The appeal of 'Do It Yourself' orthodontic aligners: A YouTube analysis

Megan Collins,* Darwin Luc,* Ersan Karadeniz,* Peter Petocz,[†] Carlos Flores-Mir,[‡] and Carmen Karadeniz^{*}

Discipline of Orthodontics, College of Medicine and Dentistry, James Cook University, Cairns, Queensland, Australia^{*} Department of Statistics, Macquarie University, Sydney, Australia[†] Orthodontics Division, University of Alberta, Edmonton, Alberta, Canada[‡]

Objective: The present study aimed to determine how the popularity of 'Do It Yourself' (DIY) aligner videos available on YouTube relates to authorship, video content, quality and reliability, and to determine why DIY aligners appeal to consumers. *Methods:* The Google Trends website was interrogated to identify the most frequently used search terms regarding DIY aligners which were subsequently applied to a search of the YouTube website. One hundred twenty-three videos were assessed for completeness of content, reliability (using a modified version of the DISCERN tool) and quality using the Global Quality Score (GQS). The relationship between the variables and authorship, popularity, financial interest, and recommendations were assessed using Pearson Correlation Coefficients.

Results: Laypeople produced the majority of the videos (73%). Dentists/Orthodontists uploaded only 4% of the videos, and dental professional bodies uploaded none. Most videos (86%) were content poor, unreliable (average DISCERN score of 1) and of low quality (average GQS of 2). The more popular, reliable and superior the quality of the video, the greater the number of views, likes and viewing rate (p < 0.05). Conversely, authors with a financial interest and lower quality and less reliable videos were more likely to recommend DIY aligners. Consumers sought DIY aligner treatment due to a reduced cost.

Conclusions: YouTube should not be considered as a viable nor reliable source of DIY aligner information for patients or the public. Dentists/Orthodontists should be encouraged to publish comprehensive and more informative YouTube content related to DIY aligners.

(Aust Orthod J 2021; 37: 321 - 332. DOI: 10.21307/aoj-2021.036)

Received for publication: March, 2021 Accepted: October, 2021

Megan Collins: meeg@hotmail.com; Darwin Luc: darwinluc@gmail.com; Ersan Karadeniz: eikdeniz@hotmail.com; Peter Petocz: peter.petocz@mq.edu.au; Carlos Flores-Mir: cf1@ualberta.ca; Carmen Karadeniz: gonzales_carmenb@yahoo.com

Introduction

'Do It Yourself' (DIY) aligners are defined as clear appliance systems constructed and provided without person-to-person contact between the patient/ client and clinician during aligner treatment.^{1,2} Several companies, in more than ten countries, offer DIY aligners directly to the public.^{3,4} Most brands advertise regular remote reviews by a dental professional and a 3–9-month treatment time.^{3–9}

The availability of DIY clear orthodontic aligners has been newly introduced and has gained recent popularity. Over the internet, consumers may obtain home orthodontic treatment via aligners and never have to visit a clinic. Dental phobia is commonplace in the general population as around 80% of adults report being apprehensive about visiting a dental surgery, 20% are highly anxious, and 5% avoid treatment altogether.¹⁰ Dental-related anxiety may be a barrier to patients seeking orthodontic treatment. The DIY aligner brands capitalise on patients' anxiety by offering an 'out-of-the-box' solution delivered directly to the consumer's door, without the need to see a clinician. In addition, the DIY aligner stores set-up for taking digital impressions are carefully designed to be dissimilar to a dental surgery. As a result, DIY aligners are likely to appeal to anxious patients due to the avoidance of the clinical environment.

The cost of DIY aligners is only a small percentage of the price of clear aligners or fixed appliances offered through a dentist or orthodontist. Generally, the cost is approximately A\$2000-\$3000 whereas the cost of aligners or fixed appliances through a dentist or orthodontist is currently between A\$4000-\$9000. However, access to orthodontic treatment is not universal and often limited. The level of untreated malocclusion is higher in socially disadvantaged communities.¹¹ In addition, it is more difficult for lower-income and rural families to access orthodontic care. The DIY aligners therefore fill a market and management gap because they offer low-cost orthodontic treatment which is accessible to anyone with a mailbox and an internet connection.

Before the rise of social media, celebrity endorsements were the primary means of creating brand associations in the minds of consumers. Today, social media celebrities or 'influencers' are a more successful form of advertising in some markets. It has been shown that consumers identify more with influencers than celebrities, trust influencers more than celebrities and feel more similar to influencers than celebrities.12 YouTube videos created by influencers form a substantial part of the marketing campaigns for DIY aligner companies. In addition, a significant amount of marketing and general information about aligner products is also available via social media through platforms such as YouTube and Instagram. Patient testimonials and personal narratives published on YouTube are becoming an increasingly popular method for potential clients and patients to gain healthcare-related information.13 The content of YouTube videos is not peer-reviewed by experts and may be misleading.14 Research shows that the experiences of others strongly influence healthcarerelated decisions made by consumers.¹⁵ This may lead to choices based on anecdotal evidence rather than evidence-based dentistry.

It is generally accepted that clear aligners are best suited to mild-to-moderate severity cases. Overall, aligners are less able to control complex tooth movements compared with traditional fixed appliances and are therefore less effective in correcting a significant malocclusion.¹⁶ As oral health care providers become more proficient in managing clear aligner cases, these concepts may change. Without high-quality professional images and impressions, radiographs and a clinical examination, it is impossible to attain a complete and accurate diagnosis. The need for attachments, composite buttons, elastics and interproximal reduction (IPR) are some of the mainstays of orthodontic treatment using aligners. The adjuncts are applied in most cliniciandirected cases and are necessary to create space and assist in the alignment of the teeth. However, these tools are not offered through DIY aligner systems since the placement of the adjuncts requires the consumer to visit a surgery.

Orthodontic treatment using aligners, as with any orthodontic therapy, carries risks. These include root resorption, recession, bone loss, tooth devitalisation and, rarely, tooth loss.¹⁷ The patient's primary concerns, expectations, benefits, and risks cannot be adequately discussed without a personal consultation between the patient and the clinician. Traditionally, a dentist or orthodontist shares information (relating to the patient and his/her needs and circumstances), which facilitates a fully-informed decision to accept, decline and/or continue with treatment.¹⁸ In the digital age, over 80% of internet users report accessing health information online,¹⁹ including through social media platforms such as YouTube. The inherent associated problem is that specialised and individualised professional information is not accessed. For example, customers may not be fully aware that a six-monthlong treatment with DIY aligners will usually improve only the alignment of the anterior teeth.20 Cliniciandirected orthodontic treatment aims to align teeth as well as achieve the 'six keys' to normal occlusion.²¹ The alignment of the patient's teeth without occlusal correction may cause problems with oral function.

As DIY aligners are a relatively new concept, there is minimal research available. Most published papers are opinion-based and rely on little raw data. Based on this background, it is clear that an improved understanding by the oral health provider of what potential consumers experience, is paramount. Therefore, the present study aimed to determine how the popularity of DIY aligner videos available on YouTube related to the content of the video, the status of the author, and the quality and reliability of the video. A secondary aim was to evaluate the completeness of the information on YouTube videos relating to treatment with DIY aligners, and to determine why DIY aligners appeal to consumers. It was expected that the results would provide the dental profession and DIY aligner companies with information about consumer preferences, gaps in consumer knowledge and the public's perception of DIY aligners.

Materials and methods

Ethics committee approval was sought but not required since the study involved the use of data available in the public arena. A YouTube account was created for this study to ensure that there were no saved search preferences. The Google Trends application²² was used to determine the most common keywords applied to searches concerning DIY aligner companies. When the terms "clear aligners" were entered into Google Trends, and the restrictions of "worldwide", "2004 – present", "health", and "YouTube search" were applied, the only search terms relevant to DIY aligners were "SmileDirectClub – company" and "Candid – company". These keywords were used as the two subsequent terms to simulate a typical YouTube search for information on DIY aligners.

When the previous YouTube structure showed 20 videos per page, research has shown that 95% of viewers did not look past the first three pages of the results²³⁻²⁶ equating to 60 videos. Similarly, in the present study, each search term was entered, and the videos were assessed against the exclusion criteria until at least 62 videos were identified for each term. The only search filter applied was "sort by relevance", which is a default YouTube setting. Duplicate videos, irrelevant videos, videos with the comments disabled and videos with hidden likes and dislikes were excluded. Videos greater than 15 min in duration were excluded because they were unlikely to hold a viewer's attention.²⁵ A total of 209 videos were assessed against the exclusion criteria, of which 86 were excluded (Table I).

Table I. Reasons for Excluding Videos

Reason for exclusion	No. of videos
Duplicate	27
Video length > 15 min	27
Not related to the subject	19
Comments disabled	11
Likes/Dislikes hidden	2
Total exclusions	86

Finally therefore, 123 videos were included for assessment. All videos were independently assessed by two observers (MC, DL). Both researchers discussed the inclusion/exclusion criteria before evaluating the videos to ensure assessment calibration. In order to minimise a change in metrics over time, the Uniform Resource Locator (URL), the video metrics (duration, number of likes/ dislikes, the number of views, number of comments, number of days since upload) and the details of the author (number of subscribers, number of views, date joined) were recorded and saved within 72 hr.

Data collection

Authorship

The type of author (Layperson, Layperson and User, DIY aligner company, Dentist or Orthodontist, News channel, Dental Professional Body), and the number of subscribers and views were recorded. If the author disclosed sponsored content or if they had a discount link for the aligners, they were recorded as having a financial interest. If a DIY aligner company produced the video, they were also recorded as having a financial interest. The author's recommendation to viewers was also noted (Table II).

Global quality scale

The overall quality of the videos was graded using a five-point Likert-type of scoring, namely the Global Quality Scale (GQS) based on the quality of the information and how useful the reviewer assumed the particular video would be to a patient.

A GQS Score of 1 depicted poor quality; poor flow of the video in which most information was missing and not at all useful for patients. Score 2, defined a video of generally poor quality and poor flow; some information listed, but many important topics were missing and of very limited use to patients. Score 3, indicated a video of moderate quality; suboptimal flow; some important information adequately discussed, but other information poorly discussed but, in all, somewhat useful for patients. Score 4, reflected a video of good quality and generally of good flow; most of the relevant information was listed, but some topics were not covered but still useful for patients. Score 5, defined a video of excellent

Table II. Author	Recommendation	classification
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The author outwardly recommended DIY aligners. However, if they did not outwardly recommend DIY aligners but had a positive sentiment, this was only a positive sentiment and not a recommendation.
The author recommended the aligners but with a caveat, e.g. "I'd recommend SmileDirectClub if you have mild problems or have had braces before but if your problems are more severe, then speak to your Dentist or Orthodontist".
The author did not recommend DIY aligners.
There was no recommendation. e.g., if the video was instructional only.

quality, excellent flow and considered very useful for patients.

The GQS was originally designed to evaluate the quality of educational information of websites deemed important by patients and clinicians in medicine²⁷ but has been extensively used to rate the quality of YouTube videos in medicine and dentistry.^{19,24,26,28–33}

DISCERN reliability tool

For the assessment of the reliability of information, an adapted form of the DISCERN tool³⁴ (an instrument developed to judge the quality of written health information for the public on treatment choices), was used. This modified, unvalidated version of the DISCERN tool has been extensively used in past research.^{19,28,31,35–37} The tool was comprised of five questions which were answered as either 'yes' or 'no' to generate a possible score between 0 and 5, with 0 being unreliable and 5 the most reliable.

The popularity of the video

The popularity of a video was measured according to previous research methodology $^{26,38-40}$ (Table III).

Table III. Video popularity criteria

Criteria	Calculation (if applicable)
The total number of views	N/A
The total number of	N/A
comments	
The interaction index	Likes – dislikes/Total number
	of viewings x 100%
Viewing rating	Number of Views/Number of
	Days since Upload × 100%

Content assessment

No relevant universal healthcare video quality assessment tool41 was available, and so one was adapted from previously published papers.^{19,38} Fifteen criteria were assessed, including the definition of DIY clear aligners, the procedure for DIY clear aligner therapy, usage instructions for DIY clear aligners, a comparison of treatment options, biomechanics of clear aligner therapy, pain, oral hygiene, soft tissue soreness, speech performance, the cost of treatment, treatment success, complications, treatment time, and a comparison between DIY and cliniciandirected aligner therapy. Each criterion was assigned a yes (1) or no (0) response. A score of 1 was assigned when the relevant information was present, or 0 when the information was missing. The scores for each were added to provide a total score out of 15. Those videos that scored 7 or less were classified as content poor, and those of 8 or more were classified as content-rich.19,38

Any potential complications/disadvantages or appealing characteristics mentioned in the video were recorded. The overall sentiment of the video was classified as either positive, negative, or neutral.

Statistical analysis

The initial frequency and descriptive analyses were performed to examine the data, using univariate and bivariate analyses. Subsequently, a comparison of relevant variables was made via a linear regression analysis to ascertain the significance of the relationships. Finally, a P-value ≤ 0.05 was set as the significance threshold for all analyses. Inter-rater reliability was measured using Pearson's correlation coefficient.

Results

The majority of the videos (73%) were produced by consumers rather than DIY aligner companies (17%). Laypeople, dentists/orthodontists, and news channels represented less than 4% of the authors. Dental professional bodies produced none of the videos (Table IV).

The regression analysis revealed that the more subscribers to an author, the greater the number of likes (p < 0.001) and video views (p < 0.001). Similarly, the more views of an author, the greater the number of video views (p < 0.001) and likes (p < 0.001) (Table V).

Fifty-four percent of included videos were sponsored or had a financial interest (Table IV). Twenty-eight percent of authors recommended DIY aligners, 6% recommended DIY aligners but to proceed with caution, and 10% did not recommend DIY aligners (Table IV). Sixty-five per cent of authors, who made a recommendation, suggested DIY aligners to their viewers. A greater number of sponsored (86%) authors recommended DIY aligners rather than those not sponsored (39%) (Figure 1).

Reliability (DISCERN tool) and GQS

The majority (72%) of videos scored a 1 for reliability using the DISCERN tool. Sixty-nine percent of videos scored a 2 on the Global Quality Scale (Table IV).

The videos produced by dentists/orthodontists were more reliable and of higher quality compared with other authors. As a result, they received more views (Figure 2).

There was a statistically significant positive correlation (p = 0.001) between reliability and video views, reliability and the number of likes (p = 0.001), and reliability and viewing rate (p < 0.001) (Table V). Similarly, the higher the GQS, the greater the number of video views (p = 0.012), the number of likes (p < 0.001), and the higher viewing rate (p = 0.005) (Table V).

The authors of videos rated as generally unreliable (reliability rating of 0 or 1) or low quality (GQS 1 or 2) were more likely to recommend DIY aligners to viewers than those with a rating of 3 or more (Figure 3).

Content assessment

The most common content covered in the videos was related to the procedure involved in DIY aligners (n = 94) and usage instructions (n = 75). Therefore, most of the videos (86%) were content poor (Table VI).

There was no correlation (p = 0.693) between the number of video views, informational completeness and the content assessment score. However, there was a weak but statistically significant relationship between the content assessment score (p = 0.04) and the number of likes, as well as the content assessment score and interaction index (p=0.011) (Table V).

Sentiment

Most of the videos (84%) had a positive sentiment toward DIY aligners, 10% had a negative sentiment and 6% were neutral (Table VI).

Lower quality (GQS 1 or 2) and less reliable videos (DISCERN score 0 and 1) were more likely to record a positive sentiment (Figure 4).

Complications/disadvantages

The most frequently stated side effect was pain, identified in nearly half of the videos. The next most common side effect was a change in 'bite', followed by poor results, difficulty in taking impressions and poor customer service (Table VI).

Appeal

The most common stated reasons why an author of DIY aligners had appeal were (in decreasing order), a reduced cost, convenience, ease of use, same as doctor directed and a lack of contact with a dentist/ orthodontist (Table VI).

Inter-rater reliability

The Pearson correlation coefficients for inter-rater reliability were 0.805 for content assessment, 0.609 for reliability, and 0.785 for GQS. Hence, inter-rater reliability for content assessment and GQS were good and for reliability, was moderate.

Discussion

The present study identified the popularity of DIY aligner videos available on YouTube and their relationship to content, the status of the author, and the quality and reliability of the video. The completeness of the content of YouTube videos relating to treatment using DIY aligners was assessed as well as the appeal of DIY aligners to consumers.

Variables	n videos (Total = 123)	Percentage
Author		
Layperson	3	2%
Layperson and user	90	73%
DIY aligner company	21	17%
Dentist or Orthodontist	5	4%
News channel	4	3%
Dental professional body	0	0
Authors with sponsorship or financial interest		
Yes	67	54%
No	52	42%
Unsure	2	2%
N/A	2	2%
Authors that recommended DIY aligners		
Yes	35	28%
No	12	10%
Proceed with caution	7	6%
N/A	69	56%
Global Quality Score		
Score 1: Poor quality	15	12%
Score 2: Generally poor quality	85	69%
Score 3: Moderate quality	19	15%
Score 4: Good quality	4	3%
Score 5: Excellent quality	0	0%
DISCERN reliability tool criteria		
1. Are the aims clear and achieved?	101	82%
2. Are reliable sources of info used ?	16	13%
3. Is the info presented balanced & unbiased?	8	7%
4. Are additional sources of info listed for patient reference?	5	4%
5. Are areas of uncertainty mentioned?	3	2%
Total DISCERN reliability scores		
Score O	16	13%
Score 1	89	72%
Score 2	11	9%
Score 3	3	2%

4

0

3%

0%

Table IV. Descriptive statistics of assessed videos. The cumulative results from each video assessment are expressed as the number (n) of videos or as a percentage of the total number of videos

Score 4

Score 5

Table V. P-value matrix (L(DG ₁₀ data used for like	s, views, subscribers, c	author views)						
Variables	Likes	Views	Subscribers	Author views	Interaction index	Viewing rate	Content score	Reliability score	GQS score
Likes	_								
Views	p < 0.001 *	_							
Subscribers	p < 0.001 *	p < 0.001 *	_						
Author views	p < 0.001 *	p < 0.001 *	p < 0.001 *	_					
Interaction index	0.014**	p < 0.001 * *	p < 0.001 * *	p < 0.001 *	_				
Viewing rate	p < 0.001 *	p < 0.001 *	p < 0.001 *	p < 0.001 *	p < 0.001 * *				
Content score	0.040*	0.693	0.010**	0.011*	0.011*	0.554			
Reliability score	0.001 *	0.001 *	0.206	0.305	0.168	<i>p</i> < 0.001 *	0.317	_	
GQS score	p < 0.001 *	0.012*	0.984	0.652	0.857	0.005*	<i>p</i> < 0.001 *	p < 0.001 *	-
*P < 0.05									
* *P < 0.05 and neg	gative relationship								

Patients must be adequately informed before making healthcare-related decisions. Healthcare professionals are extensively trained in the procedures of informed consent and traditionally, patients consult their professional healthcare providers for personalised information and advice. Complaints may arise if inadequate efforts are made to obtain informed consent before providing health-related treatment. With the rise of the internet and social media, patients are increasingly visiting social media sites like YouTube for information when making healthcarerelated decisions.^{13,19} In considering DIY aligners, most content is generated by laypeople and appliance users (73%). The popularity of the videos (measured by the number of views, likes and viewing rate) is associated with the author's popularity (measured by the number of subscribers and author views) rather than experts in the field.

Encouragingly, the videos produced by dentists and orthodontists were viewed more than those of other authors (Figure 4) but only constituted 4% of the viewed videos. This trend is in agreement with previously published work in the orthodontic field.^{13,19,38,42} Therefore, the videos produced by dentists and orthodontists were considered more reliable and of higher quality than those of other authors. However concerningly, dental professional bodies produced no instructional videos. This highlights the need for more professionals to create engaging and reliable DIY aligner content for dissemination on social media (YouTube).

Laypeople, by definition, are not experts in dentistry nor orthodontics and do not have the training to provide adequate advice or recommendations to other members of the public. Despite this, 28% of authors recommended DIY aligners to viewers. The recommendation of the author was linked to both the GQS and reliability. The authors of videos with higher reliability and GQS scores were less likely to recommend DIY aligners to their viewers. This indicates that the more informed the author, the less likely they would recommend DIY aligner products. Financial interest/sponsorship was also associated with an author's recommendation. The sponsored authors were more likely to recommend DIY aligners (86%) than those not funded (39%). It has been shown that advice from other consumers is particularly powerful in affecting a consumer's decision.43



Figure 1. Sponsorship/financial interest vs. author recommendation.



Figure 2. Reliability and GQS vs. sentiment.



Figure 3. Author vs. average reliability, average GQS and average \log_{10} video views.

Several YouTube video authors specifically stated that they were not sponsored and merely provided an honest product review. However, these authors would often have a discount link in the video description or otherwise promote DIY aligner company products. The discount/affiliated links provided a commission to the content creator for attributable purchases.⁴⁴ It was noted that 57% of authors producing DIY aligner videos were sponsored or had a financial interest. This figure may be an under-estimation as YouTube does not currently require an author to disclose marketing in the form of 'free sampling' in which products are sent to the content creator for free in exchange for a product featuring in their video⁴⁴.

The sentiment toward DIY aligners was overwhelmingly positive (85%). The greatest appeal was a reduced cost, identified in 41% of the videos. Olsen (2019) recorded similar findings; however, the

Content assessment variables	n videos (Total = 123)	Percentage
Definition of DIY Clear Aligners	2	2%
Procedure for DIY Clear Aligner Therapy	94	76%
Usage instructions for DIY Clear Aligners	75	61%
Comparison of treatment options	34	28%
Biomechanics of Aligner Therapy	2	2%
Pain	58	47%
Oral hygiene	20	16%
Soft tissue soreness	14	11%
Speech performance	29	24%
Psychosocial aspects (e.g. social life, effect on confidence)	35	28%
Cost of treatment	54	44%
Treatment success	60	49%
Complications	26	21%
Treatment time	61	50%
Comparison between DIY and doctor directed aligner therapy	30	24%
Content assessment		
Content poor (0–7)	106	86%
Content rich (8–15)	17	14%
Sentiment		
Positive	104	84%
Neutral	7	6%
Negative	12	10%
Complications/disadvantages		
Poor results	15	12%
Change in bite	19	15%
Pain	56	46%
Difficulty taking impressions	13	11%
Poor customer service	12	10%
Results may be inferior to doctor directed	5	4%
Lack of fixed retention	2	2%
Appeal of DIY Aligners Criteria		
Reduced cost	51	41%
Convenience	32	26%
Ease of use	25	20%
Same as doctor directed	22	18%
Lack of contact with doctors office	17	14%

 $\label{eq:table_var} \begin{array}{l} \textbf{Table VI.} \ \text{Descriptive statistics of content assessment.} \ \text{The cumulative results from each video assessment are} \\ \text{expressed as the number (n) of videos or as a percentage of the total number of videos} \end{array}$



greatest perceived advantage of DIY aligners was convenience, followed by cost.45 It is of concern that 18% of video authors made a statement to suggest that DIY aligner treatment is equivalent to cliniciandirected aligner therapy. This is not considered to be the case. Most malocclusions require additional measures (beyond levelling and aligning) such as elastics, IPR, temporary anchorage devices, or extractions to achieve optimal occlusion and facial harmony. DIY aligner companies do not offer these services. A change in the occlusion was mentioned as a complication in only 15% of videos and poor results in 12% of videos. Mentioned by 26% of the videos, convenience was the second most appealing factor, closely followed by ease of use (20%). With the COVID-19 pandemic lockdown restrictions and orthodontic and dental offices temporarily closed worldwide, patients may have been more likely to seek DIY aligner solutions when they are restricted to the safety of their home⁴⁶.

Overall, 86% of videos were content poor. The most mentioned criteria were procedure (94%) and usage instructions (75%). This is similar to previous work by Ustdal et al.¹⁹ in which most authors published content about appliance procedure and usage. The least mentioned appeal of DIY aligners was a lack of contact with a dental or orthodontic surgery (17%). It was expected that dental phobic patients might take advantage of DIY aligner treatment.

However, this assertion was not supported. The videos were generally of poor quality, with 79% having a GQS of 2 and 72% considered to be unreliable (DISCERN score of 1). These findings

are in accordance with previous papers relating to orthodontics^{19,38,42} and the medical and dental field.^{23,25,29,39,47–50} Given the low informational completeness, reliability, and quality of the videos available on YouTube, the internet site should not be recommended to patients nor the public as a reliable source of information.

In summary, consumers sought DIY aligner treatment due to the reduced cost and convenience; however, there is inadequate information about the complications and risks. YouTube does not currently appear to be a viable and reliable source of information regarding DIY aligners for patients or the public. Clinicians should be encouraged to publish more YouTube DIY aligner content to balance the amount of unreliable, low-quality, non-professional consumer-generated content. It would benefit the public and orthodontic community, if future research is directed toward assessing the quality of orthodontic treatment by DIY clear aligners against cliniciandirected aligners.

A limitation of the present study was that the video metrics were collected over 72 hr. Since these statistics change with time, they may not fully represent the current situation.

Conclusion

Within the limitations of the methodological approach of the study, it is suggested that:

The completeness of YouTube information was not related to the number of video views.

The appeal of DIY aligners was reduced cost, convenience, and ease of use.

The reliability and quality of the videos were generally poor. However, those produced by dentists and orthodontists were more reliable, of higher quality and, compared with other authors, had more video views.

The higher quality and more reliable videos had more views, likes, and viewing rates.

At least 54% of authors were sponsored or had a potential financial interest.

Around 18% of authors suggested that DIY aligners were the same as clinician-directed aligners.

Conflict of Interest

The authors declare that there is no conflict of interest.

Corresponding author

Carmen Karadeniz, DDS, PhD, DipOrtho James Cook University College of Medicine and Dentistry, Cairns Queensland Australia

E-mail: gonzales_carmenb@yahoo.com

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