Content, educational value and quality analysis of videos about neurorehabilitation in people with multiple sclerosis on YouTube®

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Introduction. The use of YouTube® has spread among patients with chronic diseases such as multiple sclerosis (MS). These patients consult the available videos to learn more about their disease in terms of diagnosis and making decisions about treatments, including rehabilitation. The aim of this study was to evaluate the content, educational value, and quality analysis of MS videos about neurorehabilitation on YouTube® using quantitative instruments.

Materials and methods. A search was conducted on YouTube®. The first 30 videos that met the inclusion criteria were reviewed. The videos were classified according to the upload source and the content. All videos included in the review were assessed by the DISCERN questionnaire, the JAMA benchmark, the global quality scale (GQS) and the video information and quality index (VIQI).

Results. The mean scores were: 28.3 (±9.33) in DISCERN, 2 (±0.81) in JAMA, 2.57 (±1.22) in GQS, and 11.73 (±4.06) in VIQI. JAMA score statistically significantly differed according to upload source (p = 0.002), video content (p = 0.023) and the speaker (p = 0.002). The DISCERN, JAMA, GQS, and VIQI scores showed significant correlations with each other.

Conclusions. The analyzed videos about neurorehabilitation in people with MS on YouTube® were quite old since the upload, with a moderate duration and number of views, but with a poor quality of the content, educational value, and quality analysis of the videos. Our research showed that there were statistically significant differences in terms of quality, transparency, and reliability of the information, depending on the upload source, video content and the speaker.

Key words. Analysis of videos. Educational value. Multiple sclerosis. Neurorehabilitation. Quality content. YouTube®.

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Introduction

Multiple sclerosis (MS) is a chronic inflammatory demyelinating disease that affects the central nervous system [1,2]. The pathologic hallmark of MS consists of focal demyelinated plaques within the central nervous system, with variable degrees of inflammation, gliosis, and neurodegeneration [3]. These alterations are linked to axono-neuronal loss and problems in nerve conduction, resulting in slowed and/or blocked signals, causing characteristic symptoms of this disease [3,4]. MS is the most common neurological condition leading to disability in young adults in Europe and North America. Currently, its aetiology is unknown and is believed to have a possible multifactorial origin [4].

MS is characterised by a wide range of symptoms and progression patterns, which significantly impact the quality of life of affected individuals [5,6]. As a result of these symptoms and signs, negative effects on employability occur, leading to adverse changes in their economy, health, and social life [6]. Despite the emergence of new drugs aimed at modifying the course of the disease, there is currently no curative treatment for MS. Therefore, pharmacological therapy is complemented with rehabilitation treatment to maintain functional capacity and promote adaptation to the changes caused by the progression of MS [7].

The Internet is frequently discussed as having the potential to revolutionize healthcare having received a mixed reception. On the one hand, it has been hailed as a powerful tool for increased patient empowerment, more efficient and effective healthcare, while concern has been expressed about potential harm due to incomplete or incorrect information [8]. In this sense, YouTube®, a popular video sharing platform started in 2005, has grown into the largest online video platform across the world. It is a space where over 4 billion videos are shared

daily by organizations, advertisers, and other broadcasters. Known to have more than two billion users of all ages, YouTube® also serves as an important educational tool and information source for patients and their families.

YouTube® videos have the potential to influence patients' understanding of their diagnoses and treatment decision-making, including rehabilitation [9], with an important implication to learn more about their diseases, to obtain information or to seek different opinions or to resort to alternative sources of treatment-related information is a chronic disease in which rehabilitation will be maintained throughout their life.

A considerable number of studies have been carried out to analyse on health-related YouTube® videos about diverse diseases and topics [10-19]. Concretely, in the MS context, only general information about MS [9], about surgery treatment [8-20,21] and about personal medical information created by patients have been conducted in YouTube® videos [22]. In our best knowledge, no prior studies have investigated the content, educational value, and quality analysis about neurorehabilitation for people with MS in YouTube®.

The objective of this study was to evaluate the content, educational value, and quality analysis of MS videos about neurorehabilitation on YouTube® using quantitative instruments. Our initial hypothesis was that poor quality content would be found.

Materials and methods

For the video analysis, a search on February 16, 2023 was conducted on YouTube® with the keywords 'multiple sclerosis' and 'rehabilitation' typed into the YouTube® search bar. Video search was performed without any user login after clearing the entire search history of the browser. The first 30 videos that fulfilled the inclusion criteria were reviewed. Subsequent videos were not included in the analysis, as it was previously shown that 90% of YouTube® searchers did not watch videos listed after the first 30 items [23] and following Altunisik et al recommendations [9].

Videos published in a language other than English, those longer than 60 min, those that were not related to rehabilitation of MS patients, those without sound, repeated videos, music videos, commercials, and videos that were not related to the search were excluded from the study. The videos were classified according to the upload source (physicians, hospitals or university, health channels, and independent users) and the content (general information about rehabilitation, technique/s, and patient experience). Also, date of upload, days since upload, duration, number of views, number of likes and comments were recorded. The view ratio (views/day) and the view ratio (calculated by dividing the number of views by the time since upload) were registered.

All videos finally included in the review were assessed by the DISCERN questionnaire, the JAMA benchmark, the global quality scale (GQS) and the video information and quality index (VIQI). All videos were assessed by two raters. Discrepancies were resolved by a third rater. These three raters had a physiotherapist professional profile.

The quality of the videos was assessed by the DISCERN questionnaire. The DISCERN questionnaire consists of three sections including 16 questions, and a higher score indicates better quality. The first eight questions are related to reliability, and the next seven questions evaluate the specific details of treatments received. The last question addresses the overall quality of a publication. In the present study, according to the DISCERN scoring system, the videos were grouped into excellent quality (63-75 points), good quality (51-62 points), fair quality (39-50 points), poor quality (27-38 points), and very poor quality (16-26 points). A major advantage of DISCERN is that it is a step-by-step checklist that information consumers may use themselves when reading online health material, and it has been shown to be a valid indicator of evidence-based web site quality when used by consumers [24-26].

The JAMA benchmark was used to evaluate the quality of online information based on four criteria: authorship, attribution, disclosure, and currency. One point is given for each criterion, and the highest quality is indicated by 4 points. The JAMA benchmark is the most streamlined of the quality assessment tools, allowing the evaluator to quickly discredit web sites that lack the most basic components of information transparency and reliability [27].

The GQS was used to assess each video in terms of its instructive aspects for patients. The GQS system allows users to evaluate the overall quality of a video's content on a 5-point Likert scale. While a score of 1 point indicates the worst quality, a score of 5 points indicates excellent quality [28].

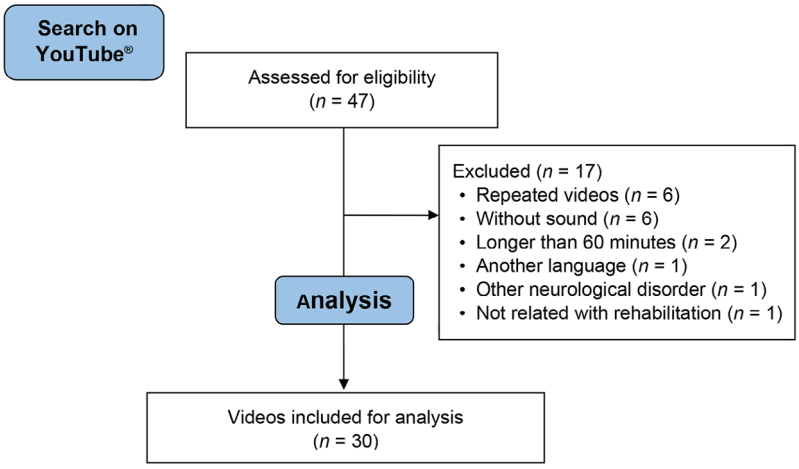
The VIQI was used to assess the quality of the videos. VIQI includes four rating criteria. For each criterion, videos are scored on a 5-point Likert scale: information flow (VIQI 1), information clarity (VIQI 2), video quality (VIQI 3), and consis-

tency (match between the title and content of the video) (VIQI 4) [26].

Statistical analysis

The data obtained were analyzed using SPSS v. 21.0 (SPSS Inc., Chicago, IL, USA). A descriptive analysis was conducted for all variables. Data distribution was tested using the Shapiro-Wilk test ($n < 50$). The Kruskal–Wallis test was used to compare the parameters between the groups. The correlation statistics were obtained using the Spearman test. $p < 0.05$ was considered statistically significant. The correlation degree was considered 'very weak' in a r_s absolute value rank from 0 to 0.19; 'weak' from 0.20 to 0.39; 'moderate' from 0.40 to 0.59; 'strong' from 0.60 to 0.79; and 'very strong' from 0.80 to 1 [29].

Figure. Flow chart.



Results

Until reach the 30 videos that fulfilled the inclusion criteria, a total of 47 videos were initially analyzed. After excluding videos that were not related to the topic and disorder ($n = 2$), duplicate videos ($n = 6$), videos longer than 60 min ($n = 2$), those without sound ($n = 6$) and those presented in any language other than English ($n = 1$) (Figure). The first 30 videos that fulfilled the inclusion criteria were included in this paper for analysis. Table I shows the descriptive information of each video included for analysis.

Nineteen of the videos (63.3%) were uploaded by health channels, 1 (3.3%) by universities, 1 (3.3%) by hospitals, 1 (3.3%) by universities and hospitals, and 8 by independent users (26.7%). Seven videos (23.3%) contained general information about MS rehabilitation, 1 (3.3%) were about patient´s experience, 13 (43.3%) discussed about techniques, 1 video (3.3%) contained general information about MS rehabilitation and patient´s experience, 5 (16.7%) contained general information and techniques, 2 videos (6.7%) contained information about patient´s experience and techniques discussion and 1 video (3.3%) was about general information about MS rehabilitation, patient´s experience and techniques. Table I summarizes the descriptive statistics of the videos.

The mean DISCERN score was 28.3 (±9.33), the mean JAMA score was 2 (±.81), the mean GQS score was 2.57 (±1.22), and the mean VIQI score was 11.73 (±4.06). JAMA score statistically significantly differed according to upload source ($p = 0.002$). JAMA score also statistically significantly differed according to video content ($p = 0.023$) and the speaker ($p = 0.002$) (Table II).

The DISCERN, JAMA, GQS, and VIQI scores showed significant correlations with each other. Some of these scores were also correlated with days since upload, video duration in seconds, and views (Table III).

According to Spearman coefficients, DISCERN score showed a weak negative significant correlation with the variable 'days since upload' ($r_s = -0.388$; $p = 0.034$). GQS score also showed a negative correlation with this variable, but in this case the correlation strength was moderate ($r_s = -0.413$; $p = 0.023$). On the other hand, DISCERN and GQS scores resulted in a moderate positive significant correlation with the variable 'duration (in seconds)' ($r_s = 0.578$; $p = 0.001$; and $r_s = 0.498$; $p = 0.005$, respectively). VIQI score showed a strong positive correlation with this same variable ($r_s = 0.605$; $p < 0.001$). Finally, DISCERN and GQS scores held a weak negative significant correlation with the variable 'views' ($r_s = -0.389$; $p = 0.033$; and $r_s = -0.372$; $p = 0.043$, respectively).

Discussion

This study evaluated the content, educational value, and quality analysis of MS videos about neurorehabilitation on YouTube®. The results of our research found that the videos integrated for the analysis were quite old since the date of upload, with a mod-

Table I. Descriptive information of each video included for analysis and descriptive statistics of the videos.

	Upload source	Content	Speaker	Target population	Date of upload
Rehabilitation In Multiple Sclerosis	Health channel	General information and patient experience	Physicians and patients	Patients	15 Jun 2015
Cognitive rehabilitation for patients with multiple sclerosis	Health channel	General information and techniques	Physicians	Physicians	20 Dec 2022
Multiple Sclerosis Rehabilitation. FAQ with Drs. Abbey Hughes and Alexius Sandoval	University and hospital	General information	Physicians	Patients	31 Jul 2017
Mellen Center for Multiple Sclerosis Overview,	Hospital	General information and techniques	Physicians	Patients	9 March 2020
Rehab for Spasticity in MS – National MS Society	Health channel	General information	Physicians	Patients	28 Jan 2010
Living with Multiple Sclerosis	Health channel	General information, patient experience and technique	Physicians and patients	Patients	19 Feb 2020
Exercise/physical activity with MS	Health channel	Patient experience and techniques	Physicians and patients	Patients	8 Feb 2016
Exercise adaptations for Multiple Sclerosis	Health channel	Patient experience and techniques	Patient and non physycians expert	Patients	31 March 2013
DTC Fitness Elite – Multiple Sclerosis Rehab Exercise	Independent user	Technique	Non physician expert	Patients	3 Jun 2015
Beginning Rehab for MS – National MS Society	Health channel	General information	Physicians	Patients	28 Jan 2010
How MS Patient can exercise at home alone?	Health channel	Technique	Physicians	Patients	29 May 2013
Multiple Sclerosis Simple Yoga Leg Exercise	Independent user	Technique	N.A.	Patients	1 Jan 2013
Walking exercise for those with Multiple Sclerosis	Independent user	Technique	Patients	Patients	10 March 2009
MULTIPLE SCLEROSIS exercise to Improve Mobility	Independent user	Technique	N.A.	Patients	8 Jun 2008
Circulation exercise for any stage of Multiple Sclerosis	Independent user	Technique	Patients	Patients	13 March 2009
Multiple Sclerosis – leg lift & foot exercise	Independent user	Technique	Patients	Patients	25 May 2009
mHealth for rehabilitation of multiple sclerosis patients	Health channel	Technique	Physicians	Physicians	21 Decem 2022
Why Exercise Is Important For Multiple Sclerosis, EXO, 66ERCISE PROGRAM FOR MS	Health channel	General information and technique	Non physician	Patients	18 Aug 2017
Multiple Sclerosis and Cognitive Rehabilitation	Health channel	General information and technique	Physicians	Patients	11 Nov 2021
Multiple Sclerosis Vestibular Rehabilitation Exercise	Independent user	Technique	Patients	Patients	9 Jan 2021
Improving Post Relapse Recovery in Multiple Sclerosis With Rehabilitation	Health channel	General information	Physicians	Patients	8 Sept 2023
Exercise for Multiple Sclerosis Patients – Balance and Propioception	Health channel	Technique	Non physician	Patients	14 March 2021
Rehabilitation Intervention and Multiple Sclerosis	Health channel	General information	Physicians	Patients	11 March 2013
What workers with Multiple Sclerosis Want Rehabilitation Professionals and Employers to Know	University	General information	Physicians	Physicians and patients	27 Aug 2019

Days since upload	Duration	Views	Likes	Comments	VR	DISCERN score	JAMA score	GQS score	VIQI score
3,044	10:32	16,600	160	13	5.45	30	2	2	15
300	4:09	323	4	N.A.	1.07	32	2	3	8
2,267	3:12	3,500	21	3	1.54	35	3	3	15
1,315	3:11	10,545	87	1	8.01	21	3	1	12
5,009	1:14	28,879	93	3	5.76	18	2	1	7
1,334	9:49	602	2	1	0.45	49	4	5	15
2,807	7:33	26,176	256	10	9.32	32	2	3	15
3,850	4:40	36,363	316	11	9.44	25	3	2	13
3,056	0:39	3,313	8	0	1.08	15	2	1	4
5,008	1:04	2,299	4	0	0.4	28	2	3	15
3,791	14:45	73,039	762	26	19.26	27	2	3	15
3,940	4:18	5,345	49	6	1.35	19	1	2	11
5,332	4:01	50,232	230	11	9.42	18	1	1	7
5,607	7:18	11,134	28	6	1.98	19	1	1	5
5,329	3:05	14,099	55	1	2.64	18	1	1	7
5,257	2:54	28,997	96	5	5.51	21	1	2	8
299	1:09	71	1	N.A.	0.23	21	2	3	8
2,249	4:05	38,222	990	64	16.99	31	2	4	13
713	4:47	486	15	0	0.68	51	3	4	16
1,009	15 :28	1,386	78	31	1.37	38	1	4	14
39	5:32	99	0	1	2.53	25	2	3	8
947	3:19	2,582	58	1	2.72	28	1	3	11
3,870	3:31	2,141	12	1	0.55	35	2	4	11
1,509	11:40	133	2	0	0.08	39	4	4	18

Table I. Descriptive information of each video included for analysis and descriptive statistics of the videos *(cont,)*,

	Upload source	Content	Speaker	Target population	Date of upload
Strength training and Multiple Sclerosis Rehabilitation with Neubie	Health channel	Patients experience	Patients	Patients	12 Sept 2019
Rehabilitation in Multiple Sclerosis	Health channel	General information and technique	Physicians	Patients	11 March 2011
Journal Club – Multiple Sclerosis (MS) Fatigue & Vestibular Rehab	Health channel	Technique	Physicians	Physicians	16 Jun 2021
Anthony Feinstein : cognitive rehabilitation in progressive MS	Health channel	General information	Physicians	Patients	14 Sept 2016
Rehabilitation in Multiple Sclerosis	Health channel	Technique	Physicians	Physicians	16 Sept 2016
Exercises for multiple sclerosis – front step & lean to improve balance	Independent user	Technique	Non physician	Patients	21 Feb 2023

	Upload source: health channel	Upload source: university	Upload source: hospital	Upload source: university and hospital	Upload source: independence user
Percentage according to (%)	63.3	3.3	3.3	3.3	26.7
	Content: general information	Content: patient's experience	Content: techniques	Content: general information and patient's experience	Content: general information and techniques
Percentage according to (%)	23.3	3.3	43.3	3.3	16.7
	Speaker: physicians	Speaker: patients	Speaker: not a physician expert	Speaker: physicias and patients	Speaker: not a physician and patients
Percentage according to (%)	50	16.7	13.3	10	3.3

N.A.: not authorised; VR: view ratio.

erate duration and number of views, but with a poor quality and a lack of the most basic components of information transparency and reliability about rehabilitation in people with MS. So, this information should be considered due to the fact of the Internet has evolved into a common information source, and 80% of users consult web sources for health information, as YouTube® platform.

Patients who want to take a more active role in decision-making about their disease and/or treatment are increasingly using the internet to seek information about their disease [30]. However, in our assessment of the quality of information presented on YouTube® videos, we found that these videos might not provide the best source of information for this topic.

As it has been addressed in the MS context, only general information on social media [9], about the chronic cerebral spinal venous insufficiency treatment [8-20,21] or personal medical information

Days since upload	Duration	Views	Likes	Comments	VR	DISCERN score	JAMA score	GQS score	VIQI score
1,496	1:12	214	0	0	0.14	15	1	1	5
4,601	6:21	55	0	0	0.011	39	2	4	17
853	50:10	383	9	4	0.45	36	3	4	17
2,588	3:48	925	7	1	0,35	24	2	2	14
2,586	3:32	222	3	0	0.08	33	2	1	13
238	5:37	7,288	399	19	30.62	27	1	2	15
2,674.77 (±1,798.32)	405.17 (±542.33)	12,188.43 (±17,983.82)	124.83 (±230.33)	7.82 (±13.65)	4.65 (±6.97)	28.30 (±9.33)	2 (±0.81)	2.57 (±1.22)	11.73 (±4.06)

Content: Patient's experience and technique	Content: general information, patient's experience and techniques
6.7	3.3

Speaker: not identified
6.7

[22] about MS in YouTube® videos have been conducted. In our best knowledge, this is the first paper that has assessed the quality of MS videos about rehabilitation topic on YouTube®. In other areas of neurology, a methodology like that applied in our research has been done to explore information in this audiovisual media platform. For example, Nanda et al [10] studied the reliability and quality of the information on stroke on YouTube®. Szmuda et al [14] aimed to evaluate the quality, reliability, and audience engagement of stroke-related YouTube® videos. Chaudhry et al [11] conducted an inquiry on YouTube® about the term cluster headache. Saffi et al [16] aimed to evaluate the content and distribution of the most popular videos on YouTube® about migraine. Related to treatment content of neurological disorders, for example Askin et al [12] investigated the educational quality, reliability and accuracy of the YouTube® videos concerning repetitive transcranial magnetic stimulation rTMS applica-

Table II. Comparison of the DISCERN, JAMA, GQS, and VIQI scores according to upload source, video content and speaker. Data expressed with medians and interquartile ranges.

		DISCERN	JAMA	GQS	VIQI
Upload source	Health channel	30 (10)	2 (3)	3 (2)	13 (7)
	University	39 (0)	4 (0)	4 (0)	18 (0)
	Hospital	21 (0)	3 (0)	1 (0)	12 (0)
	University and hospital	35 (0)	3 (0)	3 (0)	15 (0)
	Independent user	19 (8)	1 (0)	1.5 (1)	7.5 (8)
	p	0.071	0.002[a]	0.086	0.094
Video content	General information	28 (11)	2 (1)	3 (2)	14 (7)
	Patient's experience	15 (0)	1 (0)	1 (0)	5 (0)
	Tecniques	21 (12)	1 (1)	2 (2)	11 (8)
	General information and patient´s experience	30 (0)	2 (0)	2 (0)	15 (0)
	General information and techniques	32 (19)	2 (1)	4 (2)	13 (7)
	Patient´s experience and techniques	28.5 (7)	2.5 (1)	2.5 (1)	14 (2)
	General information, patient´s experience and techniques	49 (0)	4 (0)	5 (0)	15 (0)
	p	0.168	0.023[a]	0.227	0.365
Speaker	Physicians	32 (12)	2 (1)	3 (2)	14 (8)
	Patients	18 (13)	1 (0)	1 (2)	7 (5)
	Not a physician expert	27.5 (12)	1.5 (1)	2.5 (3)	12 (9)
	Physician and patients	32 (10)	2 (1)	3 (1.5)	15 (0)
	Not a physician and patients	25 (0)	3 (0)	2 (0)	13 (0)
	p	0.173	0.002[a]	0.436	0.097

GQS: global quality scale; rs: correlation coefficient; VIQI: video information and quality index; VR: view ratio. [a] $p < 0.05$.

tions in patients with stroke. Or, for example, Yasin et al [13] evaluated the quality, reliability, and usefulness of videos on mechanical thrombectomy on YouTube® using quantitative and qualitative analyses. As our findings, most of these studies have reported an overall quality of information as poor.

The results of our research showed that there were statistically significant differences in terms of transparency and reliability of the information, depending on the upload source (JAMA score). Based on these results obtained, videos which came from 'professional' profiles (hospital or university) showed higher scores in the evaluations conducted by the researchers, as indicated in table II. No such findings being found in terms of DISCERN, VIQI and GQS scores. This information would corroborate

the hypothesis of a more appropriate management and transmission of quality information related to rehabilitation for people with MS depending on the source consulted. Considering this data, given that they were professionals who have evaluated the quality of these videos, it would be interesting to have evaluations in future studies by individuals outside the healthcare field or patients. However, the validated measures used in this study are not sufficiently simple to handle and even to interpret by the general population, so instruments could be designed for this purpose.

In this line, quality of the videos also differed considering the video content and the speaker. On the other hand, there was a correlation between DISCERN scale and 'days since the upload', 'duration of the videos', and 'number of views'. Additionally, the VIQI scale was correlated with the 'duration of the video's. Finally, GQS scale was correlated with the days since the upload, 'duration of the videos', and 'number of views'.

More specifically, regarding the significant correlation identified between the DISCERN and GQS scores and the variable 'days since upload', it is important to note that this correlation is negative. Thus, we might deduce that older videos tend to have lower informational quality. Therefore, based on the information gathered in this research, there is a trend of improving the quality of information presented on YouTube® as time progresses. Furthermore, considering the variable 'duration of the videos', we can perceive that there is a moderate positive correlation with the DISCERN and GQS scores and a strong positive correlation with the VIQI score. This leads us to infer that the informational quality of the videos increases as their duration time extends. This information presents importance for future content related to this topic on YouTube®. It is important to note that the quality aspects of the videos should consider these variables described in this research.

It is worth mentioning as stated above that it would be interesting that non-professional profiles and patients evaluate the information since they are the target population of most of the videos. This fact, coupled with the assessment conducted by professionals, would allow us to gain a better understanding of the type of information reaching MS population. However, to our best knowledge, there is not a specific tool for this aim, but perhaps the GQS would be a good starting point since both three tools DISCERN, JAMA and VIQI have a pronounced professional profile.

There is not prior information to compare our findings. However, Al-Busaidi et al [31], after examining the quality of YouTube® videos that deliver general information on Parkinson´s disease and the availability and design of instructional videos addressing the caregiving role in Parkinson´s disease found that the overall quality of information presented in the videos screened was mediocre. Therefore, healthcare providers should direct patients and their families to the resources that provide reliable and accurate information. Nevertheless, it seems that this situation seems to have changed in the context of the Parkinsons´s disease. A later study in 2021 about this same topic found that the quality of YouTube® videos relevant for Parkinsons´s disease patients had increased in channels with a higher number of videos on the topic [32]. Authors identified three German channels that could be recommended to Parkinsons´s disease patients who prefer video over written content. So,

Table III. Correlations between the DISCERN, JAMA, GQS, and VIQI scores and days since upload, duration (seconds), views, likes, comments and VR.

Scale	DISCERN	JAMA	GQS	VIQI
DISCERN		r_s = 0.542 p = 0.002[a]	r_s = 0.841 p < 0.001[a]	r_s = 0.811 p < 0.001[a]
JAMA	r_s = 0.542 p = 0.002[a]		r_s = 0.443 p = 0.014[a]	r_s = 0.56 p = 0.001[a]
GQS	r_s = 0.841 p < 0.001[a]	r_s = 0.443 p = 0.014[a]		r_s = 0.667 p < 0.001[a]
VIQI	r_s = 0.811 p < 0.001[a]	r_s = 0.56 p = 0.001[a]	r_s = 0.667 p < 0.001[a]	
Variable				
Days since upload	r_s = –0.388 p = 0.034[a]	r_s = –0.298 p = 0.11	r_s = –0.413 p = 0.023[a]	r_s = –0.273 p = 0.145
Duration (seconds)	r_s = 0.578 p = 0.001[a]	r_s = 0.207 p = 0.273	r_s = 0.498 p = 0.005[a]	r_s = 0.605 p < 0.001[a]
Views	r_s = –0.389 p = 0.033[a]	r_s = –0.241 p = 0.2	r_s = –0.372 p = 0.043[a]	r_s = –0.188 p = 0.319
Likes	r_s = –0.179 p = 0.343	r_s = –0.229 p = 0.224	r_s = –0.197 p = 0.297	r_s = –0.01 p = 0.956
Comments	r_s = –0.084 p = 0.672	r_s = –0.28 p = 0.149	r_s = 0.024 p = 0.904	r_s < 0.001 p = 0.999
VR	r_s = –0.317 p = 0.088	r_s = –0.235 p = 0.212	r_s = –0.264 p = 0.158	r_s = –0.163 p = 0.390

GQS: global quality scale; rs: correlation coefficient; VIQI: video information and quality index; VR: view ratio.
[a] p < 0.05.

future video developments should be focused on creating and/or identify high-quality publishers about rehabilitation content, the so-called 'channels' that can be recommended to MS patients.

As it has been mentioned, no other papers about this topic have been addressed in the MS context about rehabilitation. Only Terrens et al [33] have studied aspects related to rehabilitation for Parkinson´s disease patients. In a concrete way, they explored the quality of information regarding aquatic physiotherapy. In contrast to our methodology, they used the Awario© social listening software, including not only YouTube®, but also Facebook, Twitter, Instagram, blogs, and the web, but only using the DISCERN tool to assess the quality of the information. Their results showed a small number of entries described the effects of aquatic physiotherapy for people with Parkinson disease. Quality of webpages was low, with many lacking information regarding sources of information, contraindications to aquatic physiotherapy and descriptions of the therapeutic environment. Social media platforms should also include information regarding enablers to exercise to improve engagement of people with Parkinson disease in aquatic physiotherapy.

There are several recommendations that could be followed, derived from the results of this work. An updated video generation about neurorehabilitation in people with MS is needed mainly by health centers (hospitals), universities and research organizations. Although there is abundant information about techniques in the videos evaluated, it would be interesting to address the scientific evidence of each of them by experts and update related content. It is possible that increasing the duration of the videos, although it could reduce the number of views, could help in better addressing the content about neurorehabilitation for people with MS, even though the actual tendencies look for formats with shorter durations. However, increasing the length of the video would allow the speaker to perform better explanation of the exercises or therapeutic tools, among others, improving the patient's knowledge and empowering them to raise awareness of their health. In this sense, it is true that video platforms are currently being increasingly used through social networks that the general population, but also patient groups, can use or review to search for information. Future work should propose an analysis of these platforms, which allow shorter video lengths (TikTok® allows videos of up to 30 minutes; Facebook® videos of up to 240 minutes; and Instagram® videos of up to 60 seconds), using specific tools for analyzing the quality of their content. In addition, there is very little previous analysis work in this regard in patients with neurological disorders [34-36] and nonexistent in the field of MS. Finally, a self-examination could be proposed by each video developers in the healthcare field, using the information from the scales employed in this work, especially in the videos related to medical or health aspects.

This work presents several limitations. First, we could not use a standardized tool to assess risk of bias of included studies due to the idiosyncrasies of the videos included. However, quality of the videos was assessed by several validated scales for this purpose. Second, only videos published in a language other than English, those longer than 60 min, those without sound, commercials, and videos that were not related to rehabilitation of MS patients were excluded. Therefore, information of interest could exist in videos with these characteristics. Third, the methodology used, and the different subtopics addressed in the videos included hampers direct comparisons with other studies for different neurological disorders and restricting the generalization of the conclusions of the present review for the videos for about rehabilitation of MS patients until the deadline described.

Conclusions

Our results showed that the videos about neurorehabilitation in people with MS on YouTube® were quite old since the upload, with a moderate duration and number of views, but with a poor quality of the content, educational value, and quality analysis of the videos. There was a lack the most basic components of information transparency and reliability about rehabilitation in people with MS. Our research showed that there were statistically significant differences in terms of quality, transparency, and reliability of the information, depending on the upload source, video content and the speaker. Also, future video material on YouTube® platform should follow the recommendations conducted in this research since days since the upload, the duration of the videos, or the number of views, among others, are aspects related educational value, and quality of MS videos about neurorehabilitation on YouTube®.

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Análisis de contenido, valor educativo y calidad de los vídeos sobre neurorrehabilitación de la esclerosis múltiple en YouTube®

Introducción. El uso de YouTube® se ha extendido entre los pacientes con enfermedades crónicas como la esclerosis múltiple (EM). Estos pacientes tienden a consultar los vídeos disponibles para aprender más sobre su enfermedad, en términos de diagnóstico y toma de decisiones sobre tratamientos, incluida la rehabilitación. El objetivo de este estudio fue evaluar el contenido, el valor educativo y el análisis de la calidad de los vídeos sobre neurorrehabilitación de la EM en la plataforma YouTube®, empleando instrumentos cuantitativos validados.

Materiales y métodos. Se realizó una búsqueda en la plataforma YouTube®. Se revisaron los 30 primeros vídeos que cumplían los criterios de inclusión establecidos. Los vídeos se clasificaron según la fuente de subida y el contenido. Todos los vídeos incluidos en la revisión se evaluaron mediante el cuestionario DISCERN, el índice de referencia JAMA, la escala de calidad global (GQS) y el índice de información y calidad de vídeo (VIQI).

Resultados. Las puntuaciones medias fueron: 28,3 (±9,33) en DISCERN, 2 (±0,81) en JAMA, 2,57 (±1,22) en GQS y 11,73 (±4,06) en VIQI. La puntuación en la escala JAMA difirió de forma estadísticamente significativa según la fuente de carga (p = 0,002), el contenido del vídeo (p = 0,023) y el perfil de la persona que lo ejecutaba (p = 0,002). Las puntuaciones en DISCERN, JAMA, GQS y VIQI mostraron correlaciones significativas entre sí.

Conclusiones. Los vídeos analizados sobre neurorrehabilitación en personas con EM y que aparecen en la plataforma YouTube® eran bastante antiguos desde su fecha de subida, con una duración y un número de visualizaciones moderados, y con una calidad deficiente en su contenido, en su valor educativo y en el propio análisis de los mismos. Nuestra investigación mostró que había diferencias estadísticamente significativas en términos de calidad, transparencia y fiabilidad de la información, dependiendo de la fuente de subida, el contenido del vídeo y el perfil de la persona que lo ejecutaba.

Palabras clave. Análisis de vídeos. Contenido de calidad. Esclerosis múltiple. Neurorrehabilitación. Valor educativo. YouTube®.