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RESEARCH ARTICLE

Exercise videos for ankylosing spondylitis: An analysis of quality, reliability, content, and text mining

Ankilozan spondilit için egzersiz videoları: Kalite, güvenilirlik, içerik ve metin madenciliği analizi

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Abstract

Aim: This study aimed to investigate the quality and reliability of exercise videos prepared for Ankylosing Spondylitis (AS) on YouTube® and perform the content and text mining analysis.

Methods: On March 18, 2025, a video search was conducted on YouTube® using the keywords "Ankylosing spondylitis rehabilitation", "Ankylosing spondylitis and exercise", "Ankylosing spondylitis physiotherapy", and "Axial spondylarthritis and exercise". A total of 240 videos were scanned, 61 met the inclusion criteria. To assess reliability and quality, the Modified Quality Criteria for Consumer Health Information (mDISCERN), Journal of American Medical Association (JAMA), and Global Quality Scale (GQS) were utilized. Subtitles were examined using text mining methods, and sentiment analysis and content reviews were performed. Videos were categorized as being uploaded by health professionals or others and useful or misleading.

Results: Videos uploaded by health professionals had higher mDISCERN (p=0.004) and GQS (p=0.036) scores than others. The JAMA scores of groups were similar (p=0.051). Between groups the polarity score was not different (p=0.367); but the subjectivity score was higher in health professional group (p=0.049). Videos categorized useful had higher mDISCERN (p=0.003), JAMA (p=0.001) and GQS (p=0.041) scores than misleading ones. Moreover, the polarity (p=0.001) and subjectivity (p=0.001) scores were higher in useful group than misleading group.

Conclusion: Our findings indicate that if videos are uploaded by health professionals and have proper content, they are more reliable and quality. Therefore, health professionals like physicians and physical therapists should be encouraged and supported to create and upload high-quality videos to ensure the reliability and quality of exercise in AS.

Keywords: Ankylosing spondylitis, exercise, social media, quality of healthcare.

Özet

Amaç: Bu çalışmada, YouTube®'da Ankilozan Spondilit (AS) için hazırlanan egzersiz videolarının kalite ve güvenilirliğinin incelenmesi ve içerik ve metin madenciliği analizi yapılması amaçlandı.

Yöntemler: 18 Mart 2025 tarihinde, "Ankilozan spondilit rehabilitasyonu", "Ankilozan spondilit ve egzersiz", "Ankilozan spondilit fizyoterapisi" ve "Aksiyel spondiloartrit ve egzersiz" anahtar kelimeleri kullanılarak YouTube'da bir video araması yapıldı. Toplam 240 video tarandı ve 61'i dahil etme kriterlerini karşıladı. Güvenilirlik ve kaliteyi değerlendirmek için Modified Quality Criteria for Consumer Health Information (mDISCERN), Journal of American Medical Association (JAMA) ve Genel Kalite Ölçeği (GQS) kullanıldı. Altyazılar metin madenciliği yöntemleri kullanılarak incelendi ve duygu analizi ve içerik incelemeleri yapıldı. Videolar, sağlık uzmanları veya başkaları tarafından yüklenen videolar ve yararlı veya yanıltıcı videolar olarak kategorilere ayrıldı.

Bulgular: Sağlık uzmanları tarafından yüklenen videoların mDISCERN (p=0,004) ve GQS (p=0,036) puanları diğerlerine göre daha yüksekti. Grupların JAMA puanları benzerdi (p=0,051). Gruplar arasında polarite puanı farklı değildi (p=0,367); ancak sağlık profesyoneli grubunda öznellik puanı daha yüksekti (p=0,049). Faydalı olarak sınıflandırılan videoların mDISCERN (p=0,003), JAMA (p=0,001) ve GQS (p=0,041) puanları yanıltıcı olanlara göre daha yüksekti. Ayrıca, polarite (p=0,001) ve öznellik (p=0,001) puanları yararlı grupta yanıltıcı gruba göre daha yüksekti.

Sonuç: Bulgularımız, videoların sağlık profesyonelleri tarafından yüklendiğinde ve uygun içeriğe sahip olduğunda daha güvenilir ve kaliteli olduğunu göstermektedir. Bu nedenle, hekimler ve fizyoterapistler gibi sağlık profesyonelleri AS'de egzersizin güvenilirliğini ve kalitesini sağlamak için yüksek kaliteli videolar oluşturması ve yüklemesi için teşvik edilmeli ve desteklenmelidir.

Anahtar Kelimeler: Ankilozan spondilit, egzersiz, sağlık hizmetinin kalitesi, sosyal medya.

INTRODUCTION

Ankylosing spondylitis (AS) is a chronic inflammatory rheumatic disease that primarily affects the axial skeleton. Symptoms of AS include chronic inflammatory low back pain, reduced spinal mobility, morning stiffness, and a loss

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of physical function. The symptoms of AS can significantly impact quality of life and result in disability (1,2).

Management of AS involves both pharmacological and non-pharmacological approaches, with a combination of treatments being the most effective (2-4). The cornerstone of non-pharmacological treatment is exercise and physical activity. The European League Against Rheumatism (EULAR) emphasizes the importance of regular exercise in managing symptoms of the disease. Guidelines recommend incorporating exercise and physical activity into the treatment plan for AS (3,4).

In recent years, technological advancements in digital health have transformed how individuals access health-related information. More people are using social media platforms to both obtain and share information on various health topics. These platforms have encouraged widespread participation among users of all genders and ages seeking health information (5). Healthcare professionals and institutions also utilize these platforms. Websites like YouTube have become a significant resource for exercise training and patient information (6).

Long-term management of AS is essential, and patients can benefit from technological resources alongside traditional face-to-face support. However, there are limited studies that systematically examine AS-specific exercise videos in the literature, with the most data avaliable dating back to 2018 or earlier (7). An update on this topic is crucial as access to online healthcare continues to improve and become more accessible.

Therefore, to address this gap, we systematically evaluated the quality, reliability, and content of exercise videos for AS available on the YouTube platform from 2019 onward. Additionally, we aimed to analyze the information in the texts of these videos using text mining techniques.

METHODS

Study Design

This study was designed as a cross-sectional, descriptive study. The study incorporated a concept based on videos on YouTube® that included exercise approaches for AS. A search was conducted using the keywords "Ankylosing spondylitis rehabilitation", "Ankylosing spondylitis and exercise", "Ankylosing spondylitis physiotherapy" and "Axial spondylarthritis and exercise" for some time up to and including March 18, 2025. A significant portion of users tend to watch videos found within the first three pages of search results (8). To investigate this, 60 searches were conducted focusing on the top three pages for various specified keywords, recording the view counts of the videos. This analysis was performed for each keyword, with the most viewed videos ranked at the top. Two researchers performed initial screening on a total of 240 videos based on specific keyword groups. For this study, videos were included in the quality analysis according to the established inclusion and exclusion criteria from the initial screening. Videos were included in the evaluation if they met the following criteria: they were produced in English, ranked among the top 60 videos by relevance, and included exercises for AS. Videos were excluded if they lasted less than one minute, did not contain information about AS, lacked exercises, were not produced in English, had inadequate audio or video quality, or were duplicates.

Ethical Consideration

Since the study did not involve human or animal participants and analyzed publicly available videos, ethics committee approval was not obligatory. Other studies in the literature have confirmed this way (7,9,10).

Features and Content of Videos

The following data was recorded: video duration, upload date, number of likes, number of comments, number of views, number of subscribers, and source. Two independent physiotherapists conducted a content analysis of the videos, evaluating and recording the type of exercises, the number of exercises, and the availability of appropriate exercise prescriptions.

Usefulness Categorization

The study team categorized the videos assessed for utility into two groups: useful and misleading. Videos classified as useful provide clinically accurate exercise information related to the disease. In contrast, videos considered misleading either contain clinically inaccurate exercise content or lack evidence supported by current scientific knowledge. If a video includes both partially useful

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and partially misleading information, it is classified as misleading (11).

Quality And Reliability Assessments

The Modified Quality Criteria for Consumer Health Information (mDISCERN) tool for reliability (mDISCERN), and Journal of American Medical Association (JAMA) and Global Quality Scale (GQS) for quality was used.

The mDISCERN is a five-point assessment tool developed by Charnock and colleagues. DISCERN consists of five questions, each answered with a yes or no. Each yes answer is worth 1 point. The total score ranges from 0 to 5, with higher scores indicating a higher level of reliability of the content (12).

The JAMA score is a quality assessment scale used to evaluate the accuracy and reliability of medical information on the Internet. The JAMA scoring system includes four criteria: Authorship, Citation, Explanation, and Validity, each scored with a score of 1. The total score ranges from 0 to 4, with higher scores reflecting a greater degree of transparency and adherence to established quality standards (13).

The GQS is a five-point likert-type scale that evaluates the overall quality of content. This scale was employed by researchers to evaluate the flow, usability, and overall quality of the videos. The scale scores are interpreted as follows: videos scoring 4 or 5 are considered high quality, those scoring 3 are considered moderate quality, and those scoring 1 or 2 are considered low quality. Higher GQS scores indicate that the videos are better structured, more beneficial, and more educational for the viewer (14).

Text Mining Analysis

The text mining section of this study was conducted solely on the subtitle transcripts of the included YouTube videos, without including video titles or descriptions. The subtitles were obtained through a Chrome extension called Language Reactor®, which provides an interface for exporting video transcript data (https://www.languagereactor.com/). These subtitle texts were then formatted into a suitable format for analysis using Python version 3.11. This approach ensured that the analysis was based solely on the actual spoken content of the videos, thereby directly reflecting the quality of the information and education presented to viewers (15).

Text preprocessing and analysis processes were performed using standard natural language processing (NLP) libraries in the Python environment. The TextBlob library (version 0.19.0) (16), which is widely preferred for sentiment analysis in health informatics and public health research, was used. Sentiment analysis included measurements of polarity (sentiment tendency) and subjectivity (the ratio of personal opinion to objective content) in the texts (17). Polarity scores range from -1 (negative sentiment) to +1 (positive sentiment), while subjectivity scores range from 0 (completely objective) to 1 (completely subjective).

Prior to sentiment analysis, several text cleaning steps were applied to the subtitle texts: converting the texts to lowercase, removing punctuation marks, cleaning non-alphabetic characters (18), and removing English stop words from the NLTK library. All cleaned transcripts were combined into a single file and prepared for frequency-based keyword analysis and visualization.

For the visual presentation of the frequency analysis, a word cloud was created using the word cloud library running in Python 3.11 (https://amueller.github.io/word_cloud/). This visualization made it possible to visually highlight the most frequently used general expressions and terms related to certain movements in the data set. The word cloud (Figure 1) intuitively reflects the density of spoken language and common expressions used in the videos, but more specific exercise techniques or detailed terminology are limited.



Figure 1. The word cloud for text

The text mining workflow followed this sequence:

1. Data collection: Downloading subtitle transcripts (Language Reactor).

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2. Preprocessing: Text cleaning, tokenization, and stop word removal.

3. Sentiment analysis: Polarity and subjectivity scoring using TextBlob® (v0.19.0).

4. Keyword visualization: Creation of a word cloud from the subtitle data of all videos.

This methodological approach is consistent with previous NLP applications in health research evaluating online video and social media content and increases the reproducibility and comparability of the results obtained (17).

Statistical Analysis

The data was analyzed using SPSS Statistics 27.0 Software Program (IBM Corp. Release 2012. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp.). Numerical variables were expressed as mean and standard deviation if the distribution was normal, and as median and interquartile range if the distribution was not normal. Categorical variables were defined as number and percentage. In pairwise comparisons, the Independent Sample T-test or Mann-Whitney U-test was used, depending on whether the assumption of normality was met. The agreement between raters for DISCERN, JAMA, and GQS was assessed using the Kappa coefficient. In this context, Cronbach's alpha (α) coefficient was calculated. Reliability was interpreted as "excellent" if $\alpha>0.9$, "good" if $0.7<\alpha<0.9$, "acceptable" if $0.6<\alpha<0.7$, "poor" if $0.5<\alpha<0.6$ and "unacceptable" if $\alpha<0.5$ (19).

RESULTS

A total of 240 videos were initially identified using the predefined keywords from the first three pages of YouTube search results. Following the removal of 77 duplicate videos, 163 unique videos remained. Of these, 46 were excluded for being in languages other than English, 3 for having a duration of less than one minute, 51 for not containing exercise content, and 2 due to poor audio quality. Consequently, 61 videos were included in the final analysis (Figure 2).

The descriptive features of all videos provided in Table 1. As the top, the mobility exercises take part in 55 (90.2%) videos. Secondly, breathing exercises take part in 20 (32.8%) videos. Exercises based on Yoga concept were in third place (16 (26.2%)). 45 (73.8%) of videos did not include exercise prescription (Table 1).

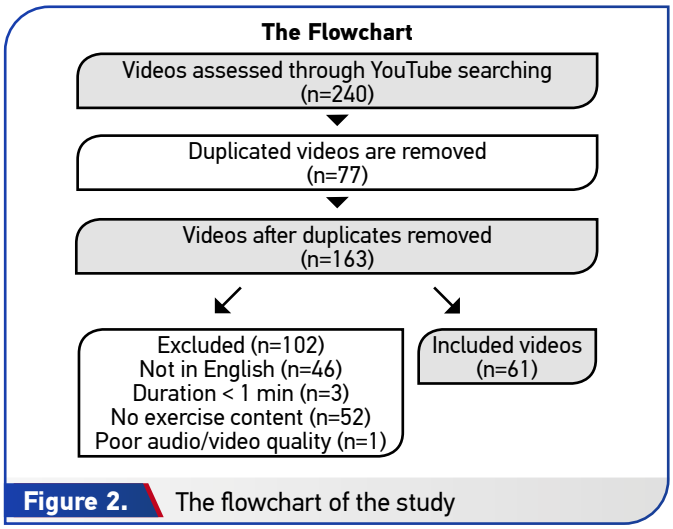

Figure 2. The flowchart of the study

Table 1. Descriptive and content features of videos

	X±SD	Min-Max
Video duration	16.69±14.95	1.00-59.44
Number of subscribers	164499.59±711659.6	46.00±5260000
Number of views	16226.73±41139.26	97.00±274685
Number of likes	419.37±1183.71	00.00±8200
Number of comments	33.13±73.38	00.00±392
Publication year	**n (%)**	-
2019	4 (6.6)	-
2020	17 (27.9)	-
2021	4 (6.6)	-
2022	18 (29.5)	-
2023	11 (18.0)	-
2024	5 (8.2)	-
2025	2 (3.3)	-
Content of video	**n (%)**	-
Aerobic exercises	10 (16.4)	-
Mobility exercises	55 (90.2)	-
Strength exercises	8 (13.1)	-
Yoga	13 (21.3)	-
Breathing exercises	20 (32.8)	-
Pilates exercises	6 (9.8)	-
Aquatic exercises	4 (6.6)	-
Exercise prescription	-	-
Available	16 (26.2)	-
Not available	45 (73.8)	-

X: Mean. SD: Standard Deviation. n: Number, Min: Minimum, Max: Maximum

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The inter-rater agreement regarding Cohen's kappa coefficient values for mDISCERN, JAMA, and GQS were 0.905 (excellent), 0.858 (good), and 0.766 (good), respectively.

Videos uploaded by health professionals had higher mDISCERN (p=0.004) and GQS (p=0.036) scores than others. The JAMA scores of groups were similar (p=0.051). Between groups the polarity score was not different (p=0.367); but the subjectivity score was higher in health professional group (p=0.049).

Table 2. Reliability, quality and text mining scores of videos according to the source of upload

	Health Professional Group (n:37) (Median (Percentile 25-75))	Other Group (n:24) (Median (Percentile 25-75))	P
mDISCERN	3 (2-3)	2 (1-2)	**0.004**
JAMA	2 (2-3)	2 (1.5-2)	0.051
GQS	3 (3-4)	3 (2-3)	**0.036**
Polarity	0.13 (0.11-0.16)	0.12 (0.07-0.17)	0.367
Subjectivity	0.43 (0.38-0.46)	0.38 (0.33-0.44)	**0.049**

*mDISCERN: Modified Quality Criteria for Consumer Health Information, JAMA: Journal of American Medical Association, GSQ: Global Quality Scale, *Bold p values represent the significance, Mann-Whitney U test*

Videos categorized useful had higher mDISCERN (p=0.003), JAMA (p=0.001) and GQS (p=0.041) scores than misleading ones. Moreover, the polarity (p=0.001) and subjectivity (p=0.001) scores were higher in useful group than misleading group.

Table 3. Reliability, quality and text mining scores of videos according to the usefulness

	Useful Group (n:55) (Median (Percentile 25-75))	Misleading Group (n:6) (Median (Percentile 25-75))	P
mDISCERN	3 (2-3)	1 (1-2)	**0.003**
JAMA	2 (2-3)	1 (1-1)	**0.001**
GQS	3 (3-4)	2.5 (2-3)	**0.041**
Polarity	0.13 (0.10-0.17)	0.00 (0.00-0.00)	**0.001**
Subjectivity	0.42 (0.37-0.46)	0.00 (0.00-0.00)	**0.001**

*mDISCERN: Modified Quality Criteria for Consumer Health Information, JAMA: Journal of American Medical Association, GSQ: Global Quality Scale, *Bold p values represent the significance, Mann-Whitney U test*

DISCUSSION

The current study yielded that the quality and reliability analysis and text mining of YouTube videos containing exercise for AS. The current study found that videos uploaded by health professionals were more reliable and they had more quality than videos uploaded by others. Moreover, useful videos had more quality and reliability than misleading ones. Additionally, useful videos were stronger positive and subjective emotions than misleading.

Exercise significantly impacts human health, particularly for AS patients, as insufficient physical activity can decrease spinal mobility and worsen their condition. It is essential in non-pharmacological treatment, helping to reduce symptoms, maintain mobility, prevent postural decline, and improve functional capacity (20). Especially, EULAR recommends a combined exercise program for managing AS that includes strengthening, aerobic, and mobility exercises (21). However, the YouTube videos examined in our study primarily focused on mobility exercises, with insufficient inclusion of strengthening and aerobic components. This lack of combination in exercise types may prevent patients from achieving optimal benefits in key areas such as muscle strength, endurance, and overall functionality, which could lead to misinformation and application errors. Research indicates that strength and aerobic exercises are effective for pain management, reducing disease activity, and improving postural stability (22, 23). Therefore, it is essential to ensure that freely accessible online exercise content includes a well-rounded combination of strength, aerobic and mobility exercises, as outlined in multidisciplinary guidelines, to promote better long-term outcomes for patients.

We found that most of the analyzed videos (73.8%) did not include appropriate exercise prescription (frequency, intensity, type, time) or progression planning. This can lead to a lack of information and confusion among patients regarding practice and may contribute to the spread of inaccurate, low-quality, or biased information. The literature emphasizes that personalized exercise programs have positive effects on functional recovery and quality of life in AS patients, and therefore, exercise prescription should be based on clear and scientific criteria (24). This situation highlights the need to increase

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and standardize the quality standards of online exercise materials. Inadequate exercise prescription may lead to false treatment effect; therefore, further videos should be added to the exercise prescription.

We also focused on comparing the reliability and quality of videos according to their resources (healthcare professionals or others) and content validity (useful or misleading). We found that videos uploaded by healthcare professionals are more reliable and quality than those by others. Moreover, videos are considered useful according to their content was more reliable and quality than misleading ones. Our study parallels the work of Koçyiğit and colleagues, who analyzed the quality of exercise videos for AS available on YouTube. While their study focused on videos earlier than October 2018, our research includes updated assessments and analyzes videos from 2019 onward. Additionally, we conducted a text mining analysis. They reported that while more than half of the videos were of high quality, the remaining content contained significantly low-quality and misleading information for exercise in AS (7). In another study by Koçyiğit et al., focusing on rheumatoid arthritis and the COVID-19 pandemic, consistent with our findings, they stated that high-quality videos primarily originated from academic institutions, professional organizations, and healthcare professionals (25). In contrast, low-quality content typically came from independent users, patient testimonials, and commercial sources. Similarly, Şahin et al. found that videos produced by independent users tended to be of lower quality compared to those created by healthcare professionals (26). A similar design to our study was carried out by Sarı et al. examining exercise videos for rheumatoid arthritis found on YouTube. They also compare the mDISCERN, GQS, and JAMA scores represents reliability and quality between useful and misleading videos and compare them according to their uploaded sources. Like our findings, they found that videos classified as misleading were significantly lower in quality than useful ones. Moreover, they reported videos uploaded by health profession or organization had better quality scores than other sources (10).

This discrepancy increases the risk of misleading patients regarding their exercise programs, negatively impacting the treatment process's effectiveness. Moreover, the similarity in engagement metrics—such as likes, comments, and views—between misleading videos and helpful ones allows low-quality content to be easily accessible to consumers without being recognized as problematic. This situation reduces the likelihood of patients encountering accurate, scientifically based information, emphasizing the issue of online disinformation (11). Although most of videos were found useful in our study, 6 out of 61 was misleading. Misleading video content is frequently uploaded by individuals or organizations not affiliated with healthcare. These videos often promote treatments that are contraindicated or risky for AS or do not align with the recommended EULAR guidelines. Therefore, healthcare professionals need to take a more active role on platforms like YouTube by providing up-to-date, evidence-based content (27). It's essential to inform and guide patients about the sources and quality of content on social media and video platforms (28). Particularly, universities, academic institutions, professional organizations, physicians, and physical therapists should be encouraged and supported to create and upload high-quality videos to ensure the reliability of the information available. Patients should also develop critical thinking skills when consuming online health content, while healthcare professionals must provide accurate information through trustworthy sources. Additionally, digital platforms should implement algorithmic adjustments to help prevent the spread of misleading content.

We focused on text mining technology, and to the best of our knowledge, our study was the first to apply text mining for video analysis. Text mining, particularly the use of NLP techniques, is a powerful tool for extracting systematic, reliable, and quantitative information from large, unstructured text data. Given the importance of self-management through exercise in rheumatology, text mining has not yet been widely utilized in analyzing online exercise videos. Our research on the text mining of exercise video captions specifically for rheumatology is a topic that has not been previously explored in the literature. This area of research could fill a critical gap in assessing the quality and reliability of digital health content while also helping to personalize patient education. In rheumatology, NLP applications are often employed for disease diagnosis, monitoring, and analyzing patient experiences from various sources, such as electronic health records, clinical notes, and patient forums. For example, a systematic review by Omar et al. examined the applications of NLP and large language

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models in rheumatology (29). Additionally, a study focused on extracting exercise details from clinical notes found that both rule-based and machine learning NLP algorithms achieved high F1 scores, indicating strong validation results (30). Although there has been no study specifically examining text mining in information videos about AS, this absence makes it difficult to provide a comprehensive discussion on the topic. However, based on our findings, we can comment that AS exercise videos present objective information and promote positive attitudes. Nevertheless, the results of our text mining analysis should be further investigated in future studies.

Our study had several limitations. We assessed video reliability and quality using subjective tools. Additionally, we analyzed videos based on a single snapshot in time, a method that does not align with the dynamic nature of YouTube, where new videos are continually being added, watched, commented on, liked, and disliked. Furthermore, we only searched for videos in English. It's important to note that geographic location and previous internet activity can affect search results.

CONCLUSION

Our study contributes to the existing literature by evaluating both the quality of these videos and the presence of exercise prescriptions. Our findings indicate that if videos are uploaded by health professionals and have proper content, they are more reliable and quality. Therefore, health professionals like physicians and physical therapists should be encouraged and supported to create and upload high-quality videos to ensure the reliability and quality of exercise in AS. Our study found that exercise videos for AS often lack variety, clear prescriptions, and sufficient information. Therefore, we think that standardized exercise prescriptions in line with EULAR guidelines are needed and should be controlled. We recommend that videos incorporate exercise recommendations and prescriptions that align with EULAR guidelines to provide patients with more precise and evidence-based information.

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