

## Smartphone application as a teaching strategy for bronchy hygiene manuals for physiotherapy

### Aplicativo para smartphone como estratégia de ensino das manobras de higiene brônquica para fisioterapia

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**RESUMO | INTRODUÇÃO:** No decorrer dos anos, os cursos da saúde têm passado por importantes mudanças na velocidade das inovações, trazendo o crescimento, pesquisa e melhoria para o processo da educação. A introdução de tecnologias e novos métodos de ensino têm contribuído para aprimorar e permitir o aprendizado de maneira mais eficiente. **OBJETIVO:** desenvolver e aplicar vídeos de manobras de higiene brônquica, através de aplicativo, como ferramenta de ensino para graduandos de fisioterapia do CESUPA. **MATERIAIS E MÉTODOS:** O estudo realizado foi experimental e descritivo. Foram analisados 40 alunos do estágio supervisionado de fisioterapia, dos 7º e 8º períodos de 2018, também foram analisados 4 juízes com comprovação na docência em curso de fisioterapia. Foi criado um aplicativo móvel, com vídeos de manobras de higiene brônquica, foi feita a validação do aplicativo móvel pelos juízes e, por fim, verificou-se a opinião dos alunos quanto à utilização do aplicativo móvel proposto para o processo de ensino-aprendizagem. **RESULTADO:** Referentes à atenção, relevância, confiança, conhecimento, compreensão e aplicação, a avaliação foi satisfatória, totalizando 60% dos para graduandos de fisioterapia. **CONCLUSÃO:** Após a análise das respostas, concluímos, em sua totalidade, a satisfação dos juízes, salientando que o aplicativo é prático, de fácil entendimento e pode auxiliar na aprendizagem. Na avaliação das opiniões geradas pelos alunos, quanto a utilização do aplicativo móvel proposto para o processo de ensino-aprendizagem, nos aspectos, instrumento de aprendizagem, ferramenta de estudo, facilidade de manuseio, na promoção de dados concretos para o ensino das manobras de higiene brônquica, auxiliar na prática da fisioterapia, a maioria significativa dos alunos considerou o aplicativo avaliado como excelente.

**PALAVRAS-CHAVE:** Aplicativos móveis. Manobra. Ensino. Aprendizagem. Recursos audiovisuais.

**ABSTRACT | INTRODUCTION:** Over the years, health courses have undergone important changes in the speed of innovation, bringing growth, research and improvement to the education process. The introduction of technologies and new teaching methods have contributed to improve and enable learning more efficiently. **OBJECTIVE:** To develop and apply videos of bronchial hygiene maneuvers, through application, as a teaching tool for physiotherapy students. **MATERIALS AND METHODS:** The study was experimental and descriptive. Forty students from the supervised physiotherapy internship, from the 7th and 8th periods of 2018, were analyzed. Four judges were also verified with the teaching in physiotherapy course. A mobile app was created, with videos of bronchial hygiene maneuvers, the mobile app was validated by the judges and, finally, the students' opinion regarding the use of the proposed mobile app for the teaching-learning process was verified. **RESULT:** Regarding attention, relevance, confidence, knowledge, understanding and application, the assessment was satisfactory, totaling 60% of those for physiotherapy students. **CONCLUSION:** After analyzing the answers, we fully concluded the satisfaction of the judges, noting that the application is practical, easy to understand and can help learning. In the evaluation of the opinions generated by the students, regarding the use of the proposed mobile application for the teaching-learning process, in the aspects, learning instrument, study tool, ease of handling, promoting concrete data for teaching hygiene maneuvers. bronchial aids, assisting in the practice of physical therapy, the significant majority of students considered the evaluated application as excellent.

**KEYWORDS:** Mobile applications. Maneuver. Teaching. Learning. audiovisual Aids.

## Introduction

Health education is under recurring criticism around the world. In Brazil, it has become the object of analysis by professionals in the field and by society in general. There is, to a certain extent, a consensus on the need to reformulate certain aspects of training with a view to meeting current care demands<sup>1</sup>.

Current national health and education policies point to the need for changes in the processes of vocational training in health, have encouragement and support to broaden social responsibility and agree proposals for defining competencies and for developing national curriculum guidelines<sup>2</sup>.

These paradigmatic changes, involving the conceptions of health and education, need to be experienced during the training, expanding the possibilities of horizontalization and democratization of knowledge. Competences and skills also need to be developed by health professionals, so that they are constituted as subjects committed to the pursuit of care appreciation<sup>2</sup>.

Over the years, health courses have undergone important changes in the speed of innovation, bringing growth, research and improvement to the education process. The introduction of technologies and new teaching methods has contributed to improve and enable early learning. The technological resources of communication and information have been developing rapidly, occupying space in the daily lives of students and teachers, serving as a tool to help in the teaching and learning process<sup>3,4</sup>. These reflexes of the "digital age" are present in education, with the new reality, educators began to rethink the traditional form of teaching, incorporating technology in their work. Speaking the "student's language", understanding what is being studied, making it easy and pleasant<sup>3,5,6</sup>.

Within the new digital landscape, teachers need to continue monitoring the teaching and learning process, updating themselves and using the new technologies applied in this process. For this, there must first be interest and initiative from those who mediate knowledge, improving their teaching methods in accordance with technological development<sup>6</sup>.

Given this technological scenario, the use of images is an important tool in the educational process. In the videos, it is evident that the quality of the images can give context and authenticity to the learning environments, making the message to be shared get even closer to reality. Also facilitating, as it is a tool that allows the student to select the content in which they want to know, and can advance, stop, return, annotate and establish the association of video with other sources of information<sup>4,7,8</sup>.

Multimedia learning proposes that people learn best when images are paced with words in an e-learning environment, including animation and narration, not just text and static illustrations. However, it is essential that the messages to be transmitted are in accordance with the cognitive process of each individual<sup>9</sup>. The use of this feature has a positive impact on student learning in respiratory therapy, a field in which instrumental and manual resources are frequently used and can be exploited using this technology<sup>10</sup>.

The literature on the manual resources of respiratory physiotherapy or bronchial hygiene maneuvers, besides scarce, does not satisfactorily describe their techniques. Most of the time, these features are only cited, perhaps because they are purely manual techniques and require much more practical experience from the practitioner than their own scientific background<sup>11</sup>, that some bronchial hygiene techniques are more widely used than others, both for ease of application and effectiveness.

The use of computational tools in healthcare is expanding, as this type of support gives health professionals greater precision and agility in their work. Thus, it is understood that developing computational solutions in application format (APP) presents an effective way to make the tool available and reach the desired target audience. APP is able to customize and extend the functions of these handheld computers called smartphones and tablets<sup>12</sup>.

In order to assist in the training of health professionals, this research aims as the final product, the development of an application that provides tutorial videos with personalized information for each

technique of bronchial hygiene. This APP can be used by physiotherapy students, healthcare professionals and in the continuing education process.

## Materials and methods

The type of study conducted in this research was experimental and descriptive. The sample consisted of 40 students, all from the supervised internship of physiotherapy, and 4 Judges, professional physiotherapists who worked as teachers in physiotherapy courses.

As inclusion criteria, we analyzed the students of the supervised internship of physiotherapy, of the 7<sup>th</sup> and 8<sup>th</sup> period of 2018 and judges with proof in teaching in physiotherapy course, with knowledge about maneuvers of bronchial hygiene. The study excluded students and judges who showed some audiovisual deficiency that prevented them from watching the videos and had difficulty understanding. Data collection was performed in December 2018.

The present study began with the construction of four videos referring to bronchial hygiene techniques (expiratory flow acceleration - EFA; autogenous drainage - AD; forced expiration technique - EFT; and slow slow expiration with open glottis in infralateral decubitus - ELTGOL. ), all these maneuvers reported and evaluated in the Lyon Consensus - 1994/2000.

The preparation of the videos took place in the following steps: a) literature review; b) elaboration of the script; c) script evaluation; d) filming of simulated environment techniques applied to an actor who played a patient; e) editing of the educational video.

Next, a mobile app - APP was created, with the videos of bronchial hygiene maneuvers, in partnership

with computer specialists, and finally the product was validated (APP) by the judges and, finally, the opinion was verified by the students regarding the use of the proposed mobile application for the teaching-learning process.

Data were treated using descriptive statistics, expressed as absolute and relative frequencies and presented in tables or figures. Compliance Chi-Square was used to compare the frequency distribution observed in each expected response category and results with  $p \leq 0.05$  were considered statistically significant.

## Results and discussion

### Mobile app presentation

We developed a smartphone app addressing bronchial hygiene maneuvers aimed at the teaching-learning process of undergraduate physiotherapy students. Initially we created an icon to make it easier to see the app on the smartphone. We produced four subdivisions of the central theme, corresponding to modules, indicating the bronchial hygiene maneuvers. Module 1 represents the video of the AFE maneuver; Module 2 represents the video of the Autogenous Drain maneuver; Module 3 represents the ELTGOL maneuver video and module 4 represents the TEF maneuver video. At this time, the mobile app for bronchial maneuvers can be accessed via the link: <https://3015970.igen.app/>

### Application analysis by judges

Tables 1 and 2 show the results of the judges' agreement on a series of 14 statements made about the evaluated application, which evaluated the motivation level (statements 1 to 11) and impact on learning (knowledge) parameters (statements 12 to 14).

**Table 1.** Distribution of judges regarding the level of agreement with the statements regarding the level of motivation made about the evaluated application. Bethlehem, 2018

Aspects and statements	Level of agreement				
	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)
<b>Attention</b>					
1. The mobile app interface design is attractive.	0 (0%)	0 (0%)	2 (50%)	2 (50%)	0 (0%)
<b>Relevance</b>					
2. It was clear to me how the content of the mobile app is related to things I already knew about bronchial hygiene maneuvers.	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (100%)
3. I liked the mobile app so much, that I would like to learn even more about the subject of it.	0 (0%)	0 (0%)	0 (0%)	1 (25%)	3 (75%)
4. The content of the mobile app is quite relevant for teaching.	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (100%)
5. I could relate the content of the mobile app to things I have already done, or thought related to student teaching.	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (100%)
6. The didactic power of the mobile app will be useful to me.	0 (0%)	0 (0%)	0 (0%)	3 (75%)	1 (25%)
<b>Confidence</b>					
7. The mobile app was harder to understand than I would like.	1 (25%)	3 (75%)	0 (0%)	0 (0%)	0 (0%)
8. The mobile app had so much information that it was difficult to identify and remember the important points.	0 (0%)	0 (0%)	2 (50%)	2 (50%)	0 (0%)
9. The content of the mobile app is so abstract that it was hard to keep attention on it.	100%	0 (0%)	0 (0%)	0 (0%)	0 (0%)
10. The mobile app activities were very difficult.	100%	0 (0%)	0 (0%)	0 (0%)	0 (0%)
11. I couldn't understand much of the content and behavior exposed in the mobile app.	100%	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Source: Survey Questionnaire, 2018.

**Table 2.** Distribution of judges regarding the level of agreement with the statements regarding the knowledge parameter made about the evaluated application. Bethlehem, 2018

Aspects and statements	Level of agreement				
	Strongly disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly agree n (%)
<b>Knowledge</b>					
12. After the mobile app I can remember more information related to the bronchial hygiene maneuvers presented by it.	0 (0%)	0 (0%)	0 (0%)	3 (75%)	1 (25%)
<b>Understanding</b>					
13. After the mobile app I can better understand the bronchial hygiene maneuvers.	0 (0%)	0 (0%)	0 (0%)	4 (100%)	0 (0%)
<b>Application</b>					
14. After using the mobile app I feel that I can better apply what I have learned.	0 (0%)	0 (0%)	0 (0%)	3 (75%)	1 (25%)

Source: Survey Questionnaire, 2018.

The judges who evaluated the mobile application were characterized by professional physiotherapists who act as teachers in physiotherapy courses, with professional experience between 10 to 15 years and academic background, mostly composed of master. However, in the study by Galvão and Püschel<sup>13</sup> we found different findings, the authors state that most evaluators were experts and had more than five years of teaching activity. Also, in the study by Tibes<sup>12</sup> at least 37% of the evaluators had a masters or doctorate in the area and 50% were specialists.

Among the characteristics of the judges, it can be highlighted that all are teachers of the physiotherapy course, active for 15 years and that encourages the training of their teachers. We believe this may have influenced the teaching time and the titration of the evaluators. Regarding the level of motivation, the judges were 50% (04/04) in agreement with the statement that addressed the aspect "Attention" and the others remained "neutral" in this regard.

We consider these findings because the filming was done and edited by the professional team and the mobile app, in partnership with computer specialists. Corroborating the above findings, the authors Galvão and Püschel<sup>13</sup> state in their study that the interface of the environment, screen design, content organization, font size and colors adopted, obtained an optimal classification by most experts.

Regarding the 'Relevance' aspect, all judges agreed 'strongly' with the statements that rated the content contained in the app for its clarity, relevance to teaching and relationship to what they did or thought in terms of teaching. Regarding the motivation to "learn more about the subject", 100% (04/04) of the evaluators were at least in agreement with this point, and 75% (04/04) of them agreed "strongly"; 75% (04/04) of the judges agreed that the "didactic power of the app" is useful to them and the others were "strongly" in agreement with this statement.

Galvão and Püschel<sup>13</sup> point out in their research that the items relevance of the theme and coherence of contents were rated as excellent by all experts.

Confirming these findings, it was found in the study by Tibes<sup>12</sup> that 100% of the physiotherapists interviewed pointed out that the subjects present in the application are related to what was seen during the undergraduate period in Physiotherapy and / or what is used in the practice of Physiotherapy.

In the selection and elaboration of the content we had the concern to make the concepts clear, using simple vocabulary and sufficient information, through short texts to avoid ambiguity and allow the transmission and capture of messages. Texts should be easy to read and quickly promote and achieve expected learning outcomes. The choice and presentation of content should take into account their ability to trigger students' prior knowledge<sup>14</sup>.

In assessing the impact of the application on student learning, the aspects 'knowledge', 'understanding' and 'application' were evaluated, based on the homonymous levels of Bloom's Taxonomy<sup>15</sup>. Regarding 'Knowledge', 75% (04/04) of the judges were in agreement and 25% (04/01) 'strongly' agreed with the fact that the application helped to remember "more information related to bronchial hygiene maneuvers" presented and the same proportions of responses were observed in the evaluation of the 'Application' aspect. With regard to 'Understanding', reviewers were unanimous in 'agreeing' that the app helped to better understand the maneuvers in question.

At the point that the application helps to remember information related to bronchial hygiene maneuvers, similar findings were found in the study by Gonçalves and Melo<sup>16</sup>. It was found that most respondents consider that the 'FISIOSPITAL' application presented in the form of a mobile device facilitated understanding and there is compatibility between the subjects covered and the practice of Physical Therapy. However, some respondents mentioned that the application could be presented differently, but realized that, using the application, there was added value to the subjects addressed in it.

Gonçalves and Melo<sup>16</sup> still ask about the first impression when trying to use the application

"FISIOSPITAL", most of the sample was observed, noting that there was no complication to use the application and was soon understood how to use it in various ways. We consider the evaluation of the mobile app when performed by a subject matter expert, is of great value. This way we can know the problems encountered and improve them for better usability. By agreeing with this thought Tibes<sup>12</sup> states that the experts' evaluation was of fundamental importance for the adequacy and improvement of their application.

### Mobile app evaluation by students

The quality of the application was evaluated by the physiotherapy students through questions that addressed different characteristics, whose answers are presented in the following. As a 'learning instrument' and 'study tool', a significant majority of students rated the application rated 'excellent' in these respects (60%, 24/40;  $p < 0.0001$  and 70%, 28/40;  $p < 0.0001$ , respectively) and, similarly, most rated their ease of handling as 'excellent' (60%, 24/40;  $p < 0.0001$ ). Similar findings were found in the study by Galvão and Püschel<sup>13</sup> stating that the educational aspects of their application were evaluated by physiotherapists as excellent and satisfactory.

According to Silva et al.<sup>10</sup> in their study, the use of an online multimedia resource had a positive impact on the learning of respiratory physiotherapy students, an area in which instrumental and manual resources are frequently used and can be explored in the context of this type of technology.

We consider that the use of videos in the mobile application has influenced the positive evaluation in the learning aspect, because the quality of the images that are moving makes the message to be shared comes even closer to reality. According to Vieira<sup>17</sup>, videos can give context and adaptation to learning environments, and can also be a reasoning tool for allowing the viewer to select the content they want to know about, stop, advance, return, annotate, establishing video relationships with other sources of learning information.

The study by Gonçalves and Melo<sup>16</sup> describes that in the categories analyzed, regarding the interface, usability, practicality and applicability, 100% of the interviewees were fully agreed that the application is easy to understand and use; that facilitated clinical practice, and would use it constantly.

We believe that the use of the mobile application may have encouraged learning, making it less formal through this complementary tool, which enriches and improves the education system.

As a "helping tool to understand the maneuvers" presented, the significant majority of students rated the app to be at least 'very good' (60%, 24/40) and 'excellent' to 30% (12/40) of the respondents ( $p < 0.0001$ ). In evaluating the usefulness of the application in promoting "hard data for teaching bronchial hygiene maneuvers", there was an equal proportion of students who considered it 'good' and 'excellent' tool (40%, 16/40;  $p < 0, 0001$ ), and as an aid in the "practice of physical therapy", the majority (50%, 20/40) of the students considered it 'excellent' for this purpose and 40% (16/40) considered it as 'very' good tool for this purpose, being significant these proportions ( $p < 0.0001$ ).

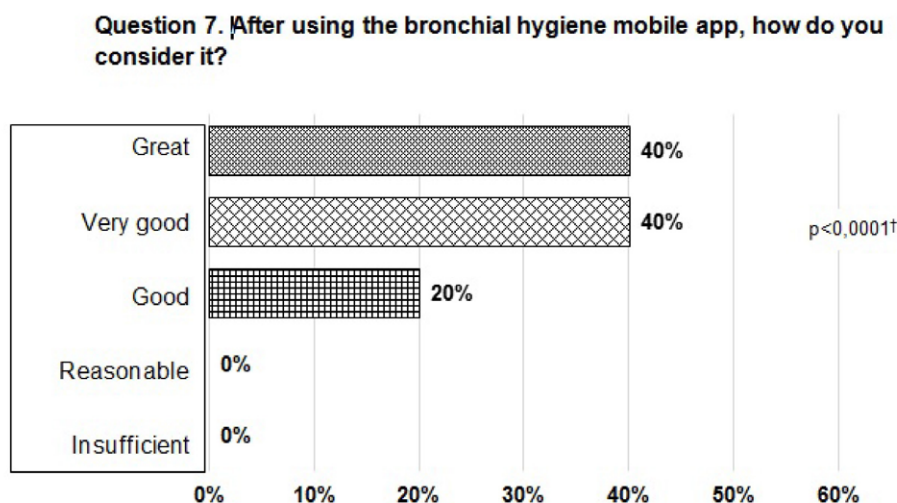
We understand these findings because the literature on bronchial hygiene maneuvers does not satisfactorily describe their techniques, perhaps because they are purely manual techniques and require much more than practical experience from those who apply them than their own scientific background. The techniques end up being adapted to the individual preference of therapists, often disregarding the maneuver originally described<sup>11</sup>.

According to Gonçalves and Melo<sup>16</sup> in their study, when evaluating the benefit of the application, there was a heterogeneity in the responses of the research participants, corresponding to 46.6% of the sample, stated that the application is useful, but needs adjustments to help the application. understanding of physical therapists. Already 26.7% said that the search application does not need to be improved, but that the user needs more time to use the subjects better. In the same proportion, they answered that the application does not need to be improved, as it is ready for use by physical therapists.



Figure 1 illustrates the distribution of students regarding the overall assessment of the mobile application containing bronchial hygiene maneuvers. There was an equal proportion of students who considered it 'good' and 'excellent' (40%, 16/40), and these represented the most significant respondents ( $p < 0.0001$ ).

**Figure 1.** Distribution of students according to the general opinion about the evaluated mobile application. Bethlehem, 2018



Statistically significant (adherence chi-square).

Source: Survey Questionnaire, 2018.

Confirming these findings, Gonçalves and Melo<sup>16</sup> stated that the use of application by physiotherapists proved to be of great value in the contribution and facilitation of subjects directed to respiratory physiotherapy when associated with the daily practice of physiotherapy.

During data collection, some students made some suggestions. They suggested adding audio tracks, or making video that combines image and sound, as complementary features.

The use of new technologies may also present barriers that seem to be more related to technical problems and student social and aptitude factors. According to Silva et al.<sup>10</sup> the biggest barriers reported by students for the use of new technologies: greater susceptibility to collapse, students consider themselves unable to work with a computer and / or believe that computer-mediated experience is not a substitute for classroom attendance.

Obviously, technology does not teach on its own, students do not learn from technological means, but from competent instructors who must have been trained to communicate through these means. We believe that the developed APP can help in teaching and that this model can be applied to the teaching of several other subjects, since studies conducted in other health areas have already suggested that the use of new technologies may facilitate students' learning.

Thinking about the enrichment of the teaching-learning process and the need to keep up with technological developments, the importance of developing tools that seek a significant transformation in education and that represent another means of achieving educational goals and improving the quality of teaching is emphasized<sup>13</sup>.

In this study we found a small limitation regarding the data transmission speed of smartphones, being suggested by the students, the use of the mobile application without the need for internet.

## Conclusion

An app has been developed that can offer students the opportunity to improve the relationship between theory and practice, to establish a correlation between what they learn and real situations, making learning more meaningful, more enriching.

The app also underwent a technical and functional quality assessment by judges, in which they described agreement with a series of statements that addressed the motivation level and learning impact parameters produced by the mobile app. After analyzing the answers, we concluded, in its entirety, the satisfaction of the judges, noting that the application is practical, easy to understand and can assist in learning.

In the evaluation of the opinions generated by the students, regarding the use of the proposed mobile application for the teaching-learning process, in the aspects, learning instrument, study tool, ease of handling, promoting concrete data for teaching hygiene maneuvers. bronchial aids, assisting in the practice of physical therapy, the significant majority of students considered the evaluated application as excellent. Still in the opinion of the students, analyzing the application as an aid to understand the maneuvers presented, a significant majority evaluated that the application is, at the very least, very good. In the general analysis of the mobile application containing bronchial hygiene maneuvers. It was observed an equal proportion of students who considered it good and excellent, showing the agreement between the different evaluators.

We understand that the insertion of technologies for the education process is executable and behaves as a complement and can be inserted as permanent education to undergraduate and physiotherapy professionals.

## Author contributions

Santos RC contributed to the project conception, data collection, literature reviewing and writing of the manuscript. Gomes PAF contributed to the project conception, supervised the project and contributed to the discussion and final draft.

## Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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