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YouTube as a source of information about pulmonary rehabilitation during the COVID-19 pandemic

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Abstract:

BACKGROUND AND AIM: To our best knowledge, there is no literature on the effectiveness of YouTube on pulmonary rehabilitation (PR) practice. In our study, we aimed to evaluate the characteristics and medical aspects of videos on YouTube about PR.

METHODS: In the internet media website YouTube.com search engine, the Word PR was searched on August 3, 2021, without any filter. The first 100 videos listed were classified according to the number of likes, dislikes, origin of country, and content of PR. The materials were evaluated in terms of intelligibility using the suitability assessment of materials (SAM). User participation measurements were obtained for each video.

RESULTS: The later years were shown to have a statistically significant relationship with respiratory techniques, PR contraindications, and videos with PR in COVID in our study ($p<0.05$). However, no significant relationship was identified between the later years and smoking in PR and videos with PR in the intensive care unit ($p>0.05$). The total SAM score was found to significantly correlate with the number of views, likes, dislikes, comments, and video durations ($p<0.05$).

CONCLUSIONS: It was observed that COVID videos with PR content were uploaded with regard to the specific video issues and treatment needs during and after the COVID infection in the later years, especially after the pandemic. Moreover, videos with high comprehensibility are more interesting for users, reflected in views, likes, dislikes, comments, and video duration. Higher quality videos created by health professionals will be more useful for patient education in the future.

Keywords:

E-learning, lung diseases, medical knowledge, pulmonary rehabilitation, YouTube

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Introduction

With the development of the Internet, as in all other areas, the speed of information exchange and the use of communication media in health care has greatly increased. Students are encouraged to access visually supported educational materials and up-to-date online publications in the active medical education system. YouTube videos are the most commonly used social media content for

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educational support. Park et al.[1] found that YouTube provides useful scientific data for medical and dental students in medical education. They stated that innovations in digital technology would revolutionize education and make it more efficient.

Not only medical students but also medical educators, physicians, medical support staff, and even patients frequently visit YouTube to experience and interpret medical issues visually. YouTube is a video hosting website founded in 2005 in San Bruno, CA, USA.[2] About 100 videos are added to this website by users every minute. The videos come from sources whose reliability cannot be verified and have not been peer-reviewed.[3] Therefore, some studies analyzing the educational content of YouTube have provided limited results. On the other hand, these studies could not exclude noneducational videos and videos from questionable sources. We anticipate that videos produced by reliable sources for the delivery of medical education will be of high quality, have a greater impact on public education, and contribute to the literature. Reliable YouTube videos about diseases of many systems in our body are watched in terms of adherence to treatment, screening, or prevention content.[4] However, it is unclear whether these medical videos on YouTube are reliable and useful.[5] Fischer et al.[6] watched YouTube videos on knee arthrocentesis and recommended a significant number of these videos for students, residents, or fellows. Nevertheless, they reported that some videos have insufficient and poor quality content even when broadcast by health professionals.

After the first case of COVID-19 emerged in November 2019, the infection COVID-19 spread rapidly around the world, and the World Health Organization declared it a pandemic in March 2020. There was confusion about the diagnosis and treatment protocols for this infection, which affects all systems, particularly the respiratory system. For this reason, many health professionals and members of the public preferred to obtain information from the Internet and YouTube in particular.[7] According to research, during this period, 80% of Internet users in the United States chose to look for health information on the Internet.[7] Rehabilitation of the pulmonary system, most affected during and after COVID treatment, has become more important. Having to stay at home under the conditions of the pandemic and being hesitant to go to a hospital, sufferers continued their search for treatment on the Internet.[8]

We are yet to come across a study that examines the quality of pulmonary rehabilitation (PR) videos on YouTube, based on our research in the literature. This study aims to analyze the quality, source, and content of PR videos on YouTube.

Materials and Methods

In this study, which is planned as a cross-sectional study, we searched for the word "pulmonary rehabilitation" in the YouTube search engine from August 3, 2021, after obtaining approval from the ethics committee (Ethics Committee Decision No: 6492-GOA 2021/20-10) and identified the videos with medical content. We have selected the first 100 videos with educational content and English language audio.[9, 10] The number of likes and dislikes, the number of views, the duration of the video, the number of comments, and from which country the PR videos were uploaded were examined. When reviewing videos for medical education purposes, comprehensibility was assessed using the suitability assessment of materials (SAM).[11, 12] User engagement metrics were gathered for each video. In assessing the content of a video, the educational content in each video was rated based on the presence or absence of 9 factors, as no validated rating system was available for the videos: (1) PR indications, (2) PR contraindications, (3) pre-PR tests, (4) pre-PR symptom interview, (5) PR exercises, 6) PR breathing techniques, (7) PR in intensive care, (8) PR and smoking relationship, and (9) PR in COVID. In this study, this quantitative method was used for data collection and analysis. To this end, a survey based on behavioral preferences and views was developed.

Evaluating the eligibility of videos

SAM rates the suitability of videos by evaluating 22 factors divided into 6 categories: (1) content of the videos, (2) literacy demand, (3) graphics, (4) layout and typography, (5) learning stimulation and motivation, and (6) cultural appropriateness. The ratings are unsuitable (0 points), adequate (1 point), and superior (2 points). If each of the 22 factors gets the maximum rate of 2 points, the maximum SAM score of 44 is obtained. The overall suitability of a video is based on the total SAM percentage score. This score is obtained by adding the scores of each factor and dividing it by the total possible score. Percentage scores are grouped into three outcome categories: (1) 70%–100%, superior; (2) 40%–69%, sufficient; and (3) 0%–39%, insufficient.[11, 12]

Evaluating the user engagement

Five user interaction measurements were recorded for each video: (1) views, (2) likes, (3) dislikes, (4) video duration, and (5) comments. These data were collected between the dates of August 3–10, 2021.

Evaluator team

Data analysis was performed independently by two scientists (E.Ö. and V.H.) with more than 7 years of experience. If the evaluations of the researchers were not the same, each video was re-rated with a combined assessment of both scientists. For analysis, only videos intended for medical education and healthcare professionals were included.

Exclusion criteria

Videos not related to PR, not written in English, repetitive videos, and videos with promotional content were excluded from the study.

Statistical analysis

The acquired data were analyzed using SPSS (Statistical Package for Social Sciences, Chicago, IL, USA) 24.0 software. Data with continuous values were expressed as mean ± standard deviation, median (interquartile range). The data indicating frequency were expressed as number (n) and percentage (%). In the analysis of frequency data, the Chi-squared test was used. In the analysis of data with continuous values, the Kruskal-Wallis test or the Mann-Whitney U test was used, depending on the number of groups. In the correlation analysis, Pearson's correlation test was used to compare the groups. A p-value less than 0.05 was considered statistically significant.

Results

Our study examined the first 100 videos accessed between August 3 and August 10, 2021, when the keyword "pulmonary rehabilitation" entered the YouTube search engine. The total duration of the videos watched was 15 h, 22 min, and 7 s. The duration of the longest video was 1 h, 13 min, and 41 s, and that of the shortest was 36 s. The video with the most likes received 1100 likes, whereas the video with the least likes received 0 likes. The most-watched video has been viewed 438 813 times, and the least viewed video has been viewed 27 times. The video which received the maximum number of comments obtained 47 comments, and the video which received the least number of comments had zero comments. The average number of views per video was 8817.08±45902.67, the average number of likes was 38.71±140.74, the average number of dislikes was 1.12±4.25, the average number of comments was 1.24±4.96, and the average video duration was 573.27±775.36 s.

Of the videos, 78 (78%) provide information on PR indications, 5 (5%) on PR contraindications, 27 (27%) on tests performed before PR, 66 (66%) on symptom evaluation before PR, 88 (88%) on exercises performed during PR, 34 (34%) on breathing techniques used during PR, 2 (2%) on PR in the intensive care unit (ICU), 8 (8%) on the relationship between COVID and PR, and 14 (14%) on the relationship between PR and smoking. When we ranked the PR video contents in our study by classifying the diseases, 40% were talking about the chronic obstructive pulmonary disease (COPD), 30% were about general pulmonary diseases (asthma, interstitial lung diseases, lung cancer, pulmonary hypertension, etc.), 4% were pulmonary fibrosis, 3% were COVID, and 1% was lung transplantation. The remaining videos did not mention any disease.

The videos were analyzed according to their SAM scores. The highest SAM score was 32 (84.21%), and the lowest SAM score was 11 (28.94%). When the movies were analyzed based on their SAM scores, 5 were identified in the insufficient group, 80 in the sufficient group, and 15 in the superior group.

When the videos were evaluated by upload date, 12 videos were uploaded before 2015, 59 were uploaded between 2015 and 2019, and 29 were uploaded in 2020 and later. A low degree of positive correlation was found between the year of video upload and video duration ($r=0.283$; $p<0.05$). It has been found that video durations increase as we get closer to the present day. According to SAM groups and advancing years, video content and characteristics created statistically significant changes (Table 1, Fig. 1).

There were statistically significant association between the advancing years and videos with ventilation techniques ($p=0.007$), between the advancing in years and PR in intensive care ($p=0.082$), between the advancing in years and PR contraindications ($p=0.002$), and between the advancing years, COVID, and PR relationship ($p<0.01$) (Table 2).

It was found that there was a positive graded weak correlation between total score SAM and number of views ($r=0.226$; $p=0.024$), between total score SAM and likes

Table 1: Comparison of the content of videos over the years

Video content	Years			p
	<2015, n (%)	2015–2019, n (%)	≥2020, n (%)	
PR indications				
+	11 (91.7)	48 (81.4)	19 (65.5)	0.115
–	1 (8.3)	11 (18.6)	10 (34.5)	
PR contraindications				
+	0 (0)	0 (0)	5 (17.2)	**0.002**
–	12 (100)	59 (100)	24 (82.8)	
Tests before PR				
+	2 (16.7)	18 (30.5)	7 (24.1)	0.566
–	10 (83.3)	41 (69.5)	22 (75.9)	
Symptom questioning before PR				
+	9 (75)	43 (72.9)	14 (48.3)	0.057
–	3 (25)	16 (27.1)	15 (51.7)	
Exercises in PR				
+	10 (83.3)	54 (91.5)	24 (82.8)	0.428
–	2 (16.7)	5 (8.5)	5 (17.2)	
Breathing techniques in PR				
+	5 (41.7)	13 (22)	16 (55.2)	**0.007**
–	7 (58.3)	46 (78)	13 (44.8)	
PR in intensive care				
+	0 (0)	0 (0)	2 (6.9)	0.082
–	12 (100)	59 (100)	27 (93.1)	
PR in COVID				
+	0(0)	0 (0)	8 (27.6)	**<0.001**
–	12 (100)	59 (100)	21 (72.4)	
Smoking in PR				
+	2 (16.7)	10 (16.9)	2 (6.9)	0.425
–	10 (83.3)	49 (83.1)	27 (93.1)	
SAM				
Insufficient	0 (0)	3 (5.1)	2 (6.9)	0.179
Sufficient	11 (91.7)	50 (84.7)	19 (65.5)	
Superior	1 (8.3)	6 (10.2)	8 (27.6)	

PR: Pulmonary rehabilitation, SAM: Suitability assessment of materials

(r=0.295; p=0.003), between the total score SAM and the dislikes (r=0.271; p=0.006), between the total score and the number of comments (r=0.210; p=0.036), and a positive graded weak correlation between the total score SAM and the video duration (r=0.389; p<0.001). Similarly, a positive graded weak correlation was discovered between SAM content score and like (r=0.236; p=0.018), SAM content score and dislike (r=0.206; p=0.040), SAM content score and number of comments (r=0.197; p=0.050), and SAM content score and video duration (r=0.207; p=0.038). Furthermore, there was a positive graded weak correlation between SAM graphic score and like (r=0.263; p=0.008), a positive graded weak correlation between SAM graphic score and dislike (r=0.221; p=0.027), a positive graded weak correlation between SAM graphic score and number of comments (r=0.209; p=0.037), and a positive graded weak correlation between SAM graphic score and video duration (r=0.462; p<0.001). However, there was no significant difference between SAM groups and countries of origin (p=0.830). A positive graded weak correlation was found between the number of views and the number of likes (r=0.289; p<0.05), dislikes (r=0.282; p=0.05), and comments (r=0.228; p=0.05) (Table 3).

The two countries with the highest number of PR-related video sources are the USA (66%) and the UK (21%). On a continent basis, 71% of videos are from the Americas and 22% are from Europe. There was no significant difference between the number of views, likes, dislikes, comments, video duration, SAM scores, and the countries and continents of the videos (p>0.05).

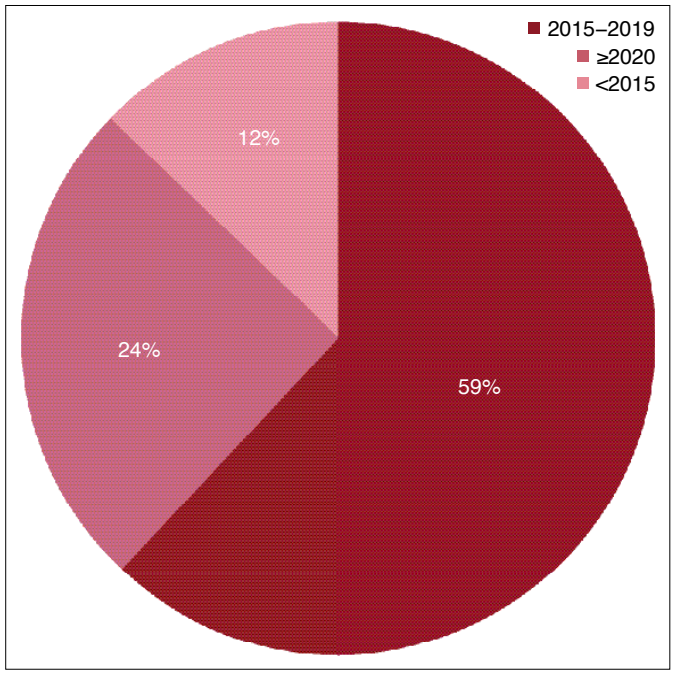

Figure 1: Number of videos by year

Discussion

This study examined the content, relevance, and user engagement of YouTube videos on the topic of PR. Although PR-related videos increased in 2018 and beyond, they peaked in 2020 after the pandemic COVID. Understandably, following infection with the respiratory coronavirus, patients and health professionals are increasingly turning to videos on PR and uploading more videos as needed. The increase in staying at home, the difficulty and reservation to go to the hospital, and quarantine after infection have also increased the need for such videos. This study aims to analyze the content of YouTube videos on PR under these difficult conditions and evaluate how understandable and reliable they are.

Although the owners of YouTube designed this social media platform for entertainment, users here share a considerable amount of health-related videos. With the increasing importance of the Internet and social media, this platform is becoming a preferred place of education for patients and where healthcare professionals can get up-to-date information. In Fischer et al.'s[6] study on arthrocentesis, they noted that YouTube videos are an interesting resource for medical education, but they reported that some videos have inadequate content even though health professionals upload them. Similarly, in Yildiz and Toros'[13] study on vestibular rehabilitation on YouTube, it was mentioned that the content of the videos is of poor quality, but that vestibular symptoms in patients can be reduced by adding high-quality videos by health professionals. However, with the development of technology, health professionals have focused on various concepts such as telerehabilitation to help their patients improve their clinical condition from home.[14] For this

Table 2: Video characteristics according to years and SAM groups (mean±SD; median [25–75th percentile])

Years	Mean±SD median (25–75th percentile)				
	Follow-up	Like	Dislike	Comment	Time
<2015 (n=12)	41 805.66±125 125.04 6470.50 (816.50–10 474.25)	26.33±29.11 20 (0–51.25)	1.08±1.16 1 (0–2)	0.41±1.16 0 (0–0)	436.75±612.97 241 (145.75–430)
2015–2019 (n=59)	4831.50±18 290.42 585 (297–1652)	41.11±169.81 3 (1–13)	1.37±5.41 0 (0–1)	1.57±6.32 0 (0–1)	342.58±424.48 186 (140–312)
≥2020 (n=29)	3275.20±8638.27 719 (267.50–2061.50)	38.93±99.49 8 (0–25)	0.62±1.59 0 (0–5)	0.89±1.75 0 (0–1)	1099.10±1094.66 967 (170–1731)
p	**0.020**	0.477	0.073	0.685	**0.010**
SAM group					
Insufficient (n=15)	580.20±884.16 2252 (985–16 399)	0.40±0.89 16 (7–58)	0 1 (0–2)	0 1 (0–3)	333.80±355.88 1347 (139–1906)
Sufficient (n=80)	3197.95±11 116.71 624.50 (286.50–2067.75)	23.25±83.71 3 (0–18)	0.73±2.68 0 (0–1)	0.77±1.90 0 (0–0)	445.54±608.14 224 (143.75–377.75)
Superior (n=5)	41 531.40±113 362.21 225 (49.50–1288.50)	133.93±298.22 0 (0–1)	3.53±8.94 0 (0–1)	4.13±11.95 0 (0–0)	1334.33±1180.60 197 (141–595)
p	**0.002**	**0.002**	**0.036**	**0.031**	0.105

SAM: Suitability assessment of materials, SD: Standard deviation

Table 3: Correlation relationships between video characteristics and SAM scores

	Follow-up		Like		Dislike		Comment		Video time	
	r	p	r	p	r	p	r	p	r	p
Total SAM score	0.226	**0.024**	0.295	**0.003**	0.271	**0.006**	0.210	**0.036**	0.389	**<0.001**
SAM content score	0.166	0.098	0.236	**0.018**	0.206	**0.040**	0.197	**0.050**	0.207	**0.038**
SAM graphic score	0.169	0.093	0.263	**0.008**	0.221	**0.027**	0.209	**0.037**	0.462	**<0.001**
Follow-up	–	–	0.289	**0.004**	0.282	**0.005**	0.228	**0.022**	0.249	**0.012**

SAM: Suitability assessment of materials

reason, social media platforms such as YouTube have become an important potential for the dissemination and sharing of health-related information.

Askin et al.[15] discovered that high-quality YouTube videos on transcranial stimulation treatment in the stroke had more views, dislikes, and longer duration. Tolu et al.[16] also stated that useful and high-quality videos receive more popularity and likes. In our study, similar to the literature, it was found that the number of views, likes, dislikes, comments, and video duration of videos with high SAM scores were longer. On the other hand, Kocyigit et al.[17] found no significant relationship between video quality and the number of impressions, likes, and dislikes.

SAM scores are higher for videos produced by major healthcare organizations. In their study, Desai et al.[18] discovered that the median SAM score was 24, and that the duration of the videos with the SAM result in the superior group was longer. Similarly, the median score of SAM in our study was 21.6. We also found that videos with high SAM scores had a longer duration. Moreover, we found that the videos made in the advancing years were longer videos secondary to the increasing information load. Bahar-Ozdemir et al.[19] also found that high-quality videos were longer in their study of cancer rehabilitation on YouTube. When designing the duration of the video, care should be taken to ensure that it provides quality information without distracting viewers but also without missing necessary information in the content.

In our study, we found some significant changes in the content of the videos according to the advancing years. For instance, a significant relationship was found between the advancing years and respiratory techniques, PR contraindications, and PR content in COVID infection. The reason for this situation, which we have noted especially in the post-2020 videos, is easily explained by the symptoms of the respiratory system caused by infection with coronavirus. Patients or health professionals have preferred videos with these topics to take precautions against symptoms that may occur during the quarantine period or after a viral infection, and these videos have been uploaded more frequently. In addition, a significant relationship was found between the videos that contained the contraindication for PR and the advancing years. This can be explained by the fact that the use of PR in patients who do not have the correct indication during the period when the exact treatment of the COVID infection is not known may harm the patient. In the literature, Stellefson et al.'s[4] study of YouTube education for patients with COPD frequently mentioned that the topic of drug use and smoking was not sufficiently addressed in the videos. Similarly, our study shows that smoking and PR videos decrease over time. This situation can be explained by the fact that smoking cessation campaigns are effective, and there is a restriction on the submission of smoking content on social media. In addition, in the study of Richardson et al.[20] in which they examined the smoking cessation content in YouTube videos, it was mentioned that these videos were not effective enough and they did not include smoking cessation strategies. In the study conducted by Duke et al.,[21] it was mentioned that access to "state tobacco control programs social media" is low and does not lead people to reduce smoking addiction sufficiently.

As a growing number of studies show, videos that include patient stories, experiences, and participation in sessions play an important role in patient-to-patient communication. In our study, interviews with patients participating in PR programs are shown to attract attention and encourage people with similar conditions to participate in the program. Chou et al.[22] stated that this sharing during cancer rehabilitation positively impacted patients. Clearly, an increasing number of such videos will help other patients by being included in these programs. According to a study conducted by Steiner,[23] the application of PR programs in patients with lung cancer and other lung diseases may increase physical capacity and health-

related capacity; therefore, it may be necessary to apply for PR programs in a standardized form in these patients.

In the videos in our study, COPD was in the first place among the diseases in which PR was performed. Although COPD is in the first place, according to the most searched keywords on Google about the major causes of death, Boehm et al.[24] in their research found that the public awareness of COPD is low. On the other hand, Barbosa et al.[25] investigated the search trend on the internet for 5 major lung diseases (asthma, chronic obstructive pulmonary disease, pneumonia, lung cancer, and tuberculosis) in the last 5 years. As a result of their studies, they found that except for lung cancer, 4 other lung diseases were searched more frequently in the COVID-19 pandemic period. Future studies with other search terms will contribute to the literature.

Our study has some limitations. Limitations include the small sample size and our compilation consisted of the first 100 videos with this content. Another limitation is that we have only included videos with English content. As we could not include non-English videos, we were not able to include the knowledge and experience of other nationalities in our study. However, considering that English is the most widely spoken language globally, it should not be argued that this limitation has much impact on our study. In our study, we wanted to take a cross-sectional picture by evaluating only the videos within a certain period. The videos added after this period were not included in our study. We should record this as another limitation of our study.

Conclusion

YouTube and other online video resources make an important contribution to public health awareness education. According to the results of our study, videos with content PR were found to be uploaded more and more for the purpose of patient education with the advancing years, especially after the COVID pandemic, with content informing about disease symptoms and treatment. In addition, videos with high comprehensibility were found to be more interesting to users, as reflected in likes, dislikes, comments, and video duration. As a result, future high-quality videos made by healthcare professionals working in this field will be more beneficial to patients in need, contributing to symptom regression and patient education.

Conflicts of interest
There are no conflicts of interest.

Ethics Committee Approval
The study was approved by the Dokuz Eylul University Non-interventional Research Ethics Committee (No: 6492-GOA, 2021/20-10, Date: 30/06/2021).

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Peer-review
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Authorship Contributions
Concept – V.H., E.Ö.; Design – V.H.; Supervision – V.H.; Funding – V.H., E.Ö.; Materials – V.H., E.Ö.; Data collection &/or processing – V.H., E.Ö.; Analysis and/or interpretation – V.H.; Literature search – E.Ö.; Writing – V.H., E.Ö.; Critical review – V.H., E.Ö.

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