Original Article

Lingual orthodontic treatment: *A YouTube™ video analysis*

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ABSTRACT

Objectives: The aim of this study was to examine the quality of information offered for patients seeking information on lingual orthodontic treatment.

Materials and Methods: YouTube™ was searched for videos about lingual orthodontic treatment using the key word "lingual braces" from the Google Trends application. One hundred and four videos were selected to be analyzed from the first 120 results. The video content was evaluated using a 10-point score, which was used for classifying low- and high-content video groups. The video information and quality index (VIQI) was applied to determine the quality of the videos. The Mann-Whitney *U*-test, Chi-square test, and logistic regression analysis were used, and the Pearson correlation coefficient was calculated for statistical evaluations.

Results: We classified 32 videos as high-content and 72 as low-content. Most videos were uploaded by laypeople (58.7%, n = 61). Definition of lingual braces and psychological impact were the most commonly discussed topics (51.0%), followed by speech performance (47.1%), pain (44.2%), tongue soreness (37.5%), and biomechanics (14.4%). Compared to the low-content group, the high-content video group had a significantly higher mean number of views (19,867.41 vs 6720.08, $P = .002$) and more "likes" (135.88 vs 13.01, $P < .001$), "dislikes" (4.34 vs 0.81, $P < .001$), and "comments" (26.28 vs 5.31, $P = .002$). There was no difference in the total VIQI score between the groups ($P = .009$).

Conclusions: The content of YouTube™ videos for lingual orthodontics was generally incomplete. Most videos mentioned psychological effects, but few videos discussed the biomechanics or procedure. Orthodontists should be aware of the information available on YouTube™. (*Angle Orthod.* 2018;88:208–214.)

KEY WORDS: Social media; YouTube™; Lingual orthodontics

INTRODUCTION

Acceptable smile esthetics has a socio-psychological effect on individuals.[1] The recent increase of esthetic expectations in physical appearance leads individuals from every age group and socioeconomic status to desire orthodontic treatment. In addition, the visibility of orthodontic appliances during active treatment can lead to esthetic concerns. Therefore, ceramic brackets were developed as an alternative to metal brackets and, subsequently, lingual orthodontics, which has gained in popularity and is demanded by many patients.[2]

In addition to face-to-face patient-clinician and patient-patient interaction, the Internet is one of the most important information sources in the dental and medical fields.[3,4] More than 80% of Internet searches are related to medical affairs.[5] The Internet is also used by professionals and nonprofessionals to share information and experiences.[6] Social media, on the other hand, provides an interesting and useful platform for patients who want to know about dental and medical subjects. The reasons for increased interest in social media can be explained by its advantages, including the independence, quickness, ease, and universal access to information it offers.[7]

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Accepted: November 2017. Submitted: September 2017.
Published Online: December 21, 2017

Today, orthodontic patients are easily able to obtain information using social media throughout the duration of their treatment regarding subjects about which they are curious. However, this may have either a positive or a negative effect on their treatment process depending on the quality of information accessed. In this respect, YouTube™ is preferred, especially by orthodontic patients, because of the ability it offers to provide visual and audio information, compared with other social media platforms.[8] Since 2005, YouTube™ has become a phenomenon for commercial and personal content distribution as well as for social networking, and it is the third most-visited Web site after Google and Facebook.[9] The ease of uploading videos, constant improvement of Web site content to support online sharing, and quick access to content are the factors that facilitate the growth and appeal of the YouTube™ Web site.[10]

As the use of the YouTube™ Web site has become popular in dentistry and medicine, the quality of YouTube™ content has been assessed in a variety of studies. The results of these studies are important in terms of revealing the level of information that patients acquire about a particular subject. In this regard, clinicians should direct their patients to use social media properly during treatment. Consequently, it is possible to foresee that the number of these studies will continue to increase for different topics in different disciplines. Many individuals associate orthodontic treatment with social norms and modern beauty standards. For this reason, it is thought that social media reflects current cultural and social tendencies, affecting the demand for treatment and satisfaction. Assessment of social media content plays an important role in understanding the motivation factors, expectations, and experiences of orthodontic patients.[11] In the literature, there are a limited number of studies examining the relationship between social media and orthodontics. However, there are no studies investigating the information about lingual orthodontic treatment through social media. Therefore, the objective of this study was to examine the content and quality of YouTube™ videos on lingual orthodontics.

MATERIALS AND METHODS

The Google Trends application determines the most commonly used search terms by calculating the search frequency relative to the total search volume in various regions of the world. After a search for "lingual orthodontics" using this application, it was determined that the most commonly used terms were "lingual orthodontics," "lingual braces," "hidden braces," and "incognito braces." When the term "lingual braces" from these concepts was searched without the quotation mark, the Google Trends application determined it was the most commonly used search term for lingual orthodontics (Google Trends, 2017). The search parameters were restricted to the past 5 years and the "Incognito"/"Worldwide" settings to prevent restrictions based on user history and to expand search results.

A search was made using the keyword "lingual braces" in the online video streaming Web site YouTube™ (https://www.YouTube.com) using the "relevance level" on May 17, 2017, to evaluate the information on lingual orthodontics. The only search filter used was to "sort by relevance" as the default filter for a YouTube™ search. The search results in this study were limited to the first 120 videos. More than 90% of YouTube™ users clicked only the first three pages of search results to receive their intended information, and 79% of these users who could not find what they had searched for on the first page looked at other pages.[12] Commercial ads from YouTube™ were not considered or included in the analysis. As the search results may change on different days, the search result was saved by creating a playlist of the videos that were identified. The source locators (URLs) were backed up and saved.

All video content was reviewed by a second examiner to evaluate interrater reliability. Multipart videos were considered as a single video. Recurrent videos, non-English videos, silent videos, or videos that were longer than 15 minutes in length were not included in the study. YouTube™ videos were then assessed for the following content: (1) definition of lingual orthodontics, (2) procedure of lingual orthodontic treatment, (3) instructions on usage of lingual braces, (4) comparison of treatment modalities (labial, lingual, Invisalign), (5) biomechanics, and (6) quality of life: (a) pain, (b) oral hygiene, (c) tongue soreness, (d) speech performance, and (e) psychological and psychosocial impact. Each area of content was given a possible 1 point, for a total of 10 possible points, which was considered as the "total content score" of that video.

Video sources were categorized into five groups, as follows: "dentist/specialist," "hospital/university," "commercial" (defined as dental manufacturing company or dental supply company), "layperson," or "other." The video information and quality index (VIQI) was used to assess the overall quality of the video. The VIQI scale uses a 5-point Likert scale ranging from 1 (poor quality) to 5 (high quality) to evaluate the following video characteristics: flow of information, information accuracy, quality (one point each for use of still images, animation, interview with individuals in the community, video captions, and a report summary), and precision (level of coherence between video title and content).

Table 1. Reasons for Excluding Videos

Reason for Exclusion	No. of Videos
No audio	14
No video	1
Not in English	0
Not related to subject	1
Duplicate	0
Video length $>$ 15 min	1
Total exclusions	16

Video features such as time elapsed since upload date, video length, video popularity, audience, likes, dislikes, and comments were recorded. Viewers' interaction was calculated using the following interaction index and viewing rate formulas, respectively:[13]

$$\left(\frac{\text{number of likes} - \text{number of dislikes}}{\text{total number of views}} \times 100\%\right);$$

$$\left(\frac{\text{number of views}}{\text{number of days since upload}} \times 100\%\right).$$

This study did not require approval from the local research ethics committee as it contained only public data.

Statistical Analysis

All statistical evaluations were performed in the SPSS software program (version 22, SPSS Inc, Chicago, Ill). The Shapiro-Wilk test was used to determine whether the data were normally distributed. Pearson correlation coefficients were calculated to examine possible correlations of total content and VIQI scores with YouTube™ features. Videos scored as 5 points or more were considered high content, and those scored less than 5 points were considered low-content videos. For the YouTube™ variables included in the study, the Mann-Whitney *U*-test was performed to determine the differences between high-content and low-content videos. The Chi-square test was used to evaluate differences in ownership and target audience among these video groups. Effects of the variables on total content score were assessed using univariate analysis for all YouTube™ variables. Variables for which the unadjusted *P*-value was $\leq$.20 in logistic regression analysis were identified as potential risk parameters and were included in the full model. All of the variables were found to be statistically significant and were included in the model that was created for multiple linear regression analysis. Fifteen videos were randomly selected and reviewed by the same author 15 days later. Intraclass correlation coefficients (ICCs) were calculated to determine intrarater and interrater reliability. The statistical significance level was set at $P < .05$.

RESULTS

ICC values ranged between 0.931 and 0.973 for intrarater reliability and from 0.901 to 0.928 for interrater reliability. The initial search using the term "lingual braces" resulted in a total of 30,700 videos. Sixteen videos were excluded for a variety of reasons (Table 1). The descriptive statistics of the video demographics are presented in Table 2. The mean length of YouTube™ videos on lingual braces was 4.42 minutes. The mean total number of views was 10,765.41. The mean viewing rate was 2017.93. The overall mean number of "likes" was 50.82 (ranging from 0 to 1403), whereas the overall mean number of

Table 2. Descriptive Statistics of the YouTube™ Videos[a]

Variables	Minimum	Maximum	Mean	SD
Video characteristics				
No. of views	6.00	133,817.00	10,765.41	20,571.20
No. of likes	0.00	1403.00	50.82	188.90
No. of dislikes	0.00	26.00	1.89	4.43
No. of comments	0.00	209.00	11.77	29.50
Duration in minutes	0.21	14.42	4.42	3.68
Days since upload	13.00	2987.00	1262.79	829.40
Average view duration, s	0.19	20.40	1.56	2.55
Interaction index	0.00	5.11	0.31	0.59
Viewing rate	42,953.00	67,186.58	2017.93	7881.39
Total content score	0.00	9.00	3.63	2.01
Video information and quality index (VIQI) content assessment				
Flow	2.00	5.00	3.88	0.91
Information accuracy	1.00	5.00	4.42	0.78
Quality	0.00	4.00	0.94	1.20
Precision	2.00	5.00	3.84	0.98
Total score	7.00	18.00	13.01	2.65

[a] SD indicates standard deviation.

Table 3. Distribution of YouTube™ Video Demographics in High- and Low-Content Video Groups

Video Demographics	High-Content Videos (n = 32)	Low-Content Videos (n = 72)	Total n (%)
Ownership			
Dentist/specialist	3 (9.4)	18 (25.0)	21 (20.2)
Hospital/university	1 (3.1)	5 (6.9)	6 (5.8)
Commercial	2 (6.3)	9 (12.5)	11 (10.6)
Layperson	25 (78.1)	36 (50.0)	61 (58.7)
Other	0.00	3 (4.2)	3 (2.9)
Total	32 (100)	72 (100)	104 (100)
Target audience			
Layperson	30 (93.8)	68 (94.4)	98 (94.2)
Professional	0.00	2 (2.8)	2 (1.9)
Layperson/ professional	2 (6.3)	2 (2.8)	4 (3.8)
Content			
Definition	25 (78.1)	28 (38.9)	53 (51.0)
Procedure	19 (59.4)	18 (25.0)	37 (35.6)
Instructions	14 (43.8)	11 (15.3)	25 (24.0)
Comparison	13 (40.6)	16 (22.2)	29 (27.9)
Biomechanics	9 (28.1)	6 (8.3)	15 (14.4)
Pain	24 (75.0)	22 (30.6)	46 (44.2)
Oral hygiene	15 (46.9)	13 (18.1)	28 (26.9)
Tongue soreness	22 (68.8)	17 (23.6)	39 (37.5)
Speech performance	28 (87.5)	21 (29.2)	49 (47.1)
Psychological impact	22 (68.8)	31 (43.1)	53 (51.0)

"dislikes" was 1.89 (ranging from 0 to 26). The mean of days since upload was 1262.79 days (ranging from 13 to 2987 days). Other video demographics including ownership, target audience, and content are summarized in Table 3.

Most YouTube™ videos on lingual braces were uploaded by laypeople (58.7%, n = 61). The target audience of the vast majority of analyzed videos were laypeople (94.2%) rather than dental professionals (1.9%). Definition of lingual braces and psychological impact of lingual treatment were the most commonly covered topics (51.0%), followed by speech performance (47.1%), pain (44.2%), and tongue soreness (37.5%). The least-mentioned content was the biomechanics of lingual orthodontics (14.4%). Thirty-two (31.0%) and 72 (69.0%) videos were included in the high-content and low-content groups, respectively. Compared to the low-content group, the high-content video group had a higher mean number of views (19,867.41 vs 6720.08, $P = .002$), "likes" (135.88 vs 13.01, $P < .001$), "dislikes" (4.34 vs 0.81, $P < .001$), and "comments" (26.28 vs 5.31, $P = .002$). There was no difference in the total VIQI score between the groups ($P = .009$) (Table 4).

There was a moderate correlation between VIQI and total content score ($r = .442$, $P < .01$). The duration of the videos showed the highest correlation with total content score ($r = .651$, $P < .01$) (Table 5). All parameters were included in the multiple regression analysis. The four parameters—duration in minutes, VIQI score, number of dislikes, and number of comments—had a significant effect on the total content score ($P < .05$). Accordingly, there was a positive relationship between total content score and the variables of duration in minutes, VIQI, and number of dislikes, but a negative relationship with the number of comments. These four parameters explained 66% of the change in total score (Table 6).

DISCUSSION

Many patients perform a search to be better informed about their orthodontic treatment and use YouTube™ as a source, in which visual content is at the forefront, in contrast to the scientific platforms accessible to professionals. However, the validity of

Table 4. Comparison of Variables Between High- and Low-Content Videos[a]

Variables	High-Content Videos (n = 32)				Low-Content Videos (n = 72)				*P* Value
	Minimum	Maximum	Mean	SD	Minimum	Maximum	Mean	SD	
Video characteristics									
No. of views	6.00	100,108.00	19,867.41	24,981.61	36.00	133,817.00	6720.08	16,955.24	.002
No. of likes	0.00	1403.00	135.88	324.98	0.00	217.00	13,014.00	30.72	<.001
No. of dislikes	0.00	26.00	4.34	6.58	0.00	17.00	0.81	2.37	<.001
No. of comments	0.00	209.00	26.28	48.60	0.00	46.00	5.32	9.71	.002
Duration in minutes	6.42	1.48	7.47	4.10	0.21	12.11	3.07	2.50	<.001
Days since upload	33.00	2669.00	1070.09	841.03	13.00	2987.00	1348.43	815.44	.097
Average view duration, s	0.56	6.40	2.10	1.43	0.19	20.40	1.31	2.99	.009
Interaction index	0.00	5.11	0.53	0.99	0.00	0.99	0.21	0.22	.109
Viewing rate	8.52	67,186.58	5506.51	13,628.34	6.08	5952.71	467.45	799.06	<.001
Video information and quality index (VIQI) content assessment	10.00	18.00	14.03	2.29	7.00	18.00	12.56	2.69	.009
Flow	2.00	5.00	4.19	0.90	2.00	5.00	3.75	0.89	.021
Information accuracy	4.00	5.00	4.72	0.46	1.00	5.00	4.29	0.86	.013
Quality	0.00	4.00	1.00	1.32	0.00	4.00	0.92	1.15	.939
Precision	2.00	5.00	4.16	0.95	2.00	5.00	3.69	0.96	.022

[a] SD indicates standard deviation.

Table 5. Correlation Matrix Displaying Pearson Correlation Coefficients Between Scores for Total Content Score, VIQI, and YouTube™ Demographics[a]

Variables	Total Content	VIQI	No. of Views	No. of Likes	No. of Dislikes	No. of Comments	Duration in Minutes	Days Since Upload	Average View Duration	Interaction Index	Viewing Rate
Total content	1	0.442**	0.331**	0.380**	0.493**	0.396**	0.651**	−0.167	0.209	0.308**	0.375**
VIQI	0.442**	1	0.265*	0.279*	0.239*	0.270*	0.116	0.032	0.191	0.191	0.081

[a] VIQI indicates video information and quality index.
* $P < .05$; ** $P < .01$.

the information on YouTube™ is questionable as a result of the ease of video sharing and the inability to standardize the content of the uploaded videos.[14] Therefore, this study aimed to evaluate the content and video quality of videos related to lingual orthodontics on YouTube™. According to content analysis, it is noteworthy that the number of videos with high content was very limited. This suggests that YouTube™ is inadequate as a source of information in the field of lingual orthodontic treatment.

All people ranging from specialists to laypeople can upload videos to YouTube™. However, there are no standards established by the system with regard to including medical topics. This may explain the low number of high-content videos uploaded regarding medical issues.[15] However, there was no difference in total VIQI score between the high- and low-content video groups. This might be the result of following the evolving technology by YouTube™ users. However, the flow, information accuracy, and precision criteria were scored higher in the high-content video group than in the low-content video group. Variables such as the flow of information, information accuracy, and the relevance of video title to the content scores were higher in the high-content video group.

As a result of the increasing use of the Internet and social media in the medical field by both professionals and laypeople, the need for studies investigating the content and importance of posts on various health-related topics is increasing. There are studies evaluating online information about different fields, such as chronic diseases, including epilepsy[16] and multiple sclerosis[17]; medical issues, such as the spread of epidemic diseases[18] or human papilloma virus[19]; as well as root canal treatment,[20] dental implants,[21] and dental anxiety,[22] all of which are related more closely to dentistry. The level of content of videos in the field of orthodontics on YouTube™ and posts on other social media tools have been assessed in previous studies.[3,8,23–25] Al-Silwadi et al.[8] investigated the importance of social media in increasing the knowledge level of patients receiving fixed orthodontic treatment and found that social media tools that convey audiovisual information, such as YouTube™, increased the knowledge level of orthodontic patients. In addition, Henzell et al.[24] concluded in their study of Twitter posts about orthodontics that patients stated their positive and negative feelings about their braces. In another Twitter analysis,[3] researchers assessed the "tweets" from patients receiving Invisalign or fixed orthodontic treatments and reported a significant number of positive posts for orthodontic treatment, but no significant differences between these two treatment methods. Knösel and Jung[23] conducted a study to measure the level of knowledge in orthodontic posts in YouTube™ and concluded that while YouTube™ is a platform where patient experiences are shared, the relevant videos were insufficient in terms of content. Since feedback from these shares/posts constitutes one of the external factors that determines the attitudes of patients toward orthodontic treatment, it can be anticipated that studies evaluating the level of content on social media will increase.

Although the total content scores show a positive correlation with parameters such as duration in minutes, likes, dislikes, and comments, it was found that the number of views, likes, dislikes, comments, and viewing rate were higher in the high-content video group than in the low-content video group. This can be thought of as a reaction of viewers to the variables providing high content. In addition, the significant difference between video durations suggests that a particular time should be targeted for the video when content is being advanced. The mean video duration in

Table 6. The Results of Multiple Regression Analysis[a]

	B	SE	β	*t*	*P* Value	r^2
Duration in minutes	0.301	0.047	0.570	6.398	<.001	.659
VIQI	0.294	0.059	0.379	4.999	<.001	
No. of dislikes	0.158	0.044	0.367	3.601	.001	
No. of comments	−0.015	0.006	−0.247	−2.331	.023	

[a] B indicates unstandardized regression coefficient; SE, standard error; β, standardized regression coefficient; r^2, coefficient of determination; and VIQI, video information and quality index.

the high-content video group was 7.47 minutes. Because it seems that the viewers lost interest in long videos despite increased video content, it is important that the subjects in new video content are presented to viewers in acceptable time durations.

Videos of laypeople serve a social purpose by allowing people to share their experiences, but videos produced by healthcare institutions usually have more educational content.[26] Laypeople and professionals uploaded 58.7% and 20.2% of the videos in the present study, respectively. There were no videos mentioning all of the contents in the research content as a whole. Many of the uploaded videos contained only one of the specified topics, leading to an increase in the number of low-content videos. When the video content was analyzed, the biomechanical aspect of lingual orthodontic treatment was the least covered subject. It is thought that this is because laypeople share more videos than do professionals and because 98% of the target population are nonprofessional individuals. This may be because this subject has not attracted as much attention from patients as have other subjects. The most mentioned topics in videos were the discomfort in speech performance and tongue soreness. However, an average of 3 years has passed since the videos were uploaded, so it should not be ignored that changes in lingual orthodontic treatment along with developing technology may affect the video contents.

YouTube™ content is dynamic, and, therefore, search inquiry results continuously change because interests and video watch times perpetually shift over time. The use of a prolonged study period, however, can often generate an overwhelmingly large volume of social media data, which becomes unmanageable and difficult to analyze. On the other hand, it should be noted that the above-mentioned YouTube variables, such as viewing rate, likes, and dislikes, could be manipulated. Although the key word was selected using the Google Trends application to determine the single most frequently used term about lingual orthodontics, it should be kept in mind that different videos may be accessed by using different key words.

CONCLUSIONS

- A wide variety of information about lingual orthodontics is available on YouTube™. Orthodontic patients posted the greatest proportion of videos. The content of YouTube™ videos for lingual orthodontic treatment was generally incomplete.
- The majority of videos mention psychological effects, but few videos discuss biomechanics and procedure. Therefore, patients searching YouTube™ for information about lingual braces might have difficulties in finding high-content videos.
- Orthodontists should be aware of the information available on the Internet and guide patients to receive appropriate and professional resources to obtain accurate and up-to-date information in order to minimize the amount of false or incomplete information received by their patients.

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