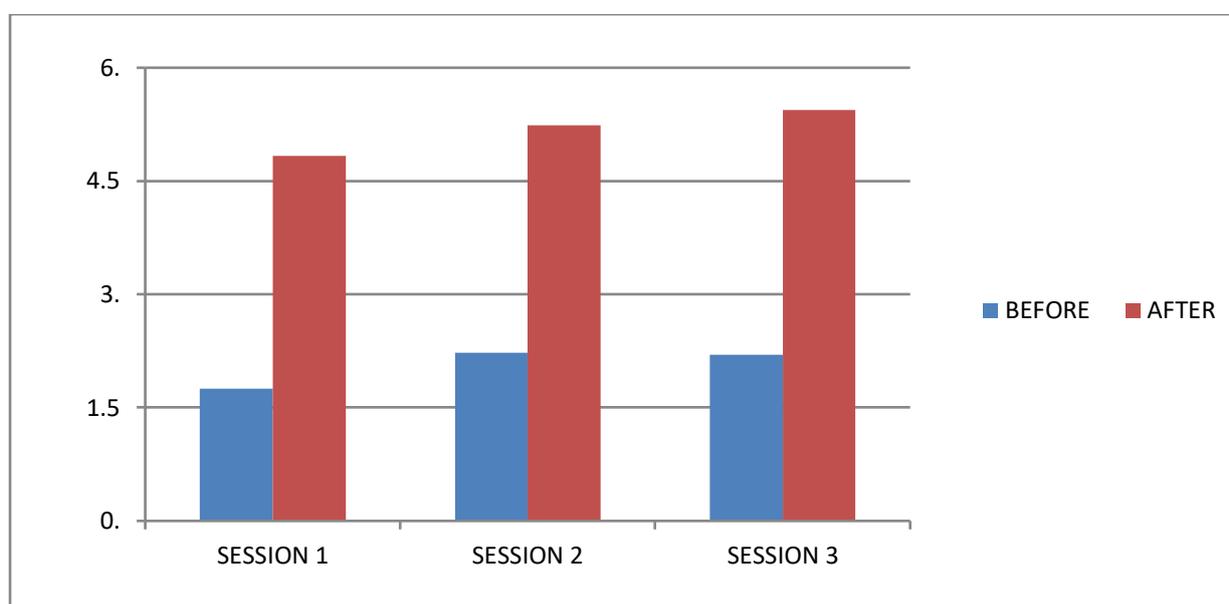
Graph 1. MCQs test scores before and after of each session

Data was collected in two ways, first numerical MCQs in a quantitative pattern and second using Likert's rating scale (feedback questioned) for a qualitative method.

Qualitative data collection method

A modified Likert's rating scale designed student feedback questionnaire form was used for qualitative assessment. The closed-ended questionnaire contained ten items that focused on the students' perception, acceptability, interest, and effectiveness in understanding the subject content and performing wire bending exercises using WhatsApp. The common responses were grouped into ranges, and the number of subjects in each range was calculated and halved to produce new midpoint coding[7]; these new codes were used as numerical data for analysis (Table 3). This midpoint coding method was performed for both pre- and post-measurements and Shapiro–Wilk statistical test applied was applied keeping the 95% confidence interval to check the students' perception, acceptability, interest and the effectiveness of WhatsApp.

Table 3. Likert rating scale for before and after test (survey) and midpoint coding

| Range	Marks obtained 10 max	Subjects	Likert codes	Midpoint coding	Session
1-7	3	8	1	4	
8-31	5	23	2	11.5	I
32-55	6	23	3	11.5	Before
56-67	7	11	4	5.5	
68-79	7.5	11	5	5.5	
1-4	5	5	1	2.5	
5-20	6	15	2	7.5	I
21-33	7.5	12	3	6	After
33-57	8	24	4	12	
57-79	8.5	20	5	10	
1-3	4	4	1	2	
4-11	5	7	2	3.5	II
12-33	6.5	21	3	10.5	Before
34-53	7.5	19	4	9.5	
54-79	8	25	5	4	
1-7	5	8	1	4	
8-23	7	15	2	7.5	II
24-47	7.5	24	3	12	After
48-63	8	15	4	2	
64-79	9	15	5	2.5	
1-8	3.5	9	1	4.5	
9-27	5	18	2	9	III
28-43	5.5	15	3	7.5	Before
44-61	6	17	4	8.5	
62-79	7	17	5	8.5	
1-6	4.5	7	1	3.5	
7-17	5	10	2	5	III
18-27	6	9	3	4.5	After
28-57	6.5	29	4	18.5	
58-79	8	21	5	10.5	

Quantitative data collection method

A pre- and post-session offline MCQs test, as well as a wire bending exercise, were used for quantitative evaluation. The obtained scores were tabulated in terms of mean standard deviation, and the Shapiro-Wilk statistical test was used to assess normal data handling using IBM SPSS statistical software (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). However, the obtained data demonstrated that $P<0.0001$, with an alternative hypothesis and skewed data distribution.

To assess the acceptability of the course, we created an ideal feedback questioner, which consisted of ten closed-ended questions rated on an ideal scale (Likert rating scale). Each question was graded on a scale of 1 to 5. (1-strongly disagree, 2-disagree, 3-Neutral, 4-Agree, and 5-Strongly agree). The Wilcoxon signed-rank test was used to evaluate the obtained nonparametric data.

Acceptability Evaluation

To evaluate the acceptability of the course, we developed ideal feedback questioned, this questionnaire composed of 10 close-ended questions weighing one marks each and ten were the maximum marks awarded. The acceptability assessment was executed using modified non-parametric Likert's rating scale. In this scale minimum score of individual students compared with Likert's strongly disagree (. i.e., score 1) maximum marks have been compared with strongly agree (i.e., 5-Strongly agree). Based on individual scores of students all the 79 students have grouped in five groups as per Likert scale and number of subjects were halved and given an arbitrary midpoint coding to convert categorical values into numerical and Mann-Whitney U test statistical test applied to test normal data handling using IBM SPSS statistics software (IBM Corp).
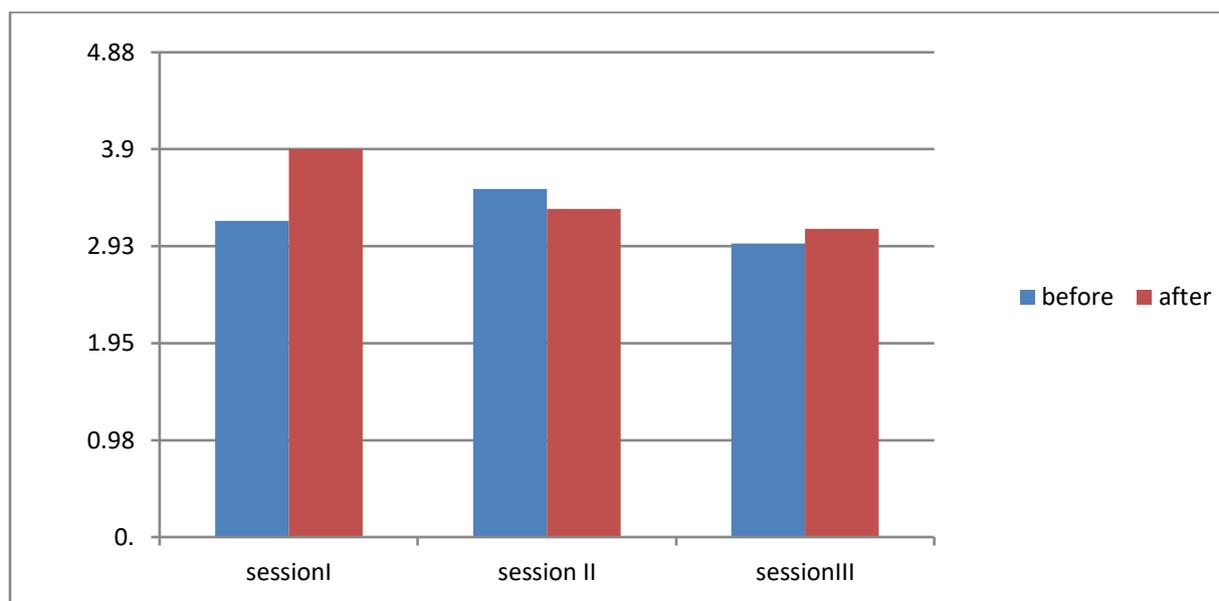
Graph 2. Likert arbitrary converted midpoint new code results of before test and after test scores of each session

Results

Except for those who do not have a smart phone or internet access, students enjoyed and actively participated in this study for almost the entire duration of their final year of graduation. As a result, 79 students took part in total.

Quantitative assessment

The average test scores of the session before start and immediately after the end of the session were tabulated, and standard deviation was calculated. Mann-Whitney U test statistical test was applied. SD score before the first, second and third session was 1.75 ± 0.67, 2.23 ± 0.86, and 2.20 ± 0.69 respectively. However, the post-test score of each session was 4.83 ± 0.87, 5.24 ± 1.06, and 5.44 ± 0.78 for session first, second, and third respectively (Table 1). There was a statistically significant difference found between before and after the test of each session with a p-value, less than 0.001 and a Z test value of -2.74. These outcomes of this study recommend that WhatsApp intervention has reinforced the performance level of the traditional wire bending demonstrations.

Table 1: The results of before test and after test scores of each session

S No	Session	Before test score SD (n=79)	After test score SD (n=79)	P – value	Z value
1	I	1.75 ±0.67	4.83±0.87		
2	II	2.23±0.86	5.24±1.06		
3	III	2.20 ±0.69	5.44±0.78	<0001	-2.74
	Average score	2.06±0.7	5.17±1.05		

Qualitative assessment

Quality assessment was done to evaluate the interest, perception, and acceptability of the participants and is based on a modified Likert rating scale. In this procedure immediately after the MCQ test, 10 marks closed-end questioner (Table 2) was given to everyone, and their answers were grouped and rated as per the Likert rating scale. The obtained data were converted to arbitrary numerical using midpoint coding; these new coding's were used for analysis. The average standard deviation asset value of each before the session was 3.18±0.45, 3.5±0.86, and 2.95±1.23 for the first, second and third session respectively. However, after the test score was 3.9±0.57, 3.3±0.12, and 3.1±2.3 for the first, second and third after the session respectively (Table 3). As a result, the new midpoint coded Likert rating scale results show that the student's perception (Qualitative assessment) of the WhatsApp modality was 100% satisfaction. There were few students in the 'disagree' category and many in the 'strongly agree' category. As a result, the use of E-learning reinforces knowledge acquisition more effectively than the traditional method alone.

Table 2: The average Likert scale score of feedback questionnaire

S.No	Question
1	I enjoyed learning pre-clinical wire banding exercise using this method
2	This method provided enough learning resource for pre-clinical wire banding (brief description about appliance, image, and discussion)
3	It has improved level of participation in learning as compared to pre-clinical wire bending lecture cum demonstrations
4	It helped me to improve communication with teachers and colleagues
5	I liked anytime anywhere learning by this method
6	I would prefer this method for learning pre-clinical wire banding as reinforcement for pre-clinical wire bending lecture cum demonstrations
7	It boosted my confidence in wire banding exercise
8	This method helped to clear technical doubts wire banding exercise
9	It helped me to practice the wire banding exercise in my hostel.
10	It is a cost-effective method of learning

Acceptability

Mann-Whitney U test applied for arbitrary converted numerical values, revealed significant differences between pre-and post-differences (3.5 ± 2.1 and 4.2 ± 3.3).

Discussion

Between student and teacher, a stronger, faster instant and relaxing bridge of communication has developed.[7] According to studies on WhatsApp usage, more than 78%-83% of young people spend 3-5 hours per day on WhatsApp; thus, this study concludes that the use of WhatsApp wastes valuable time during students' lives.[8] However, because the implementation is very economical, simple, accessible, and efficient, WhatsApp usage can be converted into constructive ways of learning.[9]

In this study, we look at the usability, acceptability, and efficacy of the WhatsApp application for learning pre-clinical wire bending exercises.

This method was a fair and realistic study that can be implemented practically anywhere. To evaluate the study's strengths, weaknesses, and reproducibility, we measured accessibility by enrolling all final year BDS students in a WhatsApp group; we discovered that only 9 students dropped out due to internet inaccessibility.

The acceptability of this study was evaluated using a feedback questionnaire, which revealed that WhatsApp teaching is the most acceptable method for learning pre-clinical wire bending exercise. We could see that the method's execution was simple and effective. The necessary resources, namely a smartphone and access to the internet, were used by all students and teachers. Once the images are posted, they can be retrieved at any time and from any location in their mobile device and used to learn wire bending exercises. As a result, the WhatsApp method for learning wire bending exercise is the most convenient and acceptable.

The evaluation of determined, critical, or preferred effects following an intervention is known as effectiveness. To assess effectiveness, we took before and after tests for each session in our study. The results showed that the WhatsApp teaching method for pre-clinical wire bending exercise resulted in a significant improvement. As a result, we discovered that the participants developed a stronger preference for the WhatsApp learning method over the traditional method for clearing their doubts during the pre-clinical wire bending exercise.

To the best of our knowledge, ours is the first study to be carried out in orthodontics regarding this field. However, few interventional studies have done in medical and non-medical categories. The study conducted by Gon and Rawekar in 2017 in pathology to evaluate the effectiveness of WhatsApp teaching over didactic lectures, a study has shown that intervention of WhatsApp teaching method reinforces to gain knowledge in a better way than didactic lectures.[1-15] The study concludes, however, that the WhatsApp method is better but not superior. Similarly, Dyavarishetty and Patil conducted research to assess the efficacy of WhatsApp teaching in community medicine.[16] We conducted the study using a pre-test and post-test, and the results revealed that WhatsApp teaching improves students' understanding of the subject.[17-18]

In our current study, we discovered a few advantages and disadvantages of the WhatsApp teaching method. The use of the WhatsApp application fosters a positive atmosphere within the group by allowing for the sharing of educational material even when students are not present, as well as easy accessibility, approachability, and the availability of teachers to correct mistakes immediately. These are some of the advantages of the WhatsApp learning method. The most significant disadvantage of the WhatsApp teaching method that we discovered during this study is that it requires extra time and special attention to witness irrelevant messages such as birthday, festival wishes, and rude arguments during the discussion, which may cause discomfort.

Several researchers (Heinze and Procter 2006, Lohitashwa et al. 2017) have reported similar experiences. According to these studies, students sometimes give too much communication, off-topic communication, or no communication.[17-21]

The current study had a few shortcomings. The first major disadvantage was that we only considered pre- and post-tests to evaluate the effectiveness of the WhatsApp teaching method, rather than creating two groups in batch (WhatsApp teaching group and traditional method of teaching). We don't do this to prevent injustice or to kick a few students off the WhatsApp learning platform. The second disadvantage of the current study was that it was an introductory study using images captured on a smartphone. However, it required videos of wire bending demonstrations, as well as briefings on each step, and it required ongoing efforts to determine long-term effects. As a result, it is the study's future scope.

Table 4. Likert arbitrary converted midpoint new code results of before test and after test scores of each session

S.No	Session	Before test score SD (n=79)	After test score SD (n=79)	P value	Z value
1	I	3.18±0.45	3.9±0.57		
2	II	3.5±0.86	3.3±0.12		
3	III	2.95±1.23	3.1±2.3	<0.0001	-2.76
	Average score	3.5±2.1	4.2±3.3		

Conclusion

Our research concludes that pre-clinical wire bending exercise teaching via WhatsApp is the most effective tool that is easily accessible and acceptable to final year BDS students. This study, on the other hand, examines the potential benefits and drawbacks of the WhatsApp teaching method. This method can be used in other areas of dentistry.

Conflict of Interest: None

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