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# Quality and reliability assessment of the space maintainer videos as a source of information

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## KEYWORDS

Internet; Space Maintainer; Pediatric Dentistry; Social Media; Video; Youtube. .

## ABSTRACT

*Aim: YouTube™ has very quickly become one of the most preferred online video services by patients to consult health related information. To date, quality and reliability of YouTube™ video content about space maintainers is unknown. The aim of this study was to analyze the educational potential of information provided by YouTube™ for patients searching content on space maintainers..*

*Material and methods: By examining the search interest of space maintenance terms via Google Trends, we selected 'space maintainer' term to assess on YouTube™. Two viewers independently analyzed the educational potential of included videos using the total content scoring (TCS), video information and quality index (VIQI) and DISCERN criteria. TCS was determined by using 17 point-score list, allocated low and high-content video groups. VIQI was used to assess the quality of content for each video. The educational quality and bias of YouTube™ videos were assessed by using DISCERN criteria.*

*Results: The majority of videos had low-content (91.5%, n=65).and high-content videos were significantly longer than low-content videos (p:0.023). TCS was significantly correlated with DISCERN criteria (p:0.004) and VIQI score (p<0.001). Significant correlation was also found between the DISCERN criteria and VIQI score (p<0.001). Video power index of videos was not significantly affected by their educational potential.*

*Conclusion: YouTube™ videos on space maintainer contained insufficient data in terms of quality and quantity. With the contribution of the health care professionals, YouTube™ video contents related to health information should be standardized to become more reliable and more educational.*

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## Introduction

Space management is essential in situations of premature loss of deciduous teeth to prevent malposition, impaction, supra-eruption or crowding of the developing permanent dentition. The use of space maintainers is a significant responsibility of dentists who are involved in observing the development of dentition and may potentially avoid future needs such as extractions and complicated orthodontic treatment. There are many types of space maintainers which are designed specifically for different cases with particular indications. The process of applying space maintainers to children in the clinic may be a cause of concern for parents. At this point, the Internet offers a convenient and attractive source for patients searching healthcare-related information.

As a result of accelerating the flow of information

through social media, the rate of people using the Internet for health-related issues is increasing day by day. It was stated that more than 80% of Internet searches were conducted for medical support and information (1). In this respect, using the Internet for health-care issues was found to be beneficial in improving patient empowerment (2). Similarly, the Internet has the potential to educate and empower the dental consumer by providing information about oral health services. Additionally, improving the quality of dental care, encouraging the adoption of healthy behaviours by patients, better adherence to recommendations and supporting the proper use of preventive agents can be listed as other potential advantages of informing patients via the Internet (3).

YouTube™ ([www.youtube.com](http://www.youtube.com)) is an open-access platform that has been very popular since 2005,

where users can broadcast videos that will be streamed worldwide, and has become the third most-visited website in the World (4,5). Viewers can interact with uploaders by commenting or liking/disliking their videos. A great deal of content on this web source includes medical information produced by experts and treatment experiences shared by patients. Several studies evaluated YouTube™ content in aspects of oral health. Some of these studies indicated that YouTube™ contains scientifically inaccurate and misleading information that could have an adverse effect on patients' health (1,6,7), while some studies reported that clinicians can decide to direct their patients about searching for YouTube™ videos during treatment (8,9). Therefore, the aim of the present study was to investigate the educational value, accuracy and quality of YouTube™ content regarding the space maintainers with two different scoring systems.

## Material and methods

### Video search

'Google Trends' is an application used to see specific keywords and topics that are most frequently used for online searches in various regions of the world. Google Trends' filter settings were set to 'Worldwide' and 'past 5 years' for more comprehensive search results and keywords used by dentists for space maintenance were compared (space maintainer, space regainer, band and loop, lingual arch and nance appliance). The term 'space maintainer' was identified by the 'Google Trends' application as the most frequently used search term on the Internet (Google Trends, 2019).

A search was done using the keyword 'space maintainer' in YouTube™ using the 'sort by relevance' filter on June 10, 2019 to assess the data on space maintenance. 95% of YouTube™ users scan no more than the first 60 videos of the search results and only 79% of these users looked at other pages when they could not find what they had searched for on the first page (10,11). Many previous studies using YouTube™ content have included 60-200 videos (10). In the present study, the first 225 videos screening for the search term 'space maintainer' were included and examined. The source locators (URLs) were saved for further analysis.

### Video classification and assessment

Videos not related to the subject and irrelevant videos, videos not in English and without subtitles, silent videos, duplicate videos and conference or lecture videos (target audience is a specialized community) were excluded. Those longer than 30 sec. and containing only the fabrication phase videos were also excluded. After the removal of excluded

videos, 71 videos remained for analysis. All videos were examined by two reviewers independently. Inter-examiner disagreements about the review process were resolved by discussion of the literature (12,13) in a consensus meeting. Because the search results may change based on different time periods, the included videos were saved by creating a playlist.

Video features such as number of views, date of upload, number of comments, number of likes/dislikes and duration in seconds were extracted for the descriptive properties' determination. Interaction index ((number of likes-number of dislikes/total number of views)\*100%), viewing rate ((number of views/number of days since upload)\*100%) and video power index (VPI: number of likes/(number of likes+ number of dislikes)\*100%) were calculated to evaluate the viewers' interactions with videos (8,14).

All videos were categorized by source of uploads into five groups: healthcare professionals (general dentist, pediatric dentist, orthodontist), university/hospital, commercial (dental manufacturing company or dental supply company), independent users and other (Tv channels, news agencies, etc.). Videos were also categorized by type: educational (containing information about the space maintainer and the importance of regaining space in the dental arch) or testimonial (containing personal experience with the space maintainer).

The content of included videos was classified according to the following topics (Table 1):

1. definition of space maintainer;
2. different types of space maintainer;
3. indications;
4. contraindications;
5. application procedure;
6. benefits;
7. complications;
8. oral hygiene;
9. follow ups.

Each item of content was scored for a total of 17 points and total content score of the video was calculated. According to the total content score of the videos they were evaluated as poor (0-9) and high (10-17) content.

The quality of video content, educational properties, and source of information accuracy were measured using the "video information and quality index (VIQI)" and "DISCERN" score systems. In both methods, the higher score means better quality.

The VIQI score system uses 4 topics to examine videos: flow of information, accuracy of information, quality (1 point each for use of still images, clinical experiences with individuals, animation, video captions and a case report) and precision (level of relevance between video title and content). The videos are evaluated using a 5-point Likert Scale and each

Scoring Item	Score	Description
Definition of space maintainer	1 point	<ul style="list-style-type: none"> <li>The most proper definition: A space maintainer is indicated to keep an adequate space for the newly developing teeth to erupt and exfoliate naturally in a well- aligned position.</li> </ul>
Indications	1 point	<ul style="list-style-type: none"> <li>Premature loss of primary teeth</li> </ul>
Contraindications	1 point	<ul style="list-style-type: none"> <li>Widely spaced primary dentition teeth are expected to erupt within the next six month.</li> <li>Cuspal interference or locked opposing.</li> <li>First molars in a stable relationship patients who are expected to have future orthodontic procedures.</li> </ul>
Definition of different types of space maintainers	1 point each (Total of 6)	<ul style="list-style-type: none"> <li>Band and loop/ Crown and loop</li> <li>Distal shoe</li> <li>Lingual arch</li> <li>Nance appliance/ Transpalatal arch</li> <li>Removable space maintainers</li> <li>Partial dentures</li> </ul>
Application procedure of space maintainer	1 point each (Total of 4)	<ul style="list-style-type: none"> <li>Taking the impression</li> <li>Fabrication of space maintainer</li> <li>Fitting the space maintainer</li> <li>Cementation</li> </ul>
Advantages	1 point	<ul style="list-style-type: none"> <li>The goal of space maintenance is to prevent loss of arch length, width, and perimeter by maintaining the relative position of the existing dentition.</li> </ul>
Complications	1 point	<ul style="list-style-type: none"> <li>Increased risk of infection, dental caries, plaque accumulation, local pain and discomfort</li> <li>Interference with the normal development and alignment of the erupting succeeding teeth</li> <li>Undesirable teeth position and movement</li> <li>Soft tissue irritation and impingement</li> <li>Complications related to the appliances</li> </ul>
Oral hygiene	1 point	<ul style="list-style-type: none"> <li>Avoiding chewing on hard foods and eating sticky gums</li> </ul>
Follow ups	1 point	<ul style="list-style-type: none"> <li>Early identification of signs of infection, caries or disintegration</li> </ul>
For each topic 1 point-score was used for a total of 17 possible points. 0-9 score=low content video (not at all educational for patients), 10-17 score=high video content (very educational for patients). Topic domains were allocated according to current AAPD guideline.		

**Table 1** Content Scores Used to Evaluate Videos

topic ranges from 1 (low quality) to 5 (high quality) (9).

The DISCERN system was created and developed by a specialized group at the University of Oxford (UK) as a tool to assess health information (15). It includes of 16 questions ranging from 1 to 5 and the total score is between 6 and 80.

The present study did not require confirmation by the ethics committee as it contained publicly available data only.

#### Statistical analysis

Data were evaluated by taking the average of the

numerical scores obtained from the two reviewers. The data obtained were subjected to statistical analysis using the SPSS (ver: 20) software. Descriptive data were shown with 'n' and '%' values in categorical variables and shown with median Interquartile Range (IQR) values in continuous variables. Fisher's test was used to compare categorical variables. Kolmogorov-Smirnov test was used for detecting the normality of the data and the Mann-Whitney U test was used to compare the non-normally distributed data. Correlations were determined using the Spearman correlation test. The level of significance was set at  $p < 0.05$ .

## Results

The first 225 videos were screened for relevance with the initial search using the term ‘space maintainer’ and 154 videos were excluded (Figure 1). The remaining 71 videos were analyzed in the present study.

The descriptive statistic of the video demographics are presented in Table 2. The median length of YouTube™ videos on space maintainers was 2.03 minutes. The median VPI, Interaction Index and Viewing Rate were 92.7, 0.2 and 101.3 respectively. The overall median total content score, DISCERN and total VIQI score were 4.0, 3.5 and 12.0 respectively. Other video characteristic including source of upload, video type and content score are summarized in Table 3.

### Source of upload and video type

Overall, the vast majority of the videos were uploaded on the site by healthcare professionals (39.4%, n=28). The commercial sources were 29.6% (n=21) of all the videos with the responsibility of the remaining majority. The commercial sources were responsible of the remaining majority (29.6%, n=21) of all the videos. Laypersons and Hospital/University were responsible for uploading 22.5% (n=16) and 7% (n=5) of the total videos respectively, whereas 1.4% (n=1) were uploaded by others.

When videos were classified by types, 84.5% (n=60) of the videos were categorized as educational,

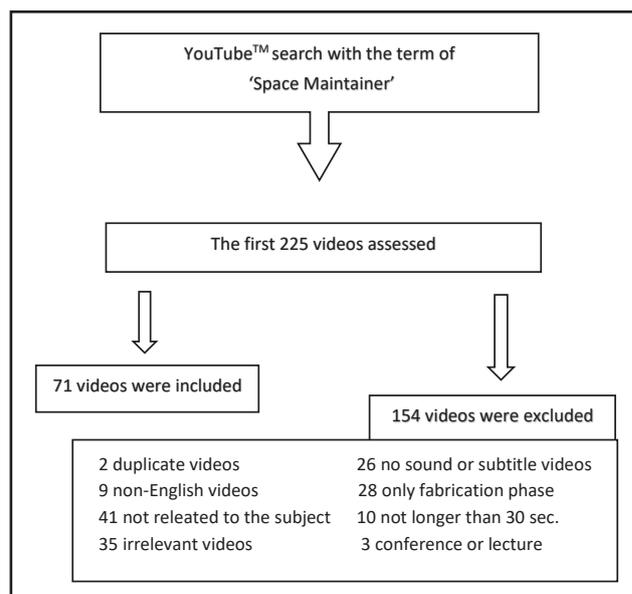


Figure 1 YouTube™ search strategy

meaning they were explanatory videos including benefits and application stages of space maintainers. The remaining 15.5% (n=11) of the videos were categorized as testimonial which were based on individual experiences and opinions.

### Content and quality

Most videos (91.5%, n=65) were low content and

	Median	(IQR)
Number of Views	969.0	(177.0-6220.0)
Duration in Seconds	123.0	(78.0-285.0)
Number of Comments	0.0	(0.0-2.5)
Likes	8.0	(0.0-18.0)
Dislikes	0.0	(0.0-1.0)
Video Power Index (VPI)	92.7	(0.0-100.0)
Interaction Index	0.2	(0.0-0.9)
Viewing Rate	101.3	(17.5-453.8)
DISCERN	3.5	(2.5-4.0)
Total Content Score	4.0	(3.0-7.0)
VIQI Content Assessment		
• <i>Flow of information</i>	3.0	(2.0-4.0)
• <i>Information accuracy</i>	4.0	(4.0-5.0)
• <i>Quality</i>	1.0	(1.0-2.0)
• <i>Precision</i>	3.0	(2.0-4.0)
• <i>Total VIQI score</i>	12.0	(9.0-14.0)

Table 2 Descriptive Demographic Data of YouTube™ Videos

Video Characteristic		n	(%)
Source of Upload	Healthcare professionals	28	(39.4)
	Hospital/University	5	(7.0)
	Commercial	21	(29.6)
	Layperson	16	(22.5)
	Other	1	(1.4)
Video Type	Educational	60	(84.5)
	Testimonial	11	(15.5)
Total Content Score	Low Content Video	65	(91.5)
	High Content Video	6	(8.5)

**Table 3** Distribution of YouTube™ Videos According to Source of Upload, Video Type and Total Content Score

	Total Content Score				p <sup>a</sup>
	Low Content Video		High Content Vid		
	Median	(IQR)	Median	(IQR)	
Video Characteristic					
Number of views	849.0	(133.0-6220.0)	3527.0	(332.0-6172.0)	0.378
Duration in seconds	110.0	(70.0-224.0)	369.0	(199.0-731.0)	0.023
Number of comments	.0	(0.0-3.0)	.0	(0.0-.0)	0.681
Likes	7.0	(0.0-17.0)	14.0	(4.0-27.0)	0.194
Dislikes	.0	(0.0-1.0)	1.0	(0.0-2.0)	0.378
Video Power Index (VPI)	92.3	(0.0-100.0)	95.5	(88.2-100.0)	0.400
Interaction Index	.2	(0.0-.8)	.8	(.2-2.0)	0.142
Viewing Rate	93.2	(17.5-453.8)	356.7	(73.9-441.2)	0.305
DISCERN	3.4	(2.5-3.9)	4.1	(4.0-4.2)	0.026
VIQI Content Assessment					
Flow of information	3.0	(2.0-4.0)	5.0	(4.0-5.0)	<0.001
Information accuracy	4.0	(4.0-5.0)	5.0	(5.0-5.0)	0.047
Quality	1.0	(1.0-2.0)	2.0	(2.0-3.0)	0.012
Precision	3.0	(2.0-4.0)	5.0	(4.0-5.0)	0.003
Total VIQI score	11.0	(9.0-14.0)	17.0	(17.0-17.0)	<0.001

**Table 4** Comparison of Variables Between High and Low Content Videos

only 8.5% (n=6) of videos were high content. Analysis of YouTube™ videos' descriptive data according to total content score, DISCERN and VIQI score are presented in Table 4. In the comparison of the descriptive data of videos and total content scores, the durations of high content videos were found to be significantly longer than those of low content videos (p = 0.023). However, no statistically significant result was found between the number of views, comments, likes, dislikes VPI, interaction index and viewing rate (p >0.05). DISCERN

and all VIQI score system topics (flow of information, information accuracy, quality, precision, and total VIQI score) were significantly higher in the high content video group than in the low content group (p <0.05). The statistical relationship between the total VIQI score and content of videos (p <0.001) was found to be stronger than the statistical relationship between DISCERN and content of videos (p = 0.026). There was no significant relationship between the total content score and the source of upload and the video type (Data not shown).

	Total content score		DISCERN		Flow of information		Information accuracy		Quality		Precision		Total VIQI Score	
	rho	p	rho	p	rho	p	rho	p	rho	p	rho	p	rho	p
Total content score			0.336	0.004	0.699	<0.001	0.466	<0.001	0.691	<0.001	0.344	0.004	0.659	<0.001
DISCERN	0.336	0.004			0.554	<0.001	0.445	<0.001	0.137	0.262	0.194	0.11	0.451	<0.001
Number of views	0.228	0.056	-0.01	0.931	0.23	0.057	0.144	0.238	0.144	0.238	0.209	0.085	0.275	0.02
Duration in min.	0.414	<0.001	0.037	0.757	0.380	0.001	0.208	0.087	0.506	<0.001	0.429	<0.001	0.404	<0.001
Number of comments	0.105	0.396	-0.153	0.213	0.098	0.43	0.055	0.661	0.131	0.291	0.146	0.239	0.158	0.197
Likes	0.233	0.051	-0.046	0.702	0.267	0.027	0.201	0.098	0.245	0.043	0.271	0.025	0.316	0.007
Dislikes	0.166	0.166	-0.107	0.376	0.057	0.644	-0.026	0.835	0.124	0.311	0.175	0.15	0.149	0.216
Video Power Index (VPI)	0.099	0.41	0.066	0.584	0.308	0.01	0.242	0.045	0.116	0.342	0.057	0.642	0.21	0.079
Interaction Index	0.121	0.317	0.032	0.793	0.264	0.028	0.263	0.029	0.164	0.179	0.232	0.055	0.246	0.039
Viewing Rate	0.229	0.055	-0.113	0.346	0.176	0.149	0.11	0.368	0.243	0.045	0.276	0.022	0.269	0.023
VIQI content assessment														
Flow of information	0.699	<0.001	0.554	<0.001			0.737	<0.001	0.452	<0.001	0.482	<0.001	0.876	<0.001
Information accuracy	0.466	<0.001	0.445	<0.001	0.737	<0.001			0.285	0.018	0.439	<0.001	0.798	<0.001
Quality	0.691	<0.001	0.137	0.262	0.452	<0.001	0.285	0.018			0.450	<0.001	0.616	<0.001
Precision	0.344	0.004	0.194	0.11	0.482	<0.001	0.439	<0.001	0.450	<0.001			0.774	<0.001
Total VIQI score	0.659	<0.001	0.451	<0.001	0.876	<0.001	0.798	<0.001	0.616	<0.001	0.774	<0.001		

**Table 5** Correlation of Descriptive Characteristics of the Evaluated Videos with Total Content Score, VIQI Assessment and DISCERN Scores

### Correlation analysis

The correlation of descriptive characteristics of the evaluated videos with total content score, VIQI assessment and DISCERN scores was examined (Table 5). A moderate correlation was found between the total content score and DISCERN score (rho:0.336, p:0.004), the total content score and video duration (rho:0.414, p<0.001), the total content score and information accuracy (rho:0.466, p<0.001), and the total content score and precision (rho:0.344, p:0.004). A strong correlation was found between the total content score and flow of information (rho:0.699, p<0.001), the total content score and quality (rho:0.061, p<0.001), and the total content score and total VIQI score (rho:0.659, p<0.001). A moderate correlation was found between the DISCERN score and information accuracy (rho:0.045, p<0.001), whereas a strong correlation was found between the DISCERN score and flow of information (rho:0.554, p<0.001).

Viewing rate was positively correlated with total VIQI score (rho:0.269, p:0.023), whereas no correlation was found between viewing rate and other quality assessments (total content score and DISCERN). Similarly, interaction index was positively correlated with total VIQI score (rho:0.246, p:0.039), whereas no correlation was found between viewing rate and other quality assessments. However, no significant correlation was found between VPI and quality assessment methods (total content score, DISCERN and total VIQI score).

### Discussion

Maintenance of arch length during primary and mixed dentition after premature tooth loss is of great significance for the development of permanent occlusion (16). Premature exfoliation and extraction of primary tooth can aggravate the present malocclusion and increase the necessity of long-term orthodontic treatment, making it significant to intervene in the case of early tooth loss. Therefore, using space maintainers can prevent the effects of premature tooth loss and reduce the severity of negative results such as poor molar relationship, crowding, tooth impaction and ectopic eruption (17). Future orthodontic treatment needs can also be prevented with the application of a space maintainer. Thereby, in the case of proper indication, dentists are responsible for suggesting the space maintainer which is a less costly and more timesaving procedure than orthodontic treatment (12). However, since the dental fear in children is a major obstacle to success of dental treatment (18), parents have often taken concern about the treatment process. Learning more about the treatment procedure that their children need is fundamental for families to contribute positively to the process and to help predict the cooperation of their children. Many parents perform a search for a better knowledge about treatment of their children and use YouTube™ as a source, in which visual content is at the forefront, unlike the scientific programs accessible to professionals. The specific aim of this study was to

assess the quality of information provided in YouTube™ videos related to space maintainers with two different quality assessment methods.

It has been noted that 33% of people believe that health-related information sourced on the most popular websites is correct (19). Inherently, patients are progressively searching video-sharing web sites like YouTube™ for information about healthcare decisions (20). The variety of authorship and the deficiency of the peer-reviewed process on this platform have caused misleading and inaccurate information (21). Therefore, since the validity of the information on YouTube™ is argumentative, it has become important to analyze the effectiveness of YouTube™ videos on specific topics for the patients' treatments. The present study highlights the volume of information available regarding space maintainers on YouTube™, which can be easily accessed. Although, several studies have assessed YouTube™ video content for different medical aspects including oral health (1,4,6-9,22-25), this is the first study to determine the quality of YouTube™ contents related to 'space maintainer'.

In this study, the videos had almost 1 million views (975,637), with an average of 13,741 views per video. The overall median viewing rate was 101.3 (IQR:17.5-453.8) while, the median interaction index was 0.2 (IQR:0.0-0.9). These results showed that most users searching YouTube™ videos learn more about the space maintainer procedure instead of sharing their opinions and experiences.

Previous studies revealed there was a positive correlation between information content and duration of YouTube™ videos (7,9,14). Likewise, the present study demonstrated that high content videos have longer durations than low content videos ( $p = 0.023$ ). This result showed that users are mostly interested in longer videos with more information. Even though all descriptive video demographics showed a positive correlation with total content scores such as likes/dislikes, number of comments, VPI, interaction index and viewing rate, duration was the only parameter that significantly correlated with the total content scores ( $\rho:0.414$ ,  $p<0.001$ ). Considering that the median duration in high content videos was 6.15 min, it appears that the users might have lost interest in long videos despite their higher content.

YouTube™, on the positive side is adequate, free and is an effective way to receive and deliver information to the public. However, this site commonly has 'blind' authored videos that make it impossible for dental professionals or laypersons to confirm the veracity of the content (6). Every YouTube™ user is authorized to upload video clips regardless of their medical background, professionalism and qualifications. Several studies have stated that, videos uploaded by

laypersons mostly contain patients' experiences and this may result with misleading information more than other types of videos (6,24). In this study, the type of video and the source of upload did not affect the total content and quality of information of included videos. Even though the majority of videos were uploaded by healthcare professionals (39.4%), it was found that total video content evaluation was low (91.5%). In contrast to previous studies, this study found that healthcare professionals were responsible for inaccurate and misleading information in YouTube™ videos.

Except for a small number of studies (26,27), most previous studies have demonstrated that majority of uploaded videos had low content (1,9,28,29). Likewise, in this study the number of high content videos was very limited, which means YouTube™ may not provide sufficient and proper source of information about space maintainers. However, when the content of videos was analyzed by title, the distribution was variable. While the definition of space maintainer was explained in 80% of analyzed videos, most of the videos failed to demonstrate the 'follow ups' (8.7%). Following up of patients with space maintainers is essential to assess integrity of cementation and to evaluate of the abutment teeth for the presence of caries. The space maintainer should function until the permanent teeth have erupted. Nevertheless, new appliances or adjustment may be necessary according to continued development and changes in the dental arch.<sup>13</sup> While 'band/crown and loop' was the most frequently referred-to topic (64.1%), it was seen that 'removable space maintainer' was not represented in any video. Because the band/crown and loop has several advantages such as simple fabrication, bilateral use and being well-tolerated by patients, it is commonly used in space maintenance. In the case of poor oral hygiene of patients, the presence of multiple spaces in the arch and the need for an appliance which can also be used for active orthodontic treatment is required for the removable space maintainers. These appliances present choking and swallowing hazards for patients due to their small size. They are rarely applied and may be considered dangerous appliances.<sup>12</sup> Therefore, the lack of demonstration of the removable space maintainer in the reviewed video content is a drawback that reduces the quality of information and educational features of these videos. Additionally, in this study content topics regarding 'different types of space maintainer' and 'application procedure of space maintainer' were categorized within itself according to current AAPD guideline (13).

The purpose of this sub-classification was to evaluate the effectiveness of YouTube™ videos to guide parents' expectations and the impact of the child's collaboration more specifically. Many of the

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analyzed videos only addressed a few of the content titles, resulting in low content scores. It should be noted that it would be irrational to expect every uploaded video to address every aspect of the space maintainer procedure, so it might be considered that some videos, while they have low content, do contain accurate and precious information.

Previous studies used different scoring systems from this study to assess the quality of video contents such as JAMA (Journal of American Medical Association) (14), usefulness scoring (8) and GQS (Global Quality Score) (23,25). In GQS, videos are rated for their effectiveness as a quality assessment tool on a 5-point Likert scale. A total quality score is evaluated by obtaining all subheadings of quality content (quality, flow of the videos, information accuracy and usefulness) together (26). However, in the VIQI system the subheadings of quality content are evaluated separately and independently for 1 to 5 point, and then, total quality score is obtained. Therefore, in this study, VIQI score system was preferred instead of GQS. In addition to the VIQI score system, DISCERN was also used to analyze the quality and reliability of the video content. Despite DISCERN being originally developed for print resources, this criteria was chosen in the present study, because educational and high content videos require similar qualifications as print publications to be considered high quality resources (30). A modified 5-point DISCERN tool was used in this study, which was used in previous studies to assess the reliability of the videos (14).

The comparison of high and low content videos was demonstrated, there were significant differences according to quality assessment such as DISCERN ( $p = 0.026$ ) and VIQI ( $p < 0.001$ ). Evaluation of DISCERN and VIQI scores showed that high content videos were more reliable and higher quality than low content videos. The correlation between content scoring which is based on a current AAPD guideline and these two methods revealed that health-related online videos could provide more accurate information transfer when evaluated with the DISCERN and VIQI scoring scale.

In contrast to Aydın et al. (14), in this study there was no correlation between VPI and quality assessment methods. It may be concluded that there is no relationship between user interactions and the quality of videos. The parameters correlating with VPI were flow of information and information accuracy. In order to increase the interaction of shared videos on online platforms, users should provide accurate information in a straightforward and perceptible way.

DISCERN and total VIQI scores were significantly in positively correlated ( $\rho = 0.451$ ,  $p < 0.001$ ). While, flow of information ( $\rho = 0.554$ ,  $p < 0.001$ ) and information accuracy ( $\rho = 0.445$ ,  $p < 0.001$ ) were significantly correlated with DISCERN criteria, quality

and precision were not correlated with DISCERN. This study should be considered remarkable since it is the first study to compare the DISCERN and VIQI score systems and determine the positive correlation between these two methods.

The present study possesses several limitations. The results of this kind of study may vary depending on the selected keyword. In order to minimize this limitation, the most commonly used term 'space maintainer' among the keyword alternatives was determined by Google trends. Additionally, as YouTube™ is a dynamic platform where many videos are deleted and added, it is stated that the results of the study are extremely influenced by date and time (7). To overcome this handicap, first 225 videos with a 'sort by relevance' filter were added in the 'watch later' list which is a YouTube™ feature, and the data of descriptive statistics of the videos were noted on the same time interval. However, as presented in previous studies (1,6), the 'sort by relevance' filter shows the highly rated and most viewed video and it may not be the representation of the most complete or accurate information. The DISCERN criteria was not developed for video content and therefore the rigid nature of the scoring method may artificially lower scores of the study. Therefore, although the average score from two reviewers was evaluated and reviewers rated each video only once, the DISCERN criteria may allow to bias and error in rating. In the present study, examining only English-language videos limited the results by ignoring the popularity of this topic in developing countries where English is not the native language.

## Conclusion

YouTube™ is being accessed with increasing interest by patients and it has a wide diversity of health-related information. However, this study concluded the educational quality of videos related to 'space maintainer' was poor and incomplete. It is important for the dentist to explain to the patient which points on the online platforms may be potentially misleading and inaccurate content, because it is the responsibility of healthcare professionals to direct patients towards high quality and educational information sources. To contribute to the improvement of YouTube™ content quality in the long-term, clinicians and dental health care professionals should create a higher standard of content by providing sources for this platform to the best of their ability.

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## References

1. Cianetti S, Lombardo G, Lupatelli E, Rossi G, Abraha I, ElKarmi R, Hassona Y, Taimeh D, Scully C. YouTube as a source for parents' education on early childhood caries. *Int J Paediatr Dent* 2017;27:437-443.
2. Singh S, Banerjee A. Internet and doctor-patient relationship: Cross-sectional study of patients' perceptions and practices. *Indian J Public Health* 2019;63(3):215-219.
3. Harris CE, Chestnutt IG. The use of the Internet to access oral health-related information by patients attending dental hygiene clinics. *Int J Dent Hyg* 2005;3:70-73.
4. Hassona Y, Taimeh D, Marahleh A, Scully C. YouTube as a source of information on mouth (oral) cancer. *Oral Dis* 2016;22:202-208.
5. Malik TAM, Heywood EG, O'Connor TJ, Baker DM, Marshall JH, Beasley N. YouTube™ as a source of information for patients undergoing laryngectomy: a thematic analysis. *Eur Arch Oto-Rhino-Laryngology* 2019;1-7.
6. Nason K, Donnelly A, Duncan HF. YouTube as a patient-information source for root canal treatment. *Int Endod J* 2016;49:1194-1200. doi:10.1111/iej.12575
7. Özdal Zincir Ö, Bozkurt AP, Gaş S. Potential Patient Education of YouTube Videos Related to Wisdom Tooth Surgical Removal. *J Craniofac Surg* 2019;30:e481-e484. doi:10.1097/scs.0000000000005573
8. Abukaraky A, Hamdan AA, Ameera MN, Nasief M, Hassona Y. Quality of YouTube TM videos on dental implants. *Med Oral Patol Oral Cir Bucal* 2018; 23:e463-e468.
9. Lena Y, Dindaroglu F. Lingual orthodontic treatment: A YouTube video analysis. *Angle Orthod* 2018;88:208-214.
10. Desai T, Shariff A, Dhingra V, Minhas D, Eure M, Kats M. Is content really king? An objective analysis of the public's response to medical videos on YouTube. *PLoS One*. 2013. doi:10.1371/journal.pone.0082469
11. Fox S, Duggan M. Health Online 2013. Pew Research Center.; 2013.
12. Laing E, Ashley P, Naini FB, Gill DS. Space maintenance. *Int J Paediatr Dent* 2009; 8(12):e82469.
13. Management of the developing dentition and occlusion in pediatric dentistry. *Pediatr Dent* 2017;39:334-347.
14. Aydin MA, Akyol H. Quality of Information Available on YouTube Videos Pertaining to Thyroid Cancer. *J Cancer Educ* 2019. doi:10.1007/s13187-019-01502-9
15. Enewold L, Zhu K, Ron E, et al. Rising thyroid cancer incidence in the United States by demographic and tumor characteristics, 1980-2005. *Cancer Epidemiol Biomarkers Prev* 2009;18:784-791.
16. Pawar BA. Maintenance of space by innovative three-dimensional-printed band and loop space maintainer. *J Indian Soc Pedod Prev Dent* 2019;37(2):205.
17. Law CS. Management of premature primary tooth loss in the child patient. *J Calif Dent Assoc* 2013;41:612-618.
18. Lourenço-Matharu L, Papineni McIntosh A, Lo JW. Predicting children's behaviour during dental treatment under oral sedation. *Eur Arch Paediatr Dent* 2016;17:283-284.
19. Nason GJ, Tareen F, Quinn F. Hydrocele on the web: An evaluation of Internet-based information. *Scand J Urol* 2013;47:152-157.
20. Stollefson M, Chaney B, Ochipa K, et al. YouTube as a source of chronic obstructive pulmonary disease patient education: A social media content analysis. *Chron Respir Dis* 2014;11:61-71.
21. Nason GJ, Kelly P, Kelly ME, et al. YouTube as an educational tool regarding male urethral catheterization. *Scand J Urol* 2015;49:189-192.
22. Hutchison C.M.D., V. Cave, E.G. Walshaw, B. Burns CP. YouTube™ as a source for patient education about the management of avulsed teeth. *Dent Traumatol*. 2019. doi: 10.1111/edt.12517.
23. Hamdan AA, Shaqman M, Abu Karaky A, Hassona Y, Bouchard P. Medical reliability of a video-sharing website: The gingival recession model. *Eur J Dent Educ* 2019;23:175-183.
24. Delli K, Livas C, Vissink A, Spijkervet FKL. Is YouTube useful as a source of information for Sjögren's syndrome? *Oral Dis* 2016;22:196-201.
25. E. Pons-Fuster, J.R. Roca, A. Tvarijonaviciute PLL-J. YouTube information about diabetes and oral healthcare *Odontology*:1-7.
26. Wong K, Doong J, Trang T, Joo S, Chien AL. YouTube videos on botulinum toxin a for wrinkles: A useful resource for patient education. *Dermatologic Surg* 2017;43:1466-1473.
27. Gaş S, Zincir Ö, Bozkurt AP. Are YouTube Videos Useful for Patients Interested in Botulinum Toxin for Bruxism? *J Oral Maxillofac Surg* 2019;77:1776-1783.
28. Fortuna G, Schiavo JH, Aria M, Mignogna MD, Klasser GD. The usefulness of YouTube™ videos as a source of information on burning mouth syndrome. *J Oral Rehabil* 2019;46:657-665.
29. Hegarty E, Campbell C, Grammatopoulos E, DiBiase AT, Sherriff M, Cobourne MT. YouTube™ as an information resource for orthognathic surgery. *J Orthod* 2017;44:90-96.
30. Ward M, Ward B, Abraham M, et al. The Educational Quality of Neurosurgical Resources on YouTube. *World Neurosurg* 2019;130:e660-e665.