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ABSTRACT

Title of Thesis: The quality of information on oral hygiene instructions for orthodontic patients in TikTok videos

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Objective: The study aimed to assess the reliability, content, quality, and overall usefulness of orthodontic oral hygiene instructions in TikTok videos.

Methods: The final videos were evaluated for content, reliability, quality, and usefulness by using a content domain checklist, DISCERN questionnaire, and Global Quality Scale (GQS). Descriptive video characteristics were also recorded.

Results: Dental professionals uploaded 70.00% of the TikTok videos, with orthodontists responsible for 39%. The videos had average scores of 2.19 for DISCERN, 3.96 for content, 2.14 for GQS, and 6.10 for usefulness. Video length was significantly associated with content scores ($r = 0.3553$, $P = 0.0003$), usefulness ($r=0.3553$, $P = 0.0003$), and quality (GQS) ($r=0.2620$, $P=0.0085$).

Conclusion: Most TikTok videos on orthodontic oral hygiene were uploaded by dental professionals. Reliability, content, and quality of the videos were all poor. Videos were considered slightly useful. Longer videos were significantly correlated with higher content, higher quality, and increased usefulness.

The quality of information on oral hygiene instructions for orthodontic patients in TikTok videos

by
Sabrina Dorfmann

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I Introduction

I.1 Literature review

Expanding internet access and use of social media has dramatically increased the availability of healthcare information to the public. With just a few clicks, individuals can access unlimited medical information in response to any question. In fact, in the past decade the percentage of Americans who use the internet to supplement their healthcare knowledge has risen from 50% to 80%.[1,2]

One of the key advantages of social media is its ability to disseminate information in various formats, such as blogs, tweets, Instagram/Facebook posts, reels, and YouTube videos.[3] This not only allows for the sharing of information beyond text but also provides increased accessibility to healthcare information for individuals with special needs and low literacy.[4] This increased access empowers patients to take a more active role in managing their health, leading to better health outcomes and a greater sense of self-efficacy.[5]

TikTok (ByteDance, Beijing, China) is a widely popular social media platform that allows users to create and share short videos .[6,7] It is available in over 150 countries, and has over 1 billion monthly active users worldwide.[8] In the US alone, it has been downloaded over 210 million times.[8] TikTok videos were originally only a maximum of 3 minutes in length, however in February 2022 this was changed to allow the upload of videos of up to 10 minutes.[7] TikTok's editing tools allow users to be creative with their videos and make their content more engaging. This can be a great way to present information in a fun and interactive way.

TikTok is primarily designed for entertainment purposes but during the COVID-19 pandemic, it also became popular as a means of disseminating both scientific information

and disinformation.[9] This highlights the crucial role of social media in making science and medicine accessible, accurate, and engaging to a wide audience.[9] With this understanding, social media is slowly being re-purposed as a platform for learning. In fact, social media users are more likely to say they learned practical life skills from social media than from higher education and, one of the most common hashtags of 2021 was "#learnontiktok."[8]

TikTok offers several benefits for scientific education purposes – the first of which being TikTok's short video format. This allows for content to be presented in a concise and engaging manner, making it easier for viewers to process and retain information.[10] This can be beneficial for students who have shorter attention spans or who prefer to learn through visual aids, and is particularly important for medical education where complex information needs to be effectively communicated.[10]

Like other social media platforms, TikTok fosters a sense of community by encouraging user interactions through commenting and posting response videos and allowing for fluid discussions among users.[10] Its ability to link videos with an identification hashtag allows for short educational videos to be presented in succession, with more detailed information compared to a tweet and more engagement than a YouTube video.[10] This creates an engaging and dynamic community that is constantly evolving and growing. With over 1 billion users, information presented through TikTok also has the potential to reach a wide audience, making it even more effective for education purposes, especially for public health.[10]

According to statistics, over 60% of all TikTok users are between 10 and 29 years of age, which also corresponds to the age demographic of most orthodontic patients.[3,6,7] In 2022, TikTok users had spent an average of 48% more time on the platform compared with

the previous year.[8] Given the large percentage of adolescent users and the amount of time users are interacting on TikTok, it presents a unique opportunity for the spread of public health information pertaining to this age group.[10] This includes information on safe sex practices, substance abuse, and mental health issues, which are crucial to address in this age group and can be delivered through engaging and interactive content on the platform.[10] Adolescents are also more likely to ask their peers for information about orthodontic treatment rather than their orthodontist and the easiest way for them to do so is through social media.[3,11] A study by El Tantawi et al. found that most Saudi Arabian adolescents preferred to receive oral health information through social media.[12] The study also found that teenagers with access to cell phones were more likely to use social media and the more they used social media, the more they preferred to receive oral hygiene information via social media.[12] Adolescents are a highly influenceable and vulnerable group, and as such, social media platforms are an important "opinion-making" resource for this group.[11,13] In fact, teenagers and young adults make up the most of users that follow influencers on social media, which means they are also more likely to believe what influencers tell them.[8] A study by Knösel et al. also found that adolescents rated orthodontic videos more credible than adults.[13]

Social media also reflects current cultural and social trends and understanding its role in orthodontics can provide insight into the motivations, expectations, and experiences of patients.[6,7] Examining content available on diverse social media platforms can offer a more complete understanding of patients' perspectives on the psychosocial impact of their malocclusion and orthodontic treatment, including aspects of treatment that are important to them but that the provider may not necessarily be aware of.[7]

Oral health is one of the most unmet healthcare needs among adolescents, who are associated with a high sugar and acid diet, orthodontic treatments, smoking, and oral piercings.[3] As such, given its demographics and large user base, TikTok has the potential to spread orthodontic information to a vast global audience for whom the information is particularly relevant.[7]

The importance of information delivery in orthodontics has been emphasized by several studies since it has a significant impact on patient cooperation and treatment outcomes. Brattstrom et al. found that a lack of information and insufficient communication between the orthodontist and patient were among the reasons for early termination of treatment.[11,12] Moreover, patient knowledge, compliance and cooperation are increasingly being recognized as fundamental aspects to achieving good orthodontic treatment results.[13,14] As communication and interaction between orthodontist and patient improves, patient cooperation and compliance increase as well.[14]

Building on the importance of information and communication in orthodontics, a study conducted by Al-Silwadi et al. found that presenting information through YouTube significantly improved patients' knowledge regarding appropriate care of their teeth and orthodontic appliances during treatment.[6,7,13] In fact, patients who watched a YouTube video, accessible only through a link provided to them by the study, on proper care of their teeth and appliances during treatment, demonstrated a 6% increase in knowledge when compared to the control group.[13] This highlights the potential of digital media as a tool for enhancing patient education and increasing their cooperation and compliance in orthodontic treatment.

For many patients, orthodontic treatment is a way of achieving the smile they've always desired. The final esthetic results, however, can be undermined by the presence of white spot lesions, leading to patient unsatisfaction. Like caries and periodontal disease, such areas of demineralized enamel occur as a byproduct of prolonged plaque accumulation and poor oral care. These spots are one of the most common sequelae to orthodontic treatment and one of the most emphasized to patients.[14] Studies have shown that decalcification of the enamel can occur in only as little as four weeks, which coincidentally is the typical time between orthodontic visits.[14–16] As such, it is important that patients are reminded at every visit to maintain good oral hygiene habits during treatment. Typically, oral hygiene instructions are delivered verbally or in written form, however traditional methods may not be as effective as visual content with the younger demographics, and with the ease of access the internet offers, patients are turning to online sources for information.

The downside of social media and the internet is that information is constantly evolving without any sort of control mechanism, which can lead to inaccuracies being passed off as truths.[6,7,10] This carries an added risk for health information as it can expose patients to unscientific and untested therapies and medications, which can be harmful if acted upon.[3,5,6] Patients are exposed to advertisement- or experience-driven information rather than evidence-based.[11,13] In fact, A study by Knösel et al. found that 58% of videos related to orthodontics in general were posted by patients, whereas only 14% were posted by orthodontists.[11,13]As information has become increasingly personalized through social media, information accuracy and quality has also become compromised. Any inaccurate health-related statement can be detrimental to patients' health.[1]

Unregulated health information on social media poses challenges for both patients and healthcare providers. Patients must be able to differentiate between credible and non-credible sources, while healthcare providers are expected to respond to and discredit false information to protect the public.[5] Social media also has other limitations such as undisclosed biases, and the need to sift through significant amounts of irrelevant and/or false information.[10] Therefore, it's important to be critical and verify the information found on social media before making any decisions regarding health.[7]

For medical information, there are websites and mobile apps that patients can use to help them evaluate online information, however as Drozd et al. has found, there is no readily available tool to evaluate medical reliability specific to YouTube, and similarly to TikTok videos.[17] In their literature review, they also found that no two studies had the same method of analyzing videos, making it harder to come up with a standardized method of evaluation.[17] This need for an evaluation method is illustrated by an increasing number of articles being published on the quality and accuracy of healthcare-related videos on YouTube and TikTok.[5,18–20] Specific to the dental field, studies have been released on orthodontics, endodontic therapy, oral medicine pathologies, and even oral surgery procedures.[2,18,21–26]

A recent study by Kılınç has found that while both YouTube and TikTok videos were unreliable in terms of orthodontic information presented, YouTube videos had higher quality and were more reliable compared to TikTok videos.[27] Considering how popular the TikTok platform is with younger demographics and how easily teenagers can be influenced, it is important that clinicians be aware of what misinformation is present and be able to direct patients to more reliable sources.[5] In fact, Graf et al. also noted that when

social media users sought orthodontic information, they reached out to their peers rather than asking orthodontists.[11] As such, videos that have higher number of views or likes are more likely to attract other users, and therefore it is even more important that those videos with higher engagement rates have higher content scores and greater reliability.

In a 2021 study by Fraticelli et al., content related to oral health education in TikTok videos were characterized.[3] The authors found that most of the content was created by health professionals and that it was mostly focused on promoting oral hygiene practices, such as brushing and flossing, and providing information about common oral health issues like cavities and gingivitis.[3] However, they suggested that that while TikTok can be a valuable tool for promoting health education, it does not provide enough information to help viewers achieve an adequate level of oral hygiene.[3] The authors also noted difficulty in assessing whether information came from reliable sources.[3] In fact, they found inaccurate or misleading information in 11.6% of videos assessed.[3]

The quality, reliability, and content of oral hygiene instructions for orthodontic patients were evaluated recently in YouTube videos.[28] The authors determined most of them to be of poor content, poor reliability and of medium quality.[28]

As of now, there have only been two articles published evaluating orthodontic content, reliability, and quality of TikTok videos – one on orthodontic clear aligners and another on orthodontic retention.[7,26] Both studies determined that overall, the content, reliability, and quality of TikTok videos on clear aligners and orthodontic retention were poor.[7,36]

Evaluating oral hygiene instructions in TikTok videos aimed at orthodontic patients is crucial for the success of orthodontic treatment. Proper oral hygiene is an essential

component of orthodontic treatment and plays an important role in maintaining healthy teeth and completing treatment in a timely manner.[29,30] Given the widespread popularity of TikTok, especially among younger age groups, it is important to evaluate the accuracy of the information shared on the platform, as it can have a direct impact on the oral health of orthodontic patients and sway treatment outcomes. To this date and to our knowledge, there has not been any research into the information presented by TikTok on oral hygiene instructions specific to patients undergoing orthodontic treatment.

I.2 Study aims

The aim of the study was to assess the reliability, content, and quality of information presented by TikTok videos, specific to oral hygiene instructions for orthodontic patients. Specifically, the aim was to assess the overall usefulness of orthodontic oral hygiene information offered by these videos. The study also explored any correlations between video characteristics, reliability, quality, content, and usefulness of the information. In addition, the study also evaluated whether there was an association between source of information, promotional status, and the other previously mentioned variables.

II Materials and methods

The study was designed as an observational retrospective study evaluating publicly available content of TikTok videos. No IRB approval was needed for this study.

An account on TikTok (version 27.3.0) was created and accessed both by computer and mobile app. Video discovery was completed November 17th, 2022, on the computer to allow for private browsing mode and the elimination of cookies and previous browser

histories. The search term "*brushing braces*" and four additional ones ("*braces brushing routine*" "*braces brushing tips*" "*braces brushing hacks*" "*proper hygiene for braces*") were placed in TikTok's search function. The additional terms were suggestions made by TikTok based on the original search term. Search results were limited to the first fifty videos per search term, sorted by relevance, based on similar studies.[7,26] URLs of each individual video were recorded on an excel spreadsheet.

Exclusion criteria included any videos not related to orthodontic treatment, duplicates, and non-English language. In terms of inclusion criteria, videos need to be intended for orthodontic patients by either having an orthodontist as the uploader or depicted in the video, showing braces, or mentioning braces verbally or written in the caption. Oral hygiene instructions are defined as educational and/or instructional content discussing methods and importance of proper oral hygiene care. The final selection of videos was completed by two separate reviewers, both knowledge in the field of dentistry. Any discrepancy between the reviewers was resolved by a third party, also knowledgeable in the field of dentistry.

After all parties watched the videos, 100 videos met the inclusion criteria, representing 40.8% of the initial search results (*Figure 1*).

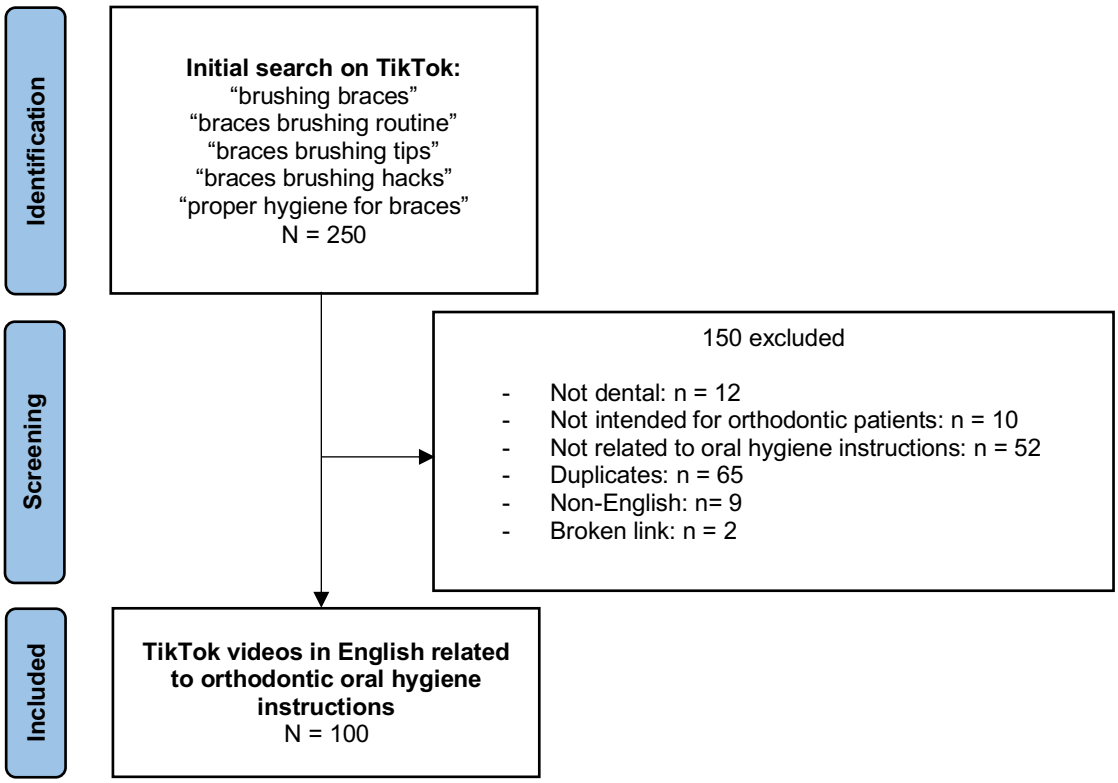

Figure 1 *Flowchart illustrating TikTok video selection.*

The following characteristics were then collected for each video over the span of three days, November 22nd to 24th, 2022.

1. Publication date & time since upload (days)
2. Hashtags
3. Video duration (seconds)
4. Number of views
5. Number of likes
6. Number of saves,
7. Number of shares
8. Number of comments
9. Information source:
    a. Dental professional
    b. Layperson

Dental professionals were subcategorized into orthodontists, dental hygienists, general dentists, other dental specialists, dental students, and dental assistants. Characteristics were collected only by the principal investigator as certain values, such as number of views, change constantly due to the dynamic nature of social media. Viewing rates for each video were calculated by dividing the number of views by the number of days.

$$Viewing\ rate\ = \frac{\#\ of\ views}{\#\ of\ days}\ \cdot\ 100\%$$

Modified per-post engagement rates were also calculated by adding the number of likes, comments, and shares, and dividing that by the number of views.[31]

$$Engagement\ rate\ = \frac{(\#\ of\ likes\ ) + (\#\ of\ comments) + (\#\ of\ shares)}{\#\ of\ views}\ \cdot\ 100\%$$

Videos were analyzed separately by both investigators for the presence of content domains using a twelve-item evidence-based checklist that was created based on oral hygiene recommendations by the American Dental Association and the American Association of Orthodontists (*Table 1*). The use of a content domain checklist is not exclusive to this study and has been widely used in research to evaluate video content.[2,5,7,17,18,20,23,24,26,28,32,33] Each domain was given a score of zero if information was lacking, plus one (+1) if information was introduced briefly, plus two (+2) if information was mentioned in detail and/or was accompanied by a practical demonstration, minus one (-1) if any of the information was inaccurate or misleading. If a video scored below eight points, it was deemed "poor content", nine to sixteen points was "moderate content", and any video with seventeen points or above was considered "rich content." The highest

possible score that could be awarded to a video was twenty-four, assuming it received maximum points for each content domain.

Table 1 *Twelve-item evidence-based checklist used to assess TikTok videos for content domains and information accuracy.*

CATEGORY	DESCRIPTION	SCORE
Tooth brushing		
Brushing duration	2 minutes	
Brushing frequency	At least 2x day, ideally after every meal or snack	
Brushing technique	Bristles at a 45-degree angle to the gingival margin and emphasis on removing plaque from around the brackets and wires. Maximum points if accompanied by practical demonstration.	
	Is video accompanied by practical demonstration?	Y/N
	Is demonstration on a dental study model/patient/oneself?	D/P/O
Rinsing	Spit out after brushing and do not rinse to maintain fluoride concentration levels, unless rinsing with a fluoridated mouth rinse	
Brushing time	Brush last thing at night and at least one other occasion	
Toothbrush size & hardness	Small toothbrush head of soft texture that can reach all areas of the mouth	
Fluoride recommendations		
Fluoride content	Fluoride toothpaste recommended without whitening; use pea-size amount of fluoridated toothpaste (1,350-1,500 ppm fluoride)	
Interdental cleaning methods		
Interdental cleaning	Multiple methods of flossing shown, such as floss threader, pre-threaded floss, water irrigators, etc. Maximum points if accompanied by practical demonstration.	
	Is video accompanied by practical demonstration?	Y/N
	Is demonstration on a dental study model/patient/oneself?	D/P/O

Table 1 *Continued*

Nutritional advice		
Foods/Drinks to avoid	Eat a balanced diet that limits sugary beverages and snacks. Avoid foods that are hard, sticky, crunchy, etc.	
Office visits		
Regular professional cleanings	See a dentist regularly (every 6 months) for prevention and treatment of oral disease	
Orthodontic visit frequency	Emphasis on seeing the orthodontist for regular check-ups and adjustments	
Other		
Other useful tools mentioned	Interproximal brush, fluoride mouth rinse (OTC/Rx), power brush, tongue scraper, etc. Maximum points if accompanied by practical demonstration.	
	Is video accompanied by practical demonstration?	Y/N
	Is demonstration on a dental study model/patient/oneself?	D/P/O
	Total	
Additional notes: What misinformation/questionable information present?		

Information reliability was assessed using a modified DISCERN questionnaire (*Table 2*).[6,7,26] DISCERN is a UK-based website that provides patients with a questionnaire to help guide them through critically evaluating online medical resources in question.[34] The modified DISCERN questionnaire has been used extensively for evaluating the reliability of medical and dental information in video format, such as in YouTube videos and more recently in TikTok videos.[3,6,7,26,35] It consists of five "yes/no" questions with one point given for "yes", and zero points for no". The maximum score of five is equivalent to excellent reliability and a score of zero to very poor reliability.[26] A score of three is considered moderate reliability.[26]

Table 2 *Modified DISCERN questionnaire used to assess information reliability. One point was given to any question answered 'yes', zero points for 'no.'*

INFORMATION RELIABILITY QUESTIONNAIRE (Modified DISCERN questionnaire)		SCORE
1.	Are the aims clear and achieved?	
2.	Are reliable sources of information used? (i.e., publication cited, speaker is an orthodontist, etc.)	
3.	Is the information presented balanced & unbiased?	
4.	Are additional sources of information listed for patient reference?	
5.	Are areas of uncertainty mentioned?	
	TOTAL	

Video educational quality was determined based on the scoring system set by a modified Global Quality Scale (GQS) (*Table 3*).[7,26] The GQS consists of a five-point Likert scale that evaluates the quality of information, the flow, and the ease of use of information available online.[19]

Videos were categorized as good or excellent quality if they received a score of four or five respectively. A score of three was equivalent to moderate quality, whereas a score of two or one was considered poor quality.[7]

Table 3 *Modified Global Quality Scale (GQS) used to assess video educational quality.*

Score	**Global Quality Scale (GQS) Definitions**
1	Poor quality, most information missing, not at all useful for patients
2	Generally poor quality, some information listed but many important topics missing, of very limited use to patients
3	Moderate quality, some important information is adequately discussed, somewhat useful for patients
4	Good quality, most of the relevant information is listed, but some topics not covered, useful for patients
5	Excellent quality, all topics covered, very useful for patients

Li et al. combined quality (GQS) and content scores to establish the total usefulness of a video.[19] Videos with fewer than zero points were “not useful”; one to nine points were “slightly useful”, ten to nineteen points “moderately useful”, and twenty to twenty-nine points “very useful.”

II.1 Statistical analysis

The study explored video characteristics collected and their correlation to the reliability, quality, and content of the information on oral hygiene instructions in TikTok videos aimed at orthodontic patients. Descriptive statistics were calculated and presented in both tabular and text formats. A random number generator was used to randomly select twenty videos for reassessment of content domains, reliability (DISCERN), and quality (GQS) scores two weeks after the initial evaluation. Inter- and intra-rater reliability for video content, reliability (DISCERN), quality (GQS), and usefulness was calculated for both raters using Kappa statistics. If values differed more than 3 points for content/accuracy, 2 points for DISCERN, 1 point for GQS, raters discussed discrepancy. Once inter- and intra-rater reliability was found to be agreeable, only one data set was used for additional comparisons and correlations. The video characteristics, reliability, content score, GQS, usefulness, information source, and promotional status were compared using the Mann–Whitney U test. The video characteristics, reliability, content score, GQS, and usefulness among dental provider subtypes were explored using the Kruskal-Wallis Test. The associations between content, reliability, quality, usefulness, and selected characteristics were explored by Spearman correlation coefficient testing. All analyses were conducted using SAS version 9.4 (SAS Institute Inc). $P < 0.05$ indicated statistical significance.

III Results

In this study, a total of 100 videos from 79 unique accounts were selected after meeting the predetermined inclusion and exclusion criteria (*Figure 1*). The exclusion criteria involved the elimination of non-dental videos (n=12), videos not intended for orthodontic patients (n=10), and videos that did not provide oral hygiene instructions (n=52). Moreover, 65 duplicate videos were excluded from the study, and nine videos were eliminated due to their non-English language. During the data collection period, two videos were taken down from the platform, resulting in their exclusion from the study (*Figure 1*). Inter-rater kappa analysis shows substantial agreement between raters for reliability (DISCERN) scores (0.74), perfect agreement for both categorized content and quality (GQS) (1.00), and moderate agreement for categorized usefulness (0.43). Intra-rater analysis for the first rater showed perfect agreement (1.00) for all scores: reliability (DISCERN), content, quality (GQS), and usefulness, whereas for the second rater the kappa analysis showed near perfect agreement for reliability (DISCERN) (0.90) and usefulness (0.88), and perfect agreement for GQS and content (1.00 both).

III.1 Overall video characteristics

The overall descriptive statistics for the video characteristics, reliability (DISCERN), content, quality (GQS), and usefulness scores are summarized in Table 4. The average DISCERN score was only 2.19 out of a maximum of five points. The average content score was 3.96 out of a maximum of 24. The quality (GQS) score had an average of 2.14 out of a maximum of five points. Over half of the videos (68.00%) scored either a 1 or 2 on the GQS. Lastly, the usefulness score, which combines both content and quality, had an average score of 6.10 out of 29 (*Table 4*).

Table 4 *Descriptive statistics of video characteristics, content score, DISCERN score, GQS, and usefulness.*

	Minimum	Maximum	Mean (SD)	95% CI of mean	Median (25-75% IQR)
Video characteristics					
Length (seconds)	6.00	179.00	36.06 (33.72)	29.37-42.75	27.00 (15.00-43.50)
No. of likes	20.00	1,900,000.00	74,044.41 (232,812.70)	27,849.33-120,239.50	4,053.00 (434.50-24,900.00)
No. of comments	0.00	29,900.00	729.77 (3,311.56)	72.69-1,386.85	51.50 (9.00-213.50)
No. of saves	0.00	99,400.00	4,574.60 (12,885.06)	2,017.92-7,131.28	462.50 (39.50-2811.50)
No. of shares	0.00	75,400.00	1,395.11 (7,645.64)	-121.95-2,912.17	49.50 (7.00-363.50)
No. of views	611.00	15,200,000.00	641,032.30 (1,815,382.00)	280,821.10-1,001,243.00	88,500.00 (14,250.00-344,950.00)
Time since upload (days)	10.00	1,482.00	427.19 (290.34)	369.58-484.80	435.50 (195.50-606.00)
Viewing rate	1.59	51,000.00	2,208.01 (7,450.47)	729.68-3,686.35	274.96 (48.14-1305.65)
Engagement rate	0.69	26.66	6.86 (5.18)	5.83-7.88	6.01 (3.26-8.35)
DISCERN	1.00	3.00	2.19 (0.90)	2.01-2.37	3.00 (1.00-3.00)
Content score	0.00	10.00	3.96 (2.15)	3.53-4.39	4.00 (2.00-6.00)
GQS	1.00	4.00	2.14 (0.83)	1.98-2.30	2.00 (2.00-3.00)
Usefulness	1.00	14.00	6.10 (2.72)	5.56-6.64	6.00 (4.00-8.00)

SD: standard deviation; CI: confidence interval; IQR: interquartile range; No: number; sec: seconds; GQS: global quality score.

III.2 Video uploaders

Out of the total videos examined, 70% were uploaded by dental professionals (n=70), while the remaining 30% were posted by laypersons (n=30). As shown by Figure 2, among the dental professionals, orthodontists accounted for most videos (n=39, 55.71%), followed by dental hygienists (n=12, 17.14%), and general dentists (n=11, 15.71%). Of the remaining videos, a pediatric dentist and a periodontist were responsible

for 3 (4.28%), dental students for another 3 (4.28%), and dental assistants for the final 2 (2.86%) (*Figure 2*).

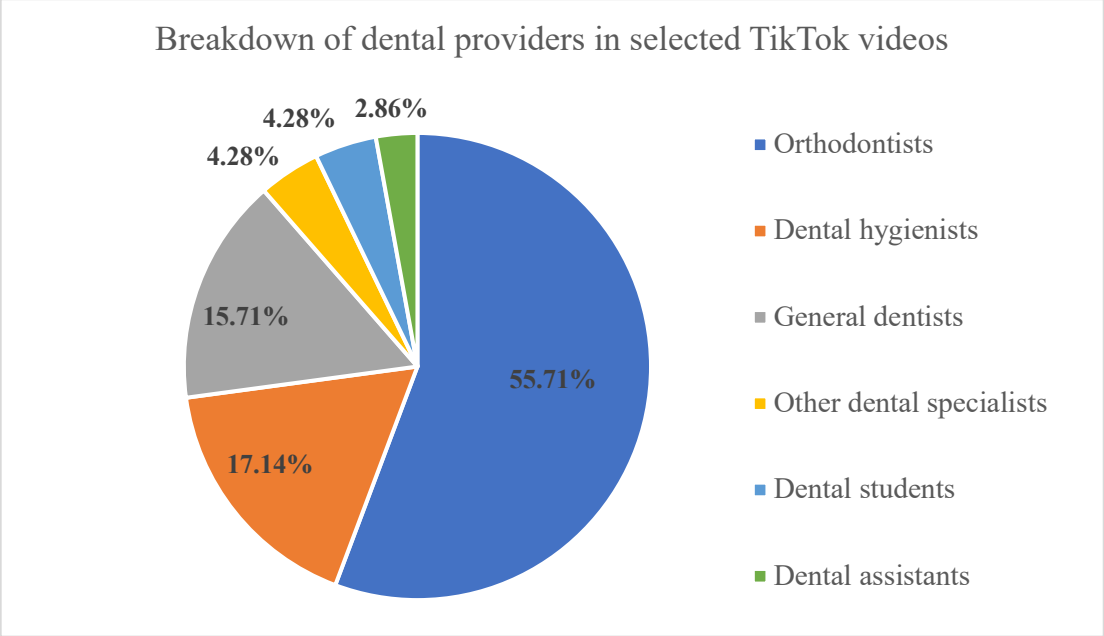

Figure 2 *Distribution of dental professionals in TikTok videos*

For video characteristics, videos posted by dental professionals were found to have higher number of likes, comments, saves, shares, and views (*Table 5*). However, the Mann-Whitney U test indicated that out of these video characteristics, only the number of shares was a statistically significant difference between uploaders (*Table 5*). Videos uploaded by dental professionals were determined to be significantly more reliable and of better quality compared to those posted by laypersons. Nevertheless, videos by laypersons were found to significantly incorporate more content domains that those by dental professionals ($P < 0.05$) (*Table 5*).

Among all dental professional categories, videos uploaded by dental students had the highest average number of likes, at 137,739.67 (*Table 6*). The categories with the top average number of views were general dentists, dental students, and orthodontists,

908,399.18, 841,000.00, and 743,920.00 respectively (*Table 6*). Those videos with the statistically significant highest average engagement rates were those uploaded by dental students (10.94), dental hygienists (8.96), and orthodontists (6.95) (*Table 6*). In addition to engagement rates, only DISCERN scores showed statistically significant differences in quality between videos uploaded by various dental professionals (*Table 6*).

Table 5 *Comparison of video characteristics, DISCERN, content score, GQS, and usefulness between uploader categories.*

	Uploader		
	Layperson (n=30)	**Dental professional (n=70)**	
	Mean (SD)	**Mean (SD)**	**P-value**
Video characteristics			
Length (seconds)	42.57 (35.94)	33.27 (32.59)	0.1372
No. of likes	52,637.77 (137,319.26)	83,218.69 (263,738.24)	0.2259
No. of comments	627.47 (2,415.98)	773.61 (3643.45)	0.1847
No. of saves	2,934.30 (7,118.51)	5,277.59 (14,671.09)	0.2231
No. of shares	325.97 (846.45)	1,853.31 (9,102.76)	0.0172*
No. of views	471,332.13 (1,194,189.50)	713,760.94 (2,027,616.56)	0.1200
Time since upload (days)	419.67 (362.50)	430.41 (256.29)	0.4359
Viewing rate	2,385.69 (8,337.91)	2,131.87 (7,099.69)	0.2541
Engagement rate	6.64 (5.41)	6.95 (5.11)	0.5512
DISCERN	1.07 (0.25)	2.67 (0.58)	<0.0001***
Content score	4.73 (1.96)	3.63 (2.15)	0.0195*
GQS	1.87 (0.73)	2.26 (0.85)	0.0405*
Usefulness	6.60 (2.49)	5.89 (2.81)	0.2157

**Mann-Whitney U test p-value < 0.05*
****Mann-Whitney U test p-value < 0.0001*

Table 6 *Comparison of video characteristics, DISCERN, content score, GQS, and usefulness between dental professional subcategories.*

	Dental professionals (n=70)					
	Orthodontist (n=39)	**Dental hygienist (n=12)**	**General dentist (n=11)**	**Other dental specialist (n=3)**	**Dental student (n=3)**	**Dental assistant (n=2)**	
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**P-value**
Video characteristics							
Length (seconds)	32.38 (27.98)	24.17 (15.89)	26.55 (16.19)	15.67 (3.06)	59.33 (71.50)	129.50 (70.00)	0.0898
No. of likes	94,429.85 (321,746.32)	64,232.92 (150,768.70)	83,221.09 (216,774.14)	14,172.00 (24,273.01)	137,739.67 (221,779.93)	291.00 (22.63)	0.2612
No. of comments	1,096.90 (4,814.28)	321.42 (616.42)	539.73 (1,427.77)	118.68 (203.80)	401.33 (533.23)	10.00 (1.41)	0.4291
No. of saves	5,730.10 (16,828.21)	5,647.75 (11,823.65)	5,282.82 (14,961.85)	184.67 (260.24)	6,495.00 (9,130.42)	17.00 (5.66)	0.1909
No. of shares	2,621.23 (12,069.81)	788.92 (1,730.82)	1,396.73 (2,959.73)	90.00 (138.58)	800.33 (1,120.35)	1.00 (0.00)	0.1751
No. of views	743,920.00 (2,455,451.28)	608,425.00 (1,184,798.33)	908,399.18 (1,820,704.97)	373,220.00 (629,426.53)	841,000.00 (1,264,889.21)	7,117.50 (596.09)	0.3550
Time since upload (days)	423.51 (273.13)	450.92 (222.26)	446.36 (256.02)	440.67 (418.70)	521.33 (67.11)	202.50 (2.12)	0.7277
Viewing rate	1,785.56 (5,006.78)	1,288.80 (2,188.50)	5,200.59 (15,242.36)	505.72 (649.18)	1,778.08 (2,710.13)	35.17 (3.32)	0.4734
Engagement rate	6.95 (5.37)	8.96 (3.47)	5.36 (5.54)	2.57 (1.22)	10.94 (5.92)	4.27 (0.65)	0.0220*
DISCERN	2.79 (0.41)	2.75 (0.45)	2.45 (0.82)	3.00 (0.00)	2.00 (1.00)	1.50 (0.71)	0.0286*
Content score	3.87 (2.08)	3.58 (2.43)	2.36 (2.01)	4.67 (2.31)	4.67 (2.08)	3.00 (1.41)	0.4080
GQS	2.41 (0.82)	2.25 (0.75)	2.00 (0.77)	2.67 (1.53)	1.67 (0.58)	1.00 (0.00)	0.1154
Usefulness	6.28 (2.73)	5.83 (3.04)	4.36 (2.69)	7.33 (3.79)	6.33 (2.31)	4.00 (1.41))	0.4346

**Kruskal-Wallis test p-value < 0.05*

III.3 Accounts

Of the 79 accounts, most (n=49, 62.03%) were associated with dental providers rather than laypersons (n=30, 37.97%) (*Figure 3*). All but one of the laypersons accounts belonged to patients who had undergone or currently were in orthodontic treatment. Eight layperson accounts specifically mentioned braces in their username (e.g., *bracxs_helpz, braces.progress1, x.life.with.braces.x*).

Analyzing those accounts linked to dental providers, the majority of them (n=30, 61.22%) were associated with orthodontists or orthodontic practices (*Figure 3*). Of those 30, only six (20.00%) accounts specifically mentioned orthodontics as part of the account name (e.g., *smilebriteortho, kriegerorthodontics, loewandpatelortho*), whereas 20 (66.67%) stated being associated with orthodontics in their profile. For the remaining four (13.33%) accounts, it was either mentioned in the video caption or verbally during the video. Only two accounts listed their practice website under their account bio description. However, a couple accounts listed links to their other social media accounts instead, such as Instagram and YouTube.

General dentists were responsible for ten accounts (20.41%) (*Figure 3*). Both dental hygienists and dental students had three accounts (6.12% each) associated with them (*Figure 3*). A pediatric dentist and a periodontist were responsible for two accounts (4.08%) (*Figure 3*). And finally, only one account (2.04%) was linked to a dental assistant (*Figure 3*).

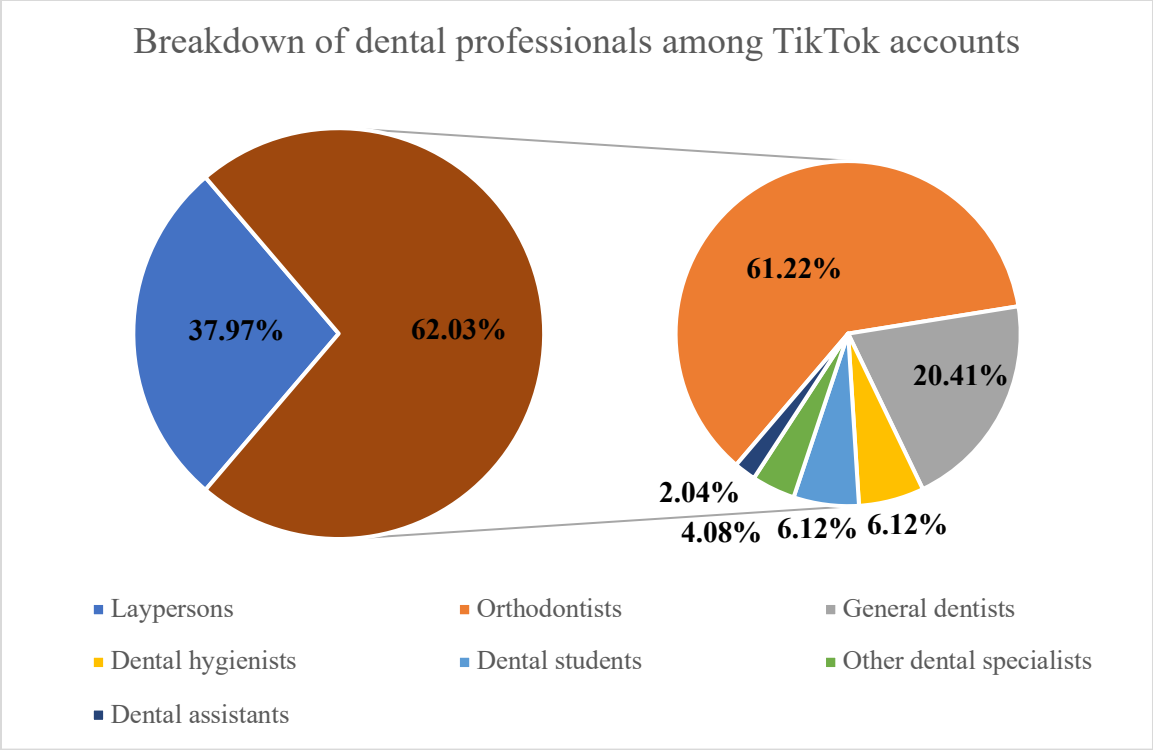

Figure 3 *Breakdown of dental providers among TikTok accounts*

The most used hashtags were #braces (n=70), #fyp (n=35), #bracestips (n=31), #learnontiktok (n=22), #dentist (n=17), and #orthodontist (n=16).

III.4 Promotional videos

Table 7 provides a comparison of video characteristics, DISCERN, content score, GQS, and usefulness between videos categorized as promotional and non-promotional. Videos that did not mention any orthodontic or dental products accounted for 80.00% (*Table 7*). These videos were found to have significantly higher reliability (DISCERN) compared to the 20.00% that promoted products (*Table 7*).

Table 7 *Comparison of video characteristics, DISCERN, content score, GQS, and usefulness between videos categorized as promotional and non-promotional.*

	Promotional		
	Promotional (n=20)	**Non-promotional (n=80)**	
	Mean (SD)	**Mean (SD)**	**P-value**
Video characteristics			
Length (seconds)	53.45 (52.33)	31.71 (25.90)	0.1017
No. of likes	62,779.75 (139,458.51)	76,860.58 (251,408.06)	0.7054
No. of comments	375.30 (911.82)	818.39 (3,674.64)	0.5823
No. of saves	3,319.50 (5,490.18)	4,888.38 (14,153.04)	0.6093
No. of shares	633.25 (1,343.27)	1,585.58 (8,522.74)	0.6182
No. of views	413,873.70 (726,182.95)	697,821.95 (1,996,693.64)	0.9794
Time since upload (days)	448.25 (255.80)	421.93 (299.60)	0.5392
Viewing rate	844.22 (1,403.61)	2,548.96 (8,276.48)	0.5973
Engagement rate	8.53 (5.92)	6.44 (4.93)	0.0994
DISCERN	1.85 (0.67)	2.28 (0.93)	0.0288*
Content score	3.90 (2.00)	3.98 (2.19)	0.9513
GQS	1.95 (1.00)	2.19 (0.78)	0.1720
Usefulness	5.85 (2.78)	6.16 (2.73)	0.5681

** Mann-Whitney U test p-value < 0.05.*

III.5 Content domains

The most common domains present among the selected videos were “brushing technique” (74.00%), “other useful tools mentioned” (65.00%), and “interdental cleaning” (56.00%) (*Figure 4*). For “brushing technique”, over half of the videos (59.00%) were accompanied by practical demonstrations: 28.00% of demonstrations were done on a dental study model, another 28.00% on oneself, and the final 3.00% on a patient volunteer. Of the videos that had “other tools mentioned,” 36.00% of the videos had demonstrations (20.00% on oneself, 15.00% on a dental study model, and 1.00% on a patient volunteer). Interproximal brushes were the most common tool with an average of 40.00% of videos

either mentioning or demonstrating its use. This was followed by mouth wash in 26.00% of videos and electric toothbrushes in 24.00% of videos. “Interdental cleaning” was discussed in 56.00% of videos and demonstrated in 30.00%. 14.00% of such demonstrations were completed on a dental study model and 16.00% on oneself. The content domains least mentioned where “brushing time” (4.00%), “regular professional cleanings” (3.00%), and both “foods/drinks to avoid” (5.00%) and “orthodontic visit frequency” (5.00%) (*Figure 4*). Out of all the videos, both raters noted nine videos with misleading information and/or inaccuracies.

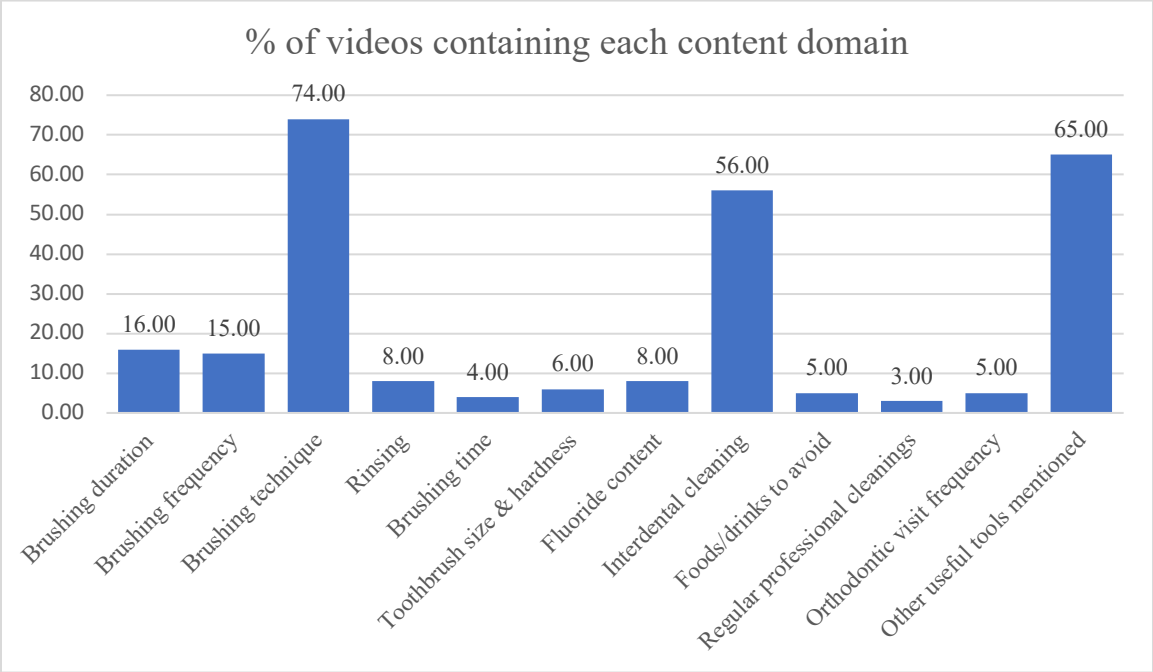

Figure 4 *Average percent of videos containing different content domain based on the 12-domain checklist created to assess completeness and accuracy of information being offered in TikTok videos.*

Almost all the videos were of poor content (98%) and the remaining 2% of moderate content (*Table 8*). Videos who scored moderate content were found to have statistically significant higher scores for both quality and usefulness (*Table 8*).

Table 8 *Comparison of video characteristics, DISCERN, GQS, and usefulness between poor content and moderate content videos. No videos were reported as rich content.*

	Content score		
	Poor content (n=98)	**Moderate content (n=2)**	
	Mean (SD)	**Mean (SD)**	**P-value**
Video characteristics			
Length (seconds)	36.07 (34.05)	35.50 (9.19)	0.5392
No. of likes	75,449.91 (234,987.30)	5,175.00 (6,823.58)	0.6854
No. of comments	734.42 (3,344.11)	61.00 (80.61)	0.6763
No. of saves	4,651.55 (13,005.32)	804.00 (1,013.99)	1.0000
No. of shares	1,422.65 (7,721.57)	45.50 (54.45)	0.6409
No. of views	652,548.27 (1,832,151.04)	76,750 (91,287.49)	0.5893
Time since upload (days)	432.47 (290.86)	168.50 (51.62)	0.2098
Viewing rate	2,245.10 (7,522.15)	390.85 (422.04)	0.9120
Engagement rate	6.89 (5.22)	5.09 (3.01)	0.7777
DISCERN	2.19 (0.89)	2.00 (1.41)	0.8083
GQS	2.11 (0.81)	3.50 (0.71)	0.0416*
Usefulness	5.95 (2.53)	13.50 (0.71)	0.0175*

** Mann-Whitney U test p-value < 0.05.*

III.6 Usefulness

In terms of usefulness, 89% of videos were slightly useful and 11% moderately useful (*Table 9*). Moderately useful videos had statistically significant higher content and quality scores (*Table 9*). Table 10 portrays the distribution of moderately and slightly useful videos between uploader categories (dental professional and laypersons).

Table 9 *Comparison of video characteristics, DISCERN, content score, and GQS between moderately useful and not useful videos.*

	Usefulness category		
	Moderately useful (n=11)	**Slightly useful (n=89)**	
	Mean (SD)	**Mean (SD)**	**P-value**
Video characteristics			
Length (seconds)	51.27 (43.93)	34.18 (32.06)	0.1001
No. of likes	7,532.27 (12735.42)	82,265.01 (245,636.31)	0.1074
No. of comments	54.45 (77.80)	813.24 (3,503.21)	0.1003
No. of saves	972.00 (1414.17)	5,019.87 (13,591.46)	0.3627
No. of shares	93.91 (134.55)	1,555.93 (8,094.62)	0.2041
No. of views	92,053.82 (121783.29)	708,883.57 (1,914,040.14)	0.0919
Time since upload (days)	321.45 (265.17)	440.26 (292.01)	0.1985
Viewing rate	333.71 (469.54)	2,439.67 (7,869.55)	0.2829
Engagement rate	5.12 (3.02)	7.07 (5.36)	0.3004
DISCERN	2.45 (0.82)	2.16 (0.90)	0.3122
Content score	7.36 (1.43)	3.54 (1.82)	<0.0001***
GQS	3.45 (0.52)	1.98 (0.71)	<0.0001***

*** *Mann-Whitney U test p-value < 0.0001*

Table 10 *Distribution of slightly useful and moderately useful videos among dental providers and laypersons.*

Uploader	Moderately useful, n = 11 (%)	Slightly useful, n = 89 (%)	Total, n = 100 (%)
Dental professional	7 (63.64)	63 (70.79)	70 (70.00)
Laypersons	4 (36.36)	26 (29.21)	30 (30.00)

III.7 Correlations between variables

Table 11 represents the results of the Spearman correlation analysis between content scores, reliability (DISCERN), quality (GQS), video characteristics and usefulness. Only the length of the videos demonstrated a statistically significant correlation among all the video characteristics. The length of videos showed statistically significant moderate positive associations with content scores (r = 0.3553, P = 0.0003), and usefulness (r=0.3553, P = 0.0003), as well as a statistically significant weak positive association with quality (r=0.2620, P=0.0085) (*Table 11*). Quality scores of videos demonstrated a

statistically significant strong positive association with content scores (r=0.5868, P<0.0001) and a moderate positive association with reliability (r=0.4236, P<0.0001). Furthermore, usefulness had a statistically significant strong positive association with content (r=0.9666, P<0.0001) and quality scores (r=0.7677, P<0.0001) (*Table 11*).

Table 11 *Spearman correlation matrix for content scores, DISCERN, GQS, video characteristics and usefulness.*

	Content	DISCERN	GQS	Length	No. of views	No. of likes	No. of saves	No. of shares	No. of comments	Time since upload	Viewing rate	Engagement rate
Content												
Rho				0.3553	-0.1297	-0.1102	-0.0061	-0.0500	-0.1036	-0.0191	-0.1390	-0.0666
P-value				0.0003**	0.1984	0.2751	0.9518	0.6211	0.3052	0.8505	0.1680	0.5106
DISCERN												
Rho	-0.0503			-0.1614	0.0648	0.0056	0.0120	0.1218	0.0165	0.0306	0.0579	-0.0930
P-value	0.6194			0.1088	0.5216	0.9562	0.9060	0.2274	0.8707	0.7623	0.5671	0.3572
GQS												
Rho	0.5868	0.4236		0.2620	-0.0627	-0.0754	0.0317	0.0487	-0.0746	-0.0741	-0.0360	-0.0744
P-value	<0.0001***	<0.0001***		0.0085**	0.5354	0.4558	0.7546	0.6307	0.4607	0.4641	0.7225	0.4621
Usefulness												
Rho	0.9666	0.0909	0.7677	0.3553	-0.1143	-0.1045	0.0097	-0.0196	-0.0994	-0.0338	-0.1160	-0.0778
P-value	<0.0001***	0.3683	<0.0001***	0.0003**	0.2577	0.3006	0.9234	0.8463	0.3252	0.7383	0.2505	0.4416

** P<0.05, **P<0.01, ***P<0.0001*

IV Discussion

Fixed orthodontic appliances increase the risk of plaque accumulation and dental caries, necessitating changes in oral hygiene habits for patients undergoing orthodontic treatment. As such, the delivery of effective oral hygiene instructions (OHI) is crucial to prevent complications and maintain good oral health. However, traditional methods such as verbal and written instructions may not be effective, especially for younger patients who are more likely to engage with visual content. In response to this, orthodontists are now using commercial software to virtually send OHI videos or curating publicly accessible OHI videos to educate patients. TikTok's popularity among young people has made it a prominent platform for creating and sharing information, including health-related content. This trend raises concerns regarding the credibility and accuracy of the sources from which they obtain dental information. For example, the user *terrakerra*, whose account has since been taken down, posted a video promoting braces for sale that could be worn without any professional supervision. This video highlights the desire for the aesthetics of braces among teenagers, despite the potential harm that can result from wearing them without proper guidance. The present study emphasizes the importance of evaluating the content, quality, and reliability of OHI in TikTok videos, given the platform's vast reach and potential impact on patient education and promotion of good oral health.

IV.1 Video characteristics

The reliability of TikTok videos as a source of orthodontic oral hygiene instructions was investigated in this study, revealing an average DISCERN score of 2.19, indicative of poor reliability (*Table 4*). This finding aligns with previous studies on TikTok videos and

orthodontics.[3,6,7,26,27] For instance, the DISCERN scores reported in TikTok studies on clear aligners and orthodontic retention were consistently poor, at 1.80.[7,26] In contrast, Kilinç's evaluation of YouTube videos reported a mean DISCERN of 2.42, while TikTok received a much lower score of 1.27.[27] This may be due to the author's evaluation of a broader range of orthodontic topics under the search terms "orthodontics" and "orthodontic treatment." Conversely, this study and the aforementioned ones limited their focus to specific topics. Topsakal et al.'s evaluation of YouTube videos on orthodontic oral hygiene instructions found an average DISCERN score of 2.18, also consistent with the findings of this study.[28] Videos evaluated in this study never received the maximum five points due to the entertainment-oriented nature of TikTok intended to boost engagement rates.[6,27] None of the TikTok videos assessed mentioned other resources or cited scientific and/or academic sources. However, Meade et al. found in their study that 5% of the orthodontist videos listed additional sources of further information.[7]

The quality (GQS) score of TikTok videos in this study averaged 2.14, also indicative of poor quality, in line with findings from other TikTok studies (*Table 4*).[6,7,26,27] In contrast to Meade et al., who reported that only 50.4% of the videos they evaluated had very poor/poor quality, this study found that 68% of the videos fell within those categories.[7] In general, TikTok videos scored lower in quality than YouTube videos, as demonstrated by Kilinç and Topsakal et al., who reported average reliability scores for YouTube videos of 2.90 and 3.14, respectively.[27,28] Based on the GQS definitions, quality scores also reflect how much important information is covered in the video. Some possible reasons for this discrepancy in quality between YouTube and TikTok videos could be the short video

format of TikTok that does not allow for too much information to be discussed as well as its focus on entertainment rather than education.

The average length of the videos assessed in this study videos was 36.06 seconds (*Table 4*), which is supported by the findings of Meade and Dreyer (23.1 seconds) and of Meade et al. (26.5 seconds).[7,26] Even though TikTok changed its length restriction from 3 minutes to 10 minutes, it appears that videos remained very short. In fact, the longest video in this study was still just under 3 minutes (*Table 4*). Kilinç found that the average duration of the videos evaluated on YouTube was just under 3 minutes, which shows that there is a similarity in video duration between the two platforms, indicating that there may be a growing preference among viewers for shorter videos across all platforms.[27] In fact, in response to TikTok's growing popularity, YouTube and Instagram have released their own version of short video platform, YouTube Shorts and Instagram Reels respectively.

The videos analyzed in this study were available on the TikTok platform for an average of 427.2 days, longer than those noted in other TikTok studies by Meade and Dreyer (226.3 days), and Meade et al. (178 days) (*Table 4*).[7,26] However, when comparing engagement rates, which is a percentage of the total number of likes, comments, and shares over number of views, Meade and Dreyer had the highest calculated rate at 12.9% for TikTok videos on orthodontic retention.[26] This study had a rate closer to that of Meade et al.'s study on clear aligners at 6.9% and 5.5% respectively (*Table 4*).[7]

TikTok differs from other major social media platforms, such as Facebook or Instagram, in a crucial way. Unlike these platforms, where relationships between users play a significant role in content distribution, TikTok's approach to content distribution is purely driven by its algorithm.[36] The TikTok algorithm, whose specifics are kept secret, plays a

crucial role in deciding which videos get shown to users, based on a variety of factors such as engagement metrics and user preferences. It is responsible for up to 80% of the content users see on their "For You" page, making it a key factor in the platform's success.[8] When users search for specific topics on TikTok, the platforms' algorithm shifts its focus from personalized content recommendations to more topic-focused results.[37] Overall, it is more complex than a simple function of time on the platform. So, videos that are on the platform longer may not have higher views or engagement rates. In fact, the videos in the previously mentioned studies with the highest engagement rate were those of Meade and Dreyer whose videos were available on TikTok only for an average of 226.3 days.[26] The number of days a video is available on the platform may make it easier to compare to other videos, however, it would be unwise to assume that there is a direct relationship between engagement metrics and length of time the video has been available.

In this study, TikTok videos related to orthodontic OHI had an average of 74,044.4 likes (*Table 4*), which was lower than those reported in the studies by Meade et al. and Meade and Dreyer, at 141,973 and 201,108 likes respectively.[7,26] All these values however were still considerably lower than the average likes reported in Meric's and Kilinç's studies (424,347.9 and 477,553 likes).[6,27] This difference could be due to their inclusion of videos under the *#orthodontics* and *#orthodontictreatment* hashtags, which covered a broad range of topics including ligatures and ligature colors, orthodontic appliances, diet during treatment, brushing, patient experience, and removal of brackets. Some of these topics may have generated more interest among viewers, resulting in higher engagement values. The same rationale can be applied to the higher average number of comments and shares reported in their studies in comparison to those found in this study.[6,27] Since their broad

focus could have included videos with more entertainment than scientific value to boost user engagement, this could have also contributed to higher engagement metrics.[6,27] Meric et al. even commented on how some of their videos emphasized the use of music, comedy, and drama to increase user engagement, but at the expense of public health.[6] For example, they noted a video in which an influencer used non-orthodontic glue to bond brackets to his teeth and then applied a power chain himself, which can result in severe dental complications.[6] Despite the risks, this post had received 1.5 million likes, over 4000 shares, and over 4000 comments at the time of the study.[6]

Meade et al. and Meade and Dreyer's studies selected TikTok videos with a narrower focus (clear aligners and orthodontic retention respectively) and found engagement metrics closer to those of this study.[7,26] Meade et al. determined that TikTok videos on clear aligners had an average of 141,973 likes, 478.9 comments, and 623.6 shares, while Meade and Dreyer found that TikTok videos on orthodontic retention had 201,108 likes, 911.3 comments, and 954.3 shares.[7,26] This suggests that videos with a more focused and specific topic may generate similar levels of engagement. Clear aligners are a popular topic nowadays in the field of orthodontics with the controversy surrounding DIY clear aligner orthodontic treatment and the growing number of dental companies marketing clear aligners. As a result, it's not surprising to see clear aligner videos garnering slightly higher engagement metrics, since more people are likely interested in learning more about this topic as a treatment option.

Compared to the present study's TikTok findings, 74,044.4 likes and 729.3 comments, Topsakal's YouTube study on orthodontic OHI found much lower average number of likes (2,800) and comments (222.1).[28] These results were also supported by

Kilinç.[27] Despite being on a newer platform, TikTok videos generated more interest with an average of 477,553.1 likes compared to an average of 7,181.1 likes for YouTube videos.[27] These results highlight the difference in engagement values between the two platforms, suggesting that TikTok may have a higher potential for engagement and reach compared to other social media platforms, even on similar topics.

TikTok offers a "save" option that allows users to bookmark and revisit videos they found interesting or informative. In this study, orthodontic OHI videos received an average of 4,574.6 saves, indicating the value users placed on the content. They can refer back to the videos for their own benefit or share them with others who need instructions on proper brushing and flossing techniques while in braces. The "saves" metric in TikTok cannot be compared to that from other social media platforms since it's not accessible to the public. The visibility of the "saves" metric on TikTok is likely a reflection of the platform's emphasis on user engagement. The "saves" metric not only serves as a measure of a video's popularity, but also its educational value and practicality as patients can easily review the instructions and techniques demonstrated in the videos.

The findings of this TikTok study not only demonstrated the educational value of the platform but also its extensive reach. In addition to the high number of saves, this study showed a higher average of views (641,032.2) when compared to Topsakal's analysis of YouTube videos, representing almost a three-fold increase.[28] Notably, the maximum number of views in this study was an impressive 15,200,000, surpassing the highest number of views recorded by Topsakal at 1,527,533.[28] These results further highlight the extensive reach of TikTok, which has a wider audience compared to other social media platforms. This massive user base can span across a diverse range of demographics, making

TikTok an excellent platform for education, as demonstrated by the millions of views recorded in Meade et al. and Meade and Dreyer's studies, 2,579,345 and 1,564,603 respectively.[7,26]

IV.2 Uploaders & accounts

This study found that 30% of TikTok videos were uploaded by laypersons and the remaining 70% were posted by dental providers. Specifically, out of all the videos 39% were from orthodontists and/or orthodontic practices, and the remaining 31% were other dental professionals such as general dentists, dental hygienists, other dental specialists, dental students, and dental assistants (11%, 12%, 3%, 3%, and 2% respectively).These findings coincided with those by Meade et al and Meade and Dreyer.[7,26] Meade et al. determined that 35.9% of uploaders were orthodontists, 44.4% were laypersons, and 19.7% were commercial clear aligner providers or sponsored by them.[7] Similarly, Meade and Dreyer found 34% of TikTok videos were uploaded by laypersons, 62.2% by dental professionals, and 3.8% by others.[26] Of the dental providers, they determined that 37.8% were orthodontists and 24.4% non-orthodontist dental professionals.[26] Even though both orthodontists and non-orthodontists are involved in sharing orthodontic content online, it appears that most videos are being uploaded by professionals. Kilinç found the same to be true for YouTube Videos.[27] This is also supported by Topsakal in his YouTube study where 58.9% of OHI videos were from dental professionals (32.1 % orthodontists, 14.3% dental clinics, 1.8% general dentists, 10.7% dental hygienists).[28] The present study's search did not yield any videos uploaded by a professional orthodontic society, which is consistent with Alkadhimi et al.'s findings.[38] In their study, the researchers found that orthodontic

societies had a limited presence on social media, as indicated by low user engagement (< 2%) and infrequent posting rates.[38]

Even though the majority of TikTok accounts investigated in this study were associated with dental professionals, their credentials were not consistently disclosed on their accounts. This can make it difficult for viewers to assess the credibility of the content. One of the challenges with TikTok, as noted by Comp et al., is the limited space to list credentials in one's account description.[10] In this study, 20% of orthodontist accounts included orthodontic terminology in their username and 66.7% mention braces in their bio description. However, only five accounts specifically included being board-certified orthodontists in their bio. Furthermore, TikTok lacks a system to verify reliable sources of information. Unlike Instagram, which has an account verification process that places a blue checkmark next to the username once completed, TikTok does not provide such a feature.[10] For example, certain layperson accounts incorporate orthodontic terminology in their account names, such as *braces.progress1* and *braces.tips.netz*, which can lead to confusion among viewers who may not recognize the lack of reliability associated with such sources, thereby posing a significant risk. Therefore, TikTok accounts run by orthodontic professionals should clearly indicate their credentials and qualifications to help viewers verify their standing as board-certified orthodontists, which can easily be achieved by including such information in the profile description or providing a link to the practice website. In addition,

Overall, the orthodontic profession must become more proactive in directing patients to reliable resources. Professional orthodontic societies did not have any videos included in this study. They should consider creating their own TikTok accounts and help

establish a benchmark for trustworthy and excellent quality educational videos in orthodontics. By doing so, not only are they providing reliable sources of information for patients and the general public, but they are also setting an example for orthodontic professionals.

In this study, videos posted by dental professionals were found to have higher number of likes, comments, saves, shares, and views (*Table 5*). Nevertheless, the Mann-Whitney U test revealed that among the video characteristics, only the number of shares showed a statistically significant difference between uploaders (*Table 5*). Specifically, dental professionals received an average of 1,853.31 shares, which was significantly higher than the 325.97 shares received by laypersons. Videos uploaded by dental professionals were also determined to be significantly more reliable (2.67) and of better quality (2.26) compared to those posted by laypersons (1.07, 1.87) (*Table 5*). These findings coincided with those from Meric and Kilinç, and Meade et al.[6,7] This could be attributed to several factors such as dental professionals having the necessary qualifications and experience to create high-quality content that is both reliable and informative. These results reinforce the idea that people are more likely to share content created by credible sources. The high number of shares received by videos posted by dental professionals could also be due to their use of social media platforms like TikTok as part of their marketing strategy. Dental providers may be promoting their videos through various channels, such as links on their websites and other social media accounts, to attract more views and engagement. However, it is important to note that some marketing companies hired by dental professionals to manage their social media presence may engage in the practice of artificially inflating engagement metrics through the purchase of "fake followers."[39]

Videos by laypersons, however, were found to significantly incorporate more content domains (4.73) that those by dental professionals (3.63) (*Table 5*). This finding is unlike those found by Meade et al. and Meade and Dreyer who determined that videos by dental professionals had higher content than those by laypersons.[7,26] In this study, this difference could be because most laypersons in their videos walk their viewers through their entire braces care routine step-by-step, offering a quick overview into maintaining oral hygiene during orthodontic treatment, and therefore covering more content in one video. On the other hand, dental professionals may focus on educating patients one concept at a time, knowing that viewers prefer to get their information quickly. So dental professionals may upload multiple videos instead to address the different content domains under orthodontic oral hygiene instructions.

The engagement rates of different dental professionals' videos varied significantly. Dental students, dental hygienists, and orthodontists had the highest average engagement rates, at 10.94, 8.96, and 6.95, respectively (*Table 6*). The reliability (DISCERN) scores also showed statistically significant differences between videos uploaded by various dental professionals. Other dental specialists (periodontist and pediatric dentist) had the highest average reliability score (3.00), followed by orthodontists (2.79), and then dental hygienists (2.75) (*Table 6*). However, due to the small sample sizes for some categories, these findings should be treated as a hypothesis. Among the dental professional subcategories, orthodontists had the most extensive sample size of n=39, making their results the most reliable. In fact, the mean DISCERN score for orthodontists in Meade et al.'s study was 2.69, which is consistent with the score found in the current study.[7]

IV.3 Promotional content

This study determined that 20.00% of TikTok videos analyzed had promotional content (*Table 7*). In most (n=7, 35.00%) laypersons or orthodontists recommended a variety of different products to help with managing oral hygiene while in braces. Laypersons typically demonstrated the products they personally used for their braces routine. Examples included *OrthoDots*, *GUM interdental brushes*, *iO9 Oral-B electric toothbrush*, and *Platypus orthodontic flossers*. Other videos focused on specific commercial products, including the *Brushee* (n=2, 10.00%), the *Curaprox Ortho Kit* (n=4, 20.00%), the *Ortho-buddy* (n=4, 20.00%), the *WaterPik* (n=2, 10.00%), and the electric toothbrush *Shyn* (n=1, 5.00%). Videos that did not mention any orthodontic or dental products accounted for 80.00% of the total videos and were found to have significantly higher DISCERN scores (2.28) compared to that of promotional videos (1.85) (*Table 7*). These videos may be perceived as more objective and trustworthy since they do not appear to have a commercial agenda or bias towards any particular product. As a result, viewers may be more likely to engage with and share these types of videos, as highlighted by the higher number of likes, comments, shares, and views noted in this study (*Table 7*).

However, when Meade et al. evaluated videos uploaded by commercial clear aligner providers or by those supported by commercial clear aligner providers, the authors found significantly higher views, with an average of 8,469,058, as compared to 1,138,244 for non-commercial clear aligner videos.[7] This is more likely due to the increased public awareness and interest in commercial clear aligner providers, as well as the marketing efforts of these companies to promote their products and services through TikTok.

Most of the promotional videos (n=17) in this study were associated with dental professional accounts, but only one video explicitly mentioned being sponsored, by using the hashtag "#sponsored" in the video caption or by any other means. Fraticelli et al. also found only one sponsored video in his study characterizing oral health education on Tiktok and determined that commercial brands do not use TikTok as a direct means of advertising.[3] However, these brands can still make use of TikTok through "influencers' who showcase their products or material, which the authors observed in half of their selected videos.[3] This lack of clear disclaimers is concerning, as it may put these dental professionals at risk of violating advertising regulations and losing the trust of their viewers, especially if they are being paid to promote something. The Federal Trade Commission (FTC) requires influencers to disclose their relationships with brands and clearly state when they are promoting a product, and failure to do so can result in legal action, fines, or other penalties.[40] Additionally, clear disclaimers help to maintain authenticity and credibility with viewers. Without a disclaimer, viewers may feel misled or deceived if they find out later that the influencer was paid to promote the product, leading to a loss of trust in the influencer and damaging their reputation.

IV.4 Content domains

This study analyzed the content of all included videos to identify the presence of twelve domains, or categories, relevant to oral hygiene instructions for orthodontic patients. These domains reflect oral hygiene instructions that are typically given verbally to patients when they first get their braces on. The study also attempted to evaluate the depth with which each domain was discussed by using a point system. However, this approach was limited, and the significance was lost when the points were tallied and the

videos categorized into poor, moderate, or rich content. For example, videos were given the maximum score for brushing technique if demonstrated, but it was difficult to differentiate based on score whether instructions were provided with the demonstration or whether the video simply showed someone brushing their teeth. Fraticelli et al. also noted that the technical information provided in the videos they evaluated was insufficient, which is consistent with the findings of this study.[3] This applies to both proper brushing technique and correct use of interdental floss.[3] In this study, the most common topics that were discussed were brushing technique (74.00%), interdental cleaning (56.00%), and other useful tools mentioned (65.00%) (*Figure 5*). Interproximal brushes were the most common additional tool used with an average of 40.00% of videos either mentioning or demonstrating its use. Fraticelli et al. also found interdental brushes present in 21.3% of videos and highlighted its benefits specifically for orthodontic patients since it offers access to areas a traditional toothbrush cannot reach.[3] This makes it reasonable for interdental brushes to be more frequently mentioned in this study. Mouth wash was the second most common tool, present in 26.00% of videos, and electric toothbrushes the third most common, in 24.00% of videos. The latter coincides with Fraticelli et al. who found that manual toothbrushes appeared in 74.3% of TikTok videos.[3]

IV.5 Misleading information and inaccuracies

Nine of the 100 videos evaluated were noted by both raters to contain information inaccuracies. Over half (55.65%) were due to recommendations to rinse teeth after brushing. Rinsing after brushing washes away any lingering protective fluoride from your teeth and as such is not recommended, especially in orthodontic patients who are at a higher risk for caries.[41] Two videos recommended to brush one's teeth with baking soda rather

than toothpaste. One of those videos was posted by an orthodontic practice, *shineorthodontics*, who recommended doing so to keep the teeth and the ceramic brackets as white as possible. Although baking soda can effectively clean teeth, it does not provide the protective benefits of fluoridated toothpaste, which is especially important in orthodontic patients. Furthermore, in the absence of proper guidance, patients may engage in aggressive and repetitive brushing using baking soda, which can lead to damage of the tooth's enamel.[42]

One video recommended using whitening mouthwash and a whitening pen around brackets to achieve a whiter smile. While not detrimental to one's health, bleaching the entire tooth surface around the bracket can lead to unaesthetic orthodontic results. Another video stated that nylon toothbrush bristles are inferior to polyester ones since their roughness can lead to gingival bleeding and damage to the teeth. According to the video, nylon toothbrush bristles also absorb water and as a result accumulate bacteria. The same video also discouraged the use of floss since floss can push stuck food deeper in between teeth leading to periodontal concerns.

IV.6 Content score

In this study, the average content score was calculated to be 3.62 (*Table 4*). This value represents the 2.00% of videos (n=2) that were determined to have moderate content, while the remaining 98.00% were found to have poor content (*Table 8*). Other TikTok studies by Meade et al., and Meade and Dreyer also reported poor content with average scores of 1.85/8 and 2.54/9.[7,26] The study by Topsakal et al. also determined that YouTube videos on orthodontic oral hygiene were generally of poor content.[28]

In the present study, videos that were determined to be of moderate content were found to have statistically significant higher scores for both quality and usefulness (*Table 8*). Since usefulness is a composite score of content and quality, it was expected there be an association. Videos of moderate content had an average GQS score of 3.50 whereas those of poor content had a lower quality score of 2.11 (*Table 8*). The TikTok study by Meade et al. demonstrated a similar trend with higher content scores statistically significantly correlating with longer videos, higher reliability, and higher quality scores.[7] This finding was also supported by Topsakal et al. where rich-content YouTube videos had a mean GQS of 3.58 and poor-content 2.99.[28] Based on the GQS definitions, poor quality scores reflect most information missing from a video. Therefore, the more content each video covers, the higher the quality score since additional relevant information is discussed.

The two moderate content videos managed to cover a lot of important information in a very short time span. One video did so by including a bullet point list of key points in the last few seconds of the video. This format allowed the user to keep the video short while still conveying key information such as the frequency of toothbrushing, the importance of dental cleanings every three months, the benefits of using an electric toothbrush, the use of fluoride mouthwash, the necessity of seeing an orthodontist on a regular basis, and the avoidance of foods that could cause damage to braces. The remaining videos only scored points for one or two content domains, which is why most were deemed to have poor content. Most would only discuss or demonstrate brushing technique without mentioning the other important aspects of oral hygiene instructions.

While the TikTok platform now allows for longer videos up to 10 minutes, most videos are still around 30 seconds (*Table 4*). This short video format has become

increasingly popular across social media platforms, and dental professionals have adapted by creating short, focused videos that address only one to two main points each. Rather than trying to cover a lot of information in one video, these professionals are creating playlists of short videos that are each focused on a specific topic. This approach allows for easy consumption and sharing of information while also fitting with the trend towards short-form video content. This same finding was also noted in Topsakal et al.'s study on oral hygiene instructions for orthodontic patients in YouTube videos.[28]

This approach, however, presents challenges for researchers trying to evaluate the quality and content of these videos since each video may only focus on one topic, and multiple videos from the same account may need to be viewed to get a complete picture of the information being presented. As such, one of the limitations of this study was the search terms used. The study aimed to use search terms with words that orthodontic patients, who are typically teenagers, would use to look up oral hygiene instructions. As a result of choosing search terms mostly related to the word "brushing," the videos found in this study may have been predominantly limited to brushing. This was indicated by the fact that 74.00% of videos discussed brushing technique (*Figure 5*). Videos on other aspects of oral hygiene instructions were included to a much lesser degree in the study.

IV.7 Usefulness

Usefulness, which considers both content and quality scores, was an average of 6.10, indicating that the videos were only slightly useful (*Table 4*). Meade et al. also categorized videos into varying degrees of usefulness, however that was based solely on content scores.[7] 89% of videos in this study were found to be slightly useful and 11% moderately useful (*Table 9*). The study found that videos considered "moderately useful"

had significantly higher content and quality scores compared to “slightly useful” videos (*Table 9*). This result was expected since the usefulness of a video is determined by both its content and quality. Table 10 shows the distribution of moderately and slightly useful videos among dental professionals and laypersons. The majority (63.64%) of moderately useful videos were uploaded by dental professionals. This suggests that these professionals recognize the importance of using social media as a tool for patient education and are taking advantage of the platform to share their expertise with a wider audience. However, it should be noted that there is still room for improvement in the quality and content of videos, regardless of who uploads them.

IV.8 Correlations

The study findings indicated a significant correlation between longer videos and their content, quality (GQS), and usefulness (Table 11). Longer videos may provide uploaders with more time to delve into comprehensive and detailed content. As a result, such videos may be considered of higher quality and more useful, as they offer viewers more informative and detailed discussions on the topic at hand. This finding was supported by Meade et al. who also found that videos with higher content scores were significantly associated with increased length, higher reliability, and higher quality scores.[7] In addition, Topsakal et al. in their study on YouTube videos and orthodontic OHI found that longer YouTube videos were statistically correlated with higher content scores.[28] This study also demonstrated a statistically significant association between higher reliability and higher quality videos, a finding supported by Meade and Dreyer as well.[26]

IV.9 Additional limitations and future directions

The results of this study highlight the challenges in conducting research on online videos. Social media is a dynamic platform, and the availability of online videos changes from day to day. Searching for videos at different times and from different locations can result in a completely different selection of videos for evaluation.[7] Therefore, the present videos represent only a snapshot of information available at a time, and as such the study could be repeated in the future to evaluate any changes in information and viewership.

Video characteristics were collected over a three-day span to limit any such changes; however, each rater had their own timeline when analyzing the videos for content, quality, reliability, and usefulness. For intra-rater analysis, two weeks were needed in between data collections and unfortunately two videos were made unavailable during this time as their privacy settings had changed. Content available on social media can also be influenced by various other factors such as algorithms, community guidelines, and user preferences, which can impact the types of videos that are accessible to viewers. The TikTok algorithm is constantly evolving and adapting to changes in user behaviors and preferences and as the platform continues to develop and refine its search functionality, the algorithm for how users search for specific topics may change over time. In this study, once the search queries had been completed any additional influence was limited by using each video's URL for access. Regardless, researchers and practitioners should be aware of these potential limitations when using social media as a source of information.

Additionally, it is also important to note for this study that the researchers' backgrounds as dental professionals along with their increased focus on scientific and quality standards could have influenced their assessments of the TikTok videos, resulting

in lower ratings for reliability and quality, especially since the GQS and DISCERN assessment tools are subjective.[27] Future directions for this study could include having both laypersons and dental professionals evaluate quality, reliability, and content and seeing how the results compare. Another study could also focus on using laypersons from different age groups since other studies have shown how teenagers and young adults find online videos more credible.

Considering how much current and future generations rely on social media platforms to get information, it may be time to establish scientific versions that are operated with peer-review processes.[6] With increased research into this topic, the hope is to also eventually create a set of guidelines for individuals to use when assessing TikTok videos and potentially other social media platforms. However, it is first necessary to establish standardized research methodologies to ensure that different research findings can be accurately compared. Future studies will need to evaluate incoming technologies as well, with recently artificial intelligence being on the forefront.

V Conclusion

This study evaluated the reliability, content, and quality of TikTok videos on orthodontic oral hygiene instructions. The findings revealed that the videos had poor reliability, content, and quality. Based on both content and quality scores, videos were deemed only slightly useful. Videos posted by dental professionals were significantly more reliable and of better quality compared to those posted by laypersons. Videos by laypersons, however, were found to significantly incorporate more content domains. Dental professionals were also responsible for most videos categorized as moderately useful. Longer videos were found to have a significant correlation with higher content,

higher quality, and increased usefulness. As such, longer videos may provide uploaders with more time to discuss content, thus increasing their quality and usefulness. Overall, the study's findings indicate that there is room for improvement in the reliability, content, and quality of orthodontic oral hygiene instruction videos on TikTok. Therefore, it is important for dental professionals to continue to recognize the significance of social media platforms in patient education.

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