

**Research Article**

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# Decoding Online Teeth Whitening Videos and Social Media Complexities

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In the era of digital information, YouTube stands out as a vital platform for special knowledge, particularly in the area of teeth whitening. This study categorizes YouTube videos into professional, and amateur domains, critically analyzing their content for accuracy, reliability, and impact on public perceptions of oral health. Examining 100 videos in Greek (N1=73), and English (N2=27) until October 7, 2023, the analysis considers views, likes, publication year, duration, background music, and the presence of a description.

Professional videos portray teeth whitening as a painless, conservative, and cost-effective procedure, emphasizing safety measures, and exploring bleaching mechanisms. Contradictory findings on home versus in-office treatments are highlighted, with internal, and external discoloration factors delineated. Amateur videos, more popular among the public, often present personal experiences, and homemade remedies, reflecting a concerning trend of misinformation. The analysis includes viewer engagement metrics, emphasizing the impact of non-professional content. Recognizing social media's influence on healthcare narratives, understanding dental discourse on YouTube is crucial for practitioners, and the public. This study covers topics from the chemical intricacies of bleaching agents to societal dynamics, contributing valuable insights to oral health education in the digital age. Future research should adopt a multi-platform approach to comprehensively understand online dental information, including the dynamic interaction between content creators, and viewers.

**Keywords:** Teeth whitening; Whitening techniques, At-home whitening; In-office whitening, YouTube, professional videos, amateur videos, bleaching agents, dental safety, social media impact, dental health education.

**Introduction**

Social media has brought about radical changes in the field of technology, and science, serving as significant means of information, updates, communication, socialization, and education [1]. Most users consist of young individuals, who predominantly utilize specific platforms over others. Specifically, while YouTube, and Facebook seem prevalent, with a continued increase in their

usage over the years, there are also other emerging platforms such as Instagram, TikTok, etc., with devoted users, not only on an individual level but also at a business level [2, 3]. Their role as a source of health information is significant, as per recent studies, where 8 out of 10 users seek such information through these networking platforms [4]. Particularly, patients can further educate themselves about their health issues, communicate with

other patients in closed groups (limited access only to members) or open networking groups (accessible to all users), exchange concerns, and obtain advice from specialists. Advantages of this mode of information dissemination include indefinite availability, ease of search, free provision of information, and access for everyone regardless of location, age, or socio-economic status [5]. In most cases, the information received strengthens doctor-patient communication without undermining it, provided it is accurate, and scientifically sound [3, 6].

Today, YouTube, as one of the most widely used social networking platforms [5], plays a pivotal role in informing users about dental topics, such as teeth whitening, through the posting of videos related to this entirely professional dental practice by professionals in the field as well as others outside it. In general, video-sharing websites constitute prominent sources of information in the modern, technologically advanced era. YouTube, the most popular among them, surpasses 2 billion views per day, with a new video being published on average every 15 minutes [7, 8]. This platform significantly contributes to the dissemination of health-related information, both through a wide range of available videos relating to pathogenesis, diagnosis, treatment, and prevention of various conditions, and through the possibility of patient interaction [9]. Its influence on users, considering its widespread appeal to the public, seems quite substantial. In fact, according to recent studies, 75% of patients make decisions about managing their conditions based on information obtained from the internet [10]. Therefore, accuracy and reliability are crucial issues when using and circulating material through these networks [11]. Concerns about the accuracy of this information primarily arise for two reasons: the increased dissemination of non-scientifically validated knowledge, and minimal control interventions regulating the content of the material posted [9, 12]. Moreover, studies have revealed that pharmaceutical companies, and profit-driven institutions increasingly use YouTube to advertise their products, weakening the credibility of this information source, and contributing to the assumption of misleading the public for profit-driven reasons, through campaigns, direct, and indirect advertising [13]. Hence, there is a need for the development of a more precise algorithm, and public perception skills for better filtering of shared videos, an achievement that is quite challenging given the large volume of health information available [6].

The role of social media in the field of dentistry is indisputable. One primary reason for their use by dental professionals is advertising, and enhancing their professional profiles through posting clinical cases, and information on oral hygiene [14]. Generally, as part of shaping a proper dental marketing and branding strategy today, there should also be a proper utilization of social media. This should involve well-thought-out planning aimed at providing optimal dental services and advancing the dentist's practice and service quality [15]. On the other hand, patients aim to enhance their knowledge about dental issues that might concern them, and seek information about dental services (e.g., number of sessions, materials used, service costs, etc.). Through Q&A sessions, and live streams organized by dentists on their profiles or through dialogue in the comments under posts, communication is

strengthened, reducing patients' anxiety [16]. Basic questions that often hinder patients from deciding to visit a dental clinic are also addressed. Furthermore, sharing humorous posts, and activities, both medical, and beyond the dentist's office, with colleagues through frequent video sharing or updates about continuous dental education, volunteering, or well-being, eliminates this fear. This presents patients with a more friendly, likable, and "human" image of the dentist, and their team, often supporting the improvement of their practice's branding when used sensibly [17-22]. Moreover, the entrance of social media into the dental field contributes to communication, exchanging opinions, and experiences regarding clinical issues among dental colleagues [16]. This potentially contributes to the continuous renewal of knowledge, and ongoing education, mainly but not exclusively for new dentists. It also fosters interaction, and social contact among them. Applying legislation on personal data protection (GDPR) in this context is crucial to avoid publicly exposing patients' personal information without their consent and to provide accurate information to the audience following them, in accordance with the dental code of ethics and relevant legislation [19-21].

The integration of social media in healthcare, including dentistry, presents both opportunities and challenges. Healthcare professionals, including dentists, choose platforms like Twitter, Facebook, and Instagram to enhance communication, education, and brand promotion [23, 24]. Recognizing its value, physicians are increasingly using social media to amplify their careers and engage in scholarly activities [25, 26]. Social media facilitates the creation of online communities of practice, fostering collaboration among healthcare professionals [27]. It also serves as a valuable tool for disseminating clinical practice guidelines and recruiting participants for trials [28, 29]. However, ethical considerations arise, such as the spread of misinformation [30]. In dentistry, social media's impact includes the rise of dental influencers transforming oral health information sharing [14, 15]. This shift in communication dynamics requires ongoing research to understand its implications on patient perceptions and healthcare decisions. The popularity of amateur teeth whitening content on platforms like YouTube, highlights a changing landscape in how individuals seek dental information.

This study calls for further research to navigate the evolving role of social media in dental education and public health. Despite potential pitfalls, the careful balance between professional engagement and ethical considerations is crucial for maximizing the benefits of social media in dentistry. Teeth whitening is considered the most conservative treatment for most discolorations and surface stains compared to resin or porcelain veneers, metal-ceramic, or all-ceramic crowns [31]. It is also the most popular procedure in aesthetic dentistry and generates particular interest among patients who seek information on social media, especially on YouTube. Users typically get informed through videos posted by both professionals and non-professionals in the field. In the first category, the process, techniques, and materials used are usually described in detail. In the second category, personal experiences (positive or negative) are documented, and related products are promoted. However, regardless of the creator, the way factors such

as video duration, publication date, views, comments, and likes, influence the interested audience, as not reported previously, are subsequently recorded. Our aim is then to search further on this phenomenon and provide valuable insights for future interventions by authorities and professionals in the field.

### Materials and Methods

The methodology involved searching YouTube using keywords

“teeth whitening,” “at-home whitening,” “in-office whitening,” “tooth whitening,” and “tooth bleaching” to meet the work requirements. The only search filter used was “relevance,” which is the default filter for a standard YouTube search. A total of 100 videos were studied, with 73 in Greek and 27 in English. The analysis was based on views, likes, publication year, duration, presence of background music, and the presence of a description. The completion date of the search was October 7, 2023.

### Results

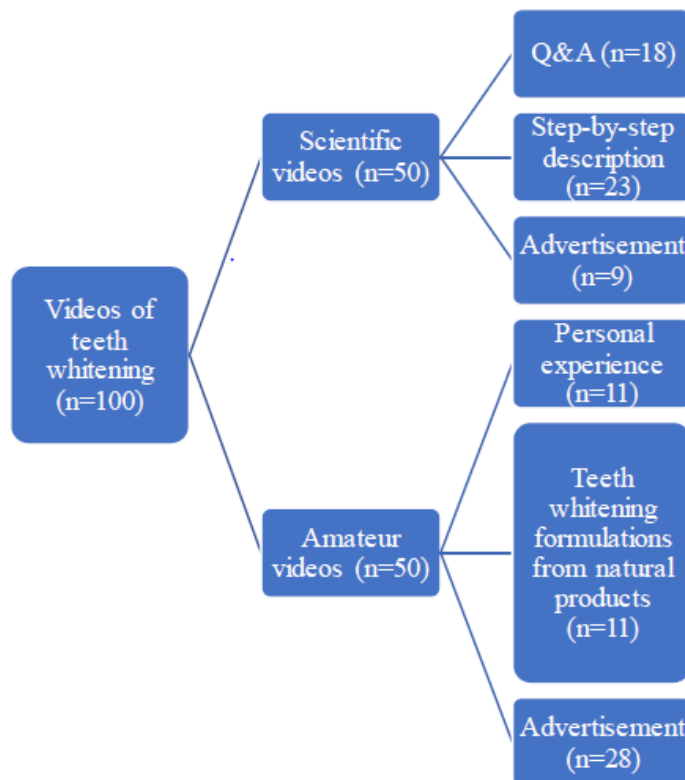


Figure 1: This figure shows the separation that was made for a better assessment of the videos.

Table 1: Recorded videos of the study in descending order of view.

Link	Title	Views	Likes (positive feedback)	Year	Duration	Music	Words
Tooth whitening Videos in English							
<a href="https://www.youtube.com/watch?v=6VxphLA7LD8">https://www.youtube.com/watch?v=6VxphLA7LD8</a>	10 Natural Ways to Whiten Teeth at Home	15.687.316	210.000	2018	10.50	Yes	Yes
<a href="https://youtu.be/010DboLorVc">https://youtu.be/010DboLorVc</a>	How I whitened my VERY yellow teeth! (WORKS!) BEFORE AND AFTER!	4.313.990	35.000	2016	2:03	Yes	No
<a href="https://youtu.be/B5k-gFsKLKI">https://youtu.be/B5k-gFsKLKI</a>	The Fastest Way Dentists Whiten Teeth   Beauty Explorers	3.037.956	25.000	2020	7:04	Yes	Yes
<a href="https://www.youtube.com/watch?v=oitq-VCXDSg">https://www.youtube.com/watch?v=oitq-VCXDSg</a>	Amazon Teeth Whitening Kit! Does MySmile Really Work?	1.326.745	13.000	2019	8:36	No	Yes

<a href="https://youtu.be/DE3-cvcEVnY">https://youtu.be/DE3-cvcEVnY</a>	Whiten Your Teeth at Home the DIY Way   Dr. Mandell	1.103.843	53.000	2022	3:29	No	Yes
<a href="https://youtu.be/M_e2xDcR0yY">https://youtu.be/M_e2xDcR0yY</a>	3 Best Ways to Whiten Teeth	884.337	17.000	2021	5:59	No	Yes
<a href="https://www.youtube.com/watch?v=AEqFz-PJ_zw">https://www.youtube.com/watch?v=AEqFz-PJ_zw</a>	DIY Teeth Whitening at Home in 2 minutes	330.134	2.000	2016	0:30	Yes	No
<a href="https://www.youtube.com/watch?v=PGzjyKx3uls&amp;t=55s">https://www.youtube.com/watch?v=PGzjyKx3uls&amp;t=55s</a>	The Risks of Teeth Whitening	312.652	3.500	2018	4:25	No	Yes
<a href="https://www.youtube.com/watch?v=Cz6pNYP55_o">https://www.youtube.com/watch?v=Cz6pNYP55_o</a>	Simply Teeth - Carrying out a Philips ZOOM! whitening system	300.492	1.000	2013	6:19	Yes	No
<a href="https://youtu.be/u6muStcUuqc">https://youtu.be/u6muStcUuqc</a>	Teeth Whitening Methods and Gimmicks- Don't waste your money	274.361	3.800	2021	6:16	No	Yes
<a href="https://www.youtube.com/watch?v=UkPiKmuSPxo">https://www.youtube.com/watch?v=UkPiKmuSPxo</a>	Do at-home teeth whitening kits really work?	268.901	1.400	2019	3:09	Yes	Yes
<a href="https://youtu.be/M9dMa5KEoOE">https://youtu.be/M9dMa5KEoOE</a>	Why Your Teeth are Yellow   How to fix Stained teeth	223.392	3.600	2022	10:07	Yes	Yes
<a href="https://www.youtube.com/watch?v=KVOohhi3xcY">https://www.youtube.com/watch?v=KVOohhi3xcY</a>	TEETH WHITENING Hacks ft. Dr. Sarang Choi   Everything you need to know	193.665	4.900	2023	9:52	Yes	Yes
<a href="https://youtu.be/CI5FEoiPWbM">https://youtu.be/CI5FEoiPWbM</a>	Teeth whitening - How is it done?	163.92	1.000	2020	1:52	Yes	No
<a href="https://www.youtube.com/watch?v=ptma-7NQs_A">https://www.youtube.com/watch?v=ptma-7NQs_A</a>	How to Use Opalescence Boost Professional Teeth Whitening   Step-by-Step Procedure	163.37	1.000	2021	4:33	Yes	Yes
<a href="https://youtu.be/EGs6jg6EdF0">https://youtu.be/EGs6jg6EdF0</a>	Is professional teeth whitening really worth it? Celebrity dentist spills all	162.751	1.100	2019	2:31	Yes	Yes
<a href="https://www.youtube.com/watch?v=MczmaVsyQUY">https://www.youtube.com/watch?v=MczmaVsyQUY</a>	what they don't tell you about teeth whitening...	146.973	1.700	2021	14:41	No	Yes
<a href="https://youtu.be/5VVtzd0guas">https://youtu.be/5VVtzd0guas</a>	How Tooth Whitening Works (ADA)	110.967	387	2016	2:45	Yes	Yes
<a href="https://www.youtube.com/watch?v=CDQkU8uZl3Y">https://www.youtube.com/watch?v=CDQkU8uZl3Y</a>	Dental Whitening Procedure Natural Bright Smile with Beyond Kit	93.137	927	2021	9:37	Yes	No
<a href="https://youtu.be/9BLElP9KFTI">https://youtu.be/9BLElP9KFTI</a>	In-Office Teeth Whitening (1 round out of 3)	84.525	392	2021	2:20	Yes	No
<a href="https://youtu.be/tZwPgOcpsz0">https://youtu.be/tZwPgOcpsz0</a>	I Got My Teeth Whitened At The Dentist... Was It Worth It?	73.992	1.200	2022	5:33	Yes	Yes
<a href="https://www.youtube.com/watch?v=66mdAqMKd5A">https://www.youtube.com/watch?v=66mdAqMKd5A</a>	GETTING MY TEETH WHITENED! *extreme pain*	63.363	678	2019	11:01	No	Yes
<a href="https://youtu.be/NXieil7mATk">https://youtu.be/NXieil7mATk</a>	Is Teeth Whitening Destroying Your Tooth Enamel?	23.04	513	2022	4:56	No	Yes
<a href="https://youtu.be/9iCUMh7gRRQ">https://youtu.be/9iCUMh7gRRQ</a>	How Teeth Whitening Works	16.624	135	2022	4:57	Yes	Yes
<a href="https://www.youtube.com/watch?v=E5LMMMsvtzY">https://www.youtube.com/watch?v=E5LMMMsvtzY</a>	Enlighten Teeth Whitening   Teeth Bleaching   Premium Whitening   Teeth Whitening Demonstration	15.471	80	2019	12:18	Yes	Yes
<a href="https://www.youtube.com/watch?v=h0lhgXtlk04">https://www.youtube.com/watch?v=h0lhgXtlk04</a>	Tooth whitening process   Enlighten whitening	14.699	134	2020	8:08	No	Yes
<a href="https://www.youtube.com/watch?v=Kv-eIH-eKAs">https://www.youtube.com/watch?v=Kv-eIH-eKAs</a>	My Teeth Whitening Journey	4.932	71	2020	12:25	Yes	Yes
Tooth whitening Videos in Greek							
<a href="https://www.youtube.com/watch?v=ZF_1wk0dxo">https://www.youtube.com/watch?v=ZF_1wk0dxo</a>	Chinese Teeth Whitening At Home #Chinesethings	236.585	7.300	2019	8:50	Yes	Yes
<a href="https://www.youtube.com/watch?v=JS8iknmmnso">https://www.youtube.com/watch?v=JS8iknmmnso</a>	How do I whiten my teeth on my own! White with style	143.984	2.200	2015	2:50	Yes	Yes

<a href="https://www.youtube.com/watch?v=25hbmKDRqH8">https://www.youtube.com/watch?v=25hbmKDRqH8</a>	Easy teeth whitening at home with two materials	76.231	1.400	2020	10:07	Yes	Yes
<a href="https://www.youtube.com/watch?v=fKpOhZnjX5U">https://www.youtube.com/watch?v=fKpOhZnjX5U</a>	Areti Kafantari shows us how to whiten our teeth at home	74.682	1.100	2018	5:39	Yes	Yes
<a href="https://www.youtube.com/watch?v=g_UaVuDvTko">https://www.youtube.com/watch?v=g_UaVuDvTko</a>	Home recipe: in 3 minutes whiten yellow teeth to white pearl	58.255	777	2021	2:01	Yes	No
<a href="https://www.youtube.com/watch?v=voEHU10ZhW8">https://www.youtube.com/watch?v=voEHU10ZhW8</a>	Review: 7h Whitening Kit-Whitening at home	49.578	749	2016	9:31	No	Yes
<a href="https://www.youtube.com/watch?v=k04EBtquo1U">https://www.youtube.com/watch?v=k04EBtquo1U</a>	I had my teeth whitened! See how it's done!	46.313	635	2017	12:50	Yes	Yes
<a href="https://www.youtube.com/watch?v=pTLw1uod47A">https://www.youtube.com/watch?v=pTLw1uod47A</a>	I've had a teeth whitening and I can answer your questions	27.248	1.100	2020	12:45	Yes	Yes
<a href="https://www.youtube.com/watch?v=gE_m8HJOTwU">https://www.youtube.com/watch?v=gE_m8HJOTwU</a>	Teeth whitening at home (+cost) and my experience with Invisalign (before-after)	26.183	388	2021	16:11	Yes	Yes
<a href="https://www.youtube.com/watch?v=U2e519_li6Q">https://www.youtube.com/watch?v=U2e519_li6Q</a>	Coconut Oil For Oral Health & Teeth Whitening	24.869	1000	2018	5:17	Yes	Yes
<a href="https://www.youtube.com/watch?v=yiqhvdvQksY">https://www.youtube.com/watch?v=yiqhvdvQksY</a>	Soda is the perfect ally for teeth whitening	23.814	247	2018	1:54	Yes	No
<a href="https://www.youtube.com/watch?v=IKvp58oKQYM&amp;t=21s">https://www.youtube.com/watch?v=IKvp58oKQYM&amp;t=21s</a>	Teeth Whitening (2022) Teeth Whitening Types, Cost & Prices-Tooth and Health	21.419	221	2020	3:14	No	Yes
<a href="https://www.youtube.com/watch?v=KOUOY3aA2Mw">https://www.youtube.com/watch?v=KOUOY3aA2Mw</a>	Teeth whitening at home with 2 materials easily and quickly!	21.379	489	2020	6:25	No	Yes
<a href="https://www.youtube.com/watch?v=DS8PnBL_m5g">https://www.youtube.com/watch?v=DS8PnBL_m5g</a>	Teeth whitening in 10 minutes?	19.916	1.100	2017	3:11	Yes	Yes
<a href="https://www.youtube.com/watch?v=Tp5fzsnpv0o">https://www.youtube.com/watch?v=Tp5fzsnpv0o</a>	Teeth whitening naturally? Is it possible?	17.347	303	2020	4:36	Yes	Yes
<a href="https://www.youtube.com/watch?v=4BsI94WQ_Og">https://www.youtube.com/watch?v=4BsI94WQ_Og</a>	Professional teeth whitening at home!!!! *it works*	12.758	318	2019	7:29	No	No
<a href="https://www.youtube.com/watch?v=C3SCek3HURk">https://www.youtube.com/watch?v=C3SCek3HURk</a>	My invisalign story & teeth whitening at home	12.683	173	2020	22:28	Yes	Yes
<a href="https://www.youtube.com/watch?v=QIMI_feKS-c">https://www.youtube.com/watch?v=QIMI_feKS-c</a>	How to do teeth whitening on a budget at home	11.941	293	2017	4:32	Yes	Yes
<a href="https://www.youtube.com/watch?v=dyRBNWD24tA">https://www.youtube.com/watch?v=dyRBNWD24tA</a>	Teeth whitening.10 essential information!	10.714	172	2020	6:34	Yes	Yes
<a href="https://www.youtube.com/watch?v=2x43K5Ueyws">https://www.youtube.com/watch?v=2x43K5Ueyws</a>	Why everyone uses glory smile tooth whitening products	8.94	0	2021	0:50	Yes	Yes
<a href="https://www.youtube.com/watch?v=3cWGhHpN7_w">https://www.youtube.com/watch?v=3cWGhHpN7_w</a>	Teeth whitening powder-100% natural teeth whitening	8.091	4	2020	0:27	Yes	No
<a href="https://www.youtube.com/watch?v=y_EzyjhdMKk">https://www.youtube.com/watch?v=y_EzyjhdMKk</a>	Teeth whitening at home	6.114	45	2019	1:06	Yes	No
<a href="https://www.youtube.com/watch?v=pLKc_DbcvBw">https://www.youtube.com/watch?v=pLKc_DbcvBw</a>	what is true with teeth whitening	5.997	186	2022	13:07	No	Yes
<a href="https://www.youtube.com/watch?v=ct42ktwhg0I">https://www.youtube.com/watch?v=ct42ktwhg0I</a>	Teeth whitening   Smile Designers	4.055	15	2017	3:35	Yes	Yes
<a href="https://www.youtube.com/watch?v=CMVU4XQ34o8">https://www.youtube.com/watch?v=CMVU4XQ34o8</a>	Teeth whitening, techniques	3.866	54	2020	6:06	Yes	Yes
<a href="https://www.youtube.com/watch?v=2nWDcoCGe7I&amp;t=28s">https://www.youtube.com/watch?v=2nWDcoCGe7I&amp;t=28s</a>	I had teeth whitening. My experience!!!	3.869	48	2020	9:56	No	No
<a href="https://www.youtube.com/watch?v=9t8CUDnBVMc">https://www.youtube.com/watch?v=9t8CUDnBVMc</a>	Instant Teeth Whitening with Activated Carbon	3.46	326	2022	4:06	Yes	No

<a href="https://www.youtube.com/watch?v=qKYdYrLqbUE">https://www.youtube.com/watch?v=qKYdYrLqbUE</a>	Teeth whitening kit- teeth whitening at home	2.861	5	2020	0:26	Yes	No
<a href="https://www.youtube.com/watch?v=X1kuXjUmmrQ">https://www.youtube.com/watch?v=X1kuXjUmmrQ</a>	What is teeth whitening and when is it recommended?	2.674	17	2018	2:09	No	Yes
<a href="https://www.youtube.com/watch?v=DSGP0BL03EU">https://www.youtube.com/watch?v=DSGP0BL03EU</a>	Whitening toothpastes - teeth whitening	2.633	42	2020	2:36	No	Yes
<a href="https://www.youtube.com/watch?v=HgSspXPSFHs">https://www.youtube.com/watch?v=HgSspXPSFHs</a>	Teeth whitening with coconut powder	2.416	2	2019	0:33	Yes	No
<a href="https://www.youtube.com/watch?v=MCKWINqHI3Y">https://www.youtube.com/watch?v=MCKWINqHI3Y</a>	Teeth whitening at home- 2019 teeth whitening kit	2.354	6	2019	0:50	Yes	No
<a href="https://www.youtube.com/watch?v=h6qYS_OelKA">https://www.youtube.com/watch?v=h6qYS_OelKA</a>	How to use and take care of whitening trays?	2.269	44	2021	5:35	Yes	Yes
<a href="https://www.youtube.com/watch?v=9O22JeWjLPs">https://www.youtube.com/watch?v=9O22JeWjLPs</a>	Teeth whitening for the holidays! Just in time for the holidays..	1.817	11	2021	4:00	Yes	Yes
<a href="https://www.youtube.com/watch?v=EQEjS32InFg">https://www.youtube.com/watch?v=EQEjS32InFg</a>	Teeth whitening - ZOOM	1.679	1	2012	0:45	Yes	Yes
<a href="https://www.youtube.com/watch?v=qSFxhzp8oU">https://www.youtube.com/watch?v=qSFxhzp8oU</a>	Teeth whitening and fresh breath with natural products	1.595	20	2019	2:24	Yes	Yes
<a href="https://www.youtube.com/watch?v=tWXIUXWGDjE">https://www.youtube.com/watch?v=tWXIUXWGDjE</a>	led whitening kit-glory smile	1.499	8	2022	0:45	Yes	No
<a href="https://www.youtube.com/watch?v=_hcg1Fo3Yvc">https://www.youtube.com/watch?v=_hcg1Fo3Yvc</a>	White Care - Painless and Teeth Whitening on a budget	1.088	2	2016	1:08	Yes	Yes
<a href="https://www.youtube.com/watch?v=FBUsLXGw0kl">https://www.youtube.com/watch?v=FBUsLXGw0kl</a>	VIDEO for Teeth Whitening - Advanced Dental Clinics	1.066	2	2015	1:19	Yes	Yes
<a href="https://www.youtube.com/watch?v=GM17NtqvMtA">https://www.youtube.com/watch?v=GM17NtqvMtA</a>	Teeth Whitening - My Story - TeethWhitening.com.gr	1.005	66	2017	1:08	Yes	Yes
<a href="https://www.youtube.com/watch?v=bMfgESH0qyo">https://www.youtube.com/watch?v=bMfgESH0qyo</a>	Activated Carbon Products For Teeth Whitening	880	5	2020	3:20	Yes	Yes
<a href="https://www.youtube.com/watch?v=djMIQIpGMmg">https://www.youtube.com/watch?v=djMIQIpGMmg</a>	Professional Teeth Whitening At Home! Review  Glory Smile -Teeth Whitening Products	847	1	2021	1:48	No	Yes
<a href="https://www.youtube.com/watch?v=of325u012co">https://www.youtube.com/watch?v=of325u012co</a>	Tania Hadjipanagiotidou for teeth whitening	858	11	2018	9:25	No	Yes
<a href="https://www.youtube.com/watch?v=7tK9ym86D28">https://www.youtube.com/watch?v=7tK9ym86D28</a>	Smiles Dental office for teeth whitening in Viva show!	830	4	2015	2:58	Yes	Yes
<a href="https://www.youtube.com/watch?v=ltv0AXmI-Kk">https://www.youtube.com/watch?v=ltv0AXmI-Kk</a>	Tooth Sensitivity during Tooth Whitening	673	21	2022	3:54	No	Yes
<a href="https://www.youtube.com/watch?v=guwGJUjCtOQ">https://www.youtube.com/watch?v=guwGJUjCtOQ</a>	www.my-smile.gr Teeth whitening Pt.1	594	0	2011	2:01	Yes	Yes
<a href="https://www.youtube.com/watch?v=gUEIUjJJUrK">https://www.youtube.com/watch?v=gUEIUjJJUrK</a>	Teeth whitening with Laser .Dental Center-Piraeus	477	0	2016	1:40	Yes	No
<a href="https://www.youtube.com/watch?v=tkPtDnJboRk">https://www.youtube.com/watch?v=tkPtDnJboRk</a>	How to whiten our teeth	410	13	2022	2:10	Yes	Yes
<a href="https://www.youtube.com/watch?v=zr3rTjLMIaM">https://www.youtube.com/watch?v=zr3rTjLMIaM</a>	Dentists - Teeth whitening	387	1	2014	3:45	Yes	Yes
<a href="https://www.youtube.com/watch?v=3wH6CVeeFJO">https://www.youtube.com/watch?v=3wH6CVeeFJO</a>	Teeth Whitening in Advances Dental Clinic	372	0	2015	2:31	Yes	No
<a href="https://www.youtube.com/watch?v=ZYsLnva9qt0">https://www.youtube.com/watch?v=ZYsLnva9qt0</a>	Teeth whitening: A procedure completed in 2 stages.	367	0	2021	0:51	No	Yes
<a href="https://www.youtube.com/watch?v=TYEd9oB8UGQ">https://www.youtube.com/watch?v=TYEd9oB8UGQ</a>	Are you going to join the group where everyone is smiling?   Review   Glory Smile - Teeth Whitening Products	337	0	2021	1:13	No	Yes
<a href="https://www.youtube.com/watch?v=RMM_CNdIVzI">https://www.youtube.com/watch?v=RMM_CNdIVzI</a>	White Care Teeth whitening   The Process in One and a Half Minutes	288	1	2016	1:39	Yes	Yes

<a href="https://www.youtube.com/watch?v=MfY7Nzgp-4w">https://www.youtube.com/watch?v=MfY7Nzgp-4w</a>	Teeth whitening - Tips from RADIX Pharmacy	275	22	2019	2:05	Yes	Yes
<a href="https://www.youtube.com/watch?v=TNyJkP0aOoo">https://www.youtube.com/watch?v=TNyJkP0aOoo</a>	Teeth whitening	254	5	2018	2:59	No	Yes
<a href="https://www.youtube.com/watch?v=cviOJVIPaGg">https://www.youtube.com/watch?v=cviOJVIPaGg</a>	Teeth whitening. An easy and quick way at home	241	11	2021	2:01	Yes	No
<a href="https://www.youtube.com/watch?v=JoTxTu-E1Gc">https://www.youtube.com/watch?v=JoTxTu-E1Gc</a>	Everything you need to know about teeth whitening	236	3	2021	9:58	No	Yes
<a href="https://www.youtube.com/watch?v=XOSO9mCuLGY">https://www.youtube.com/watch?v=XOSO9mCuLGY</a>	White teeth and clean breath!   Review  Glory smile -Teeth Whitening Products	208	0	2021	10:33	Yes	Yes
<a href="https://www.youtube.com/watch?v=QWxVADUYF14">https://www.youtube.com/watch?v=QWxVADUYF14</a>	Teeth Whitening white care-Teeth Whitening Revolution	198	0	2016	1:03	Yes	Yes
<a href="https://www.youtube.com/watch?v=S8KKSLU1WCM">https://www.youtube.com/watch?v=S8KKSLU1WCM</a>	100% Natural Products For Natural Teeth Whitening  Review   Glory Smile - Teeth Whitening Products	159	0	2021	5:56	No	Yes
<a href="https://www.youtube.com/watch?v=aGtK_YoNNZk">https://www.youtube.com/watch?v=aGtK_YoNNZk</a>	Easy & on a budget teeth whitening!  Review  Glory Smile-Tooth Whitening Products	131	1	2021	2:01	No	Yes
<a href="https://www.youtube.com/watch?v=umJgLeiw5Ek">https://www.youtube.com/watch?v=umJgLeiw5Ek</a>	Teeth whitening LYRO DENTAL CLINIC	127	0	2016	0:46	Yes	No
<a href="https://www.youtube.com/watch?v=UxlKaTkqHCc">https://www.youtube.com/watch?v=UxlKaTkqHCc</a>	Teeth whitening	123	0	2015	5:36	Yes	Yes
<a href="https://www.youtube.com/watch?v=41_tvb4Q3jI">https://www.youtube.com/watch?v=41_tvb4Q3jI</a>	Everything you need to know BEFORE you decide to whiten your teeth!	98	1	2022	8:05	Yes	Yes
<a href="https://www.youtube.com/watch?v=7IdeRA-gmWs">https://www.youtube.com/watch?v=7IdeRA-gmWs</a>	Maria Lalousi - Teeth whitening	88	4	2022	3:51	No	Yes
<a href="https://www.youtube.com/watch?v=ruY8UXtSkYc">https://www.youtube.com/watch?v=ruY8UXtSkYc</a>	Teeth Whitening beautiful white smile	73	2	2019	0:19	Yes	No
<a href="https://www.youtube.com/watch?v=yjWwp2qAZKA">https://www.youtube.com/watch?v=yjWwp2qAZKA</a>	Teeth whitening white care - easily, quickly, on a budget	68	0	2016	0:26	Yes	No
<a href="https://www.youtube.com/watch?v=XNLmv3KPtHA">https://www.youtube.com/watch?v=XNLmv3KPtHA</a>	Teeth Whitening Lyro dental clinic	67	0	2016	0:15	Yes	No
<a href="https://www.youtube.com/watch?v=BG3NAF0VN08">https://www.youtube.com/watch?v=BG3NAF0VN08</a>	Teeth Whitening	59	2	2019	1:17	Yes	No
<a href="https://www.youtube.com/watch?v=qSLcHhotihA">https://www.youtube.com/watch?v=qSLcHhotihA</a>	Teeth Whitening	56	0	2018	0:16	Yes	No
<a href="https://www.youtube.com/watch?v=RXAHQg_gZ54">https://www.youtube.com/watch?v=RXAHQg_gZ54</a>	Teeth whitening at home	44	0	2020	0:19	Yes	No
<a href="https://www.youtube.com/watch?v=kjMMV2wjNE">https://www.youtube.com/watch?v=kjMMV2wjNE</a>	Teeth whitening at home	25	1	2023	1:12	Yes	Yes
<a href="https://www.youtube.com/watch?v=UKVshrFk9c4">https://www.youtube.com/watch?v=UKVshrFk9c4</a>	Bleaching - Teeth Whitening	12	0	2022	7:00	No	Yes

Table 1 presents the relevant entries ranked by the number of views for each video.

100 videos were divided into two categories, based on their creator, professional and amateur. Then, the scientific videos were divided based on their content into Q&A videos, descriptions of whitening steps, and advertisements, while the amateur videos were divided into videos describing personal experience, creating whitening formulations from natural products, and advertisements.

In professional videos, dentists and experts on the subject refer to the steps, side effects, mechanism, indications, and

contraindications of each method; amateur videos, on the other hand, show personal experiences of patients or promote companies and products.

### Category 1:

In general, in most professional type videos, whitening is presented, in detail and descriptively - with or without words and music - as a painless, conservative and economical procedure, detailing the steps both by practices promoting their dental services and by companies with dental packages; as a procedure, it is not mentioned as destructive to the teeth nor to the periodontal

tissues. However, the materials should be used at the permitted doses and for the appropriate duration because of their potential toxicity, risk of carcinogenesis and their effect on both soft and hard dental tissues as indicated in the literature. Some adverse effects such as gingival hypersensitivity and external root resorption are also possible [32-34].

Bleaching is a complex chemical process, the exact chemical mechanism of which is controversial. The bleaching agents mentioned are hydrogen peroxide and carbamide, which on the tooth surface is eventually converted to hydrogen peroxide. It appears that these substances penetrate and become embedded in the dental tissues, where they are oxidized to eventually produce oxygen and hydroxyl free radicals which will break down the pigment molecules [35]. Different responses of different types of discoloration to these bleaching agents have been observed, so the effectiveness of different bleaching techniques is not predictable. It is therefore correctly recorded in all the relevant videos that the results of bleaching are not predetermined from the outset [36, 37].

The four main techniques presented are whitening strips, splints, the use of a light device in the doctor's office and various product packages for use at home. The home splints are specially designed to hold the 10% carbamide peroxide gel [38], which is the material of choice for this technique [39], for a long period of time. In the past, the appropriate time for their application was during sleep, when the flow of saliva is reduced. It is no longer recommended to apply the prostheses throughout the night but for 2-3 hours a day at a time that is convenient for the user depending on his or her activities. The total duration of the whole procedure is approximately 2 to 3 weeks, depending on the initial tooth coloring, age, type and concentration of the whitening agent. In contrast, in-office whitening is performed by applying 35% hydrogen peroxide for 15 minutes, 2-4 times in a 1-hour session and light devices. This technique is not recommended by some dentists due to the use of a high concentration of bleaching agent in a short period of time. Moreover, these devices give only a temporary better result since, due to the dehydration of the teeth, a whiter tone occurs, which escapes in about a week [40]. Burns and sores on the lips and gums, sensitivity and pain can also occur [32]. Personalized whitening splints with whitening material for home whitening are mentioned as the best method in most videos. However, while some studies report that home whitening provides a better and more consistent result than that done in the office, other studies claim the opposite, and similar results for both techniques have also been published. The combination of at-home and in-office treatment showed relatively better potential for whitening color retention in a study of teeth stained with tea tannin [36, 37].

As the experts in the videos emphasize, discolorations due to internal factors are signs of bleaching. Such discolorations refer to either individual teeth or the entire dental barrier and may be caused either by trauma or by hereditary abnormalities such as incomplete enamel formation. On the contrary, coffee, red wine, cigarettes, tea, taking drugs such as tetracycline and fluoride and the removal of orthodontic appliances are considered as causative external factors. This type of discoloration, however, can also be treated by brushing the teeth. Whitening products

containing hydrogen peroxide remove both internal and external discoloration. In contrast, whitening products without bleaching agents contain abrasives and agents that cause the removal of surface stains mainly by mechanical and/or chemical processes. In fact, most of the studies on the efficacy of whitening toothpastes have documented their ability to remove only exogenous stains from tooth surfaces [36, 41].

Contraindications for whitening are pregnancy, breastfeeding, cracks, chemotherapy-radiotherapy, pockets, malformations, cervical abrasion, decayed teeth, veneers, and crowns [42]. In general, these contraindications apply to people of all ages, and studies show that whitening in children and adolescents should be avoided - except in certain cases of discoloration-because of the morphological differences in the pulp and dental tissues, which are not fully developed. Finally, it is stated that whitening in children under 11 years of age is not recommended [41].

The above-described information recorded in YouTube videos is largely identical to what is mentioned in scientific publications on the subject and in this sense, one could safely classify these videos as scientifically correct and useful for the validity of their information. However, according to another study, YouTube cannot be considered as a completely reliable source of information for patients about teeth whitening [18, 36].

## 2nd Category

A wide variety of whitening videos are posted by non-professionals in the field of dentistry [18]. For example, there are videos circulating from influencers who choose to share their personal whitening experience with their followers and quote their opinion on the topic. Some of them, in collaboration with their dentist, present the whole bleaching process (method of choice, materials, concentrations, application time) while the dentist explains the steps and answers questions that concern interested parties, such as whether sensitivity or pain will occur during and after bleaching, how long it takes and whether it is an expensive procedure (reference to the cost). The dentist's demonstration of the procedure and steps and answering questions raised by the patient can help any interested user to resolve some basic questions they may have before visiting the dental practice. However, highlighting only the personal experience of the individual can lead to the formation of a false image or even to the creation of excessive expectations because, as mentioned in videos by professional dentists, every smile has its own needs and, depending on the oral condition and habits of the individual, the aesthetic result that will be obtained after whitening is proportional.

The advertising and promotion of whitening product packages promoted by various companies both at home and abroad is another category of YouTube videos. Influencers promote these products either by showing the process of placing them or by giving instructions on how to apply them. These packages usually include whitening gel, syringes for its application, individual LED device (the relevant specifications are not mentioned anywhere), splints and whitening toothpaste. There are also videos promoting whitening products from pharmaceutical companies.



Another category of non-professional videos related to whitening is the promotion of recipes and ointments using ingredients such as baking soda, water and lemon or ash. The creation and application of these pastes falsely promises the emergence of a professionally white smile at home without professional assistance and control. These videos are clearly misleading and obviously can lead to damage to dental and periodontal tissues, uncontrolled events of various forms, extent and duration that may be irreversible. These videos are harmful to public health, conflicting with key articles of the Code of Dental Ethics that refer to the disclosure of results of studies on new materials, techniques, or products. In this sense, even if they do not come from dentists but from private individuals, the dental associations should take care to control their promotion.

From the study of the number of views and likes of the videos in each category, amateur videos have a greater public appeal. More specifically, the average number of views of these videos is 526,493 and likes is 7,218, in contrast to the scientific ones which amount to 81,319 and 1,850 respectively. Perhaps the immediacy and "sharing the people next door" might attract more viewers interested in the topic, while in contrast, the description of the technique by a white-coat professional might create internal (psychological) barriers to watching the videos [43]. Feeling the need for psychological support and relief, patients communicate, advise, and guide each other through a communication channel developed on the internet. This recourse to the opinions and opinions of non-specialists on the subject can have a positive and/or negative impact on the patient-doctor relationship. On the one hand, it seems that social media through the sharing of common medical experiences have to some extent damaged the trust between doctor and patient, since there is distrust or even rejection of the guidelines of health professionals [44]. On the other hand, by being informed about their health problem and being aware of the controversial validity of the information they receive from non-specialists, patients are more receptive, can communicate better with their dentist and thus help to create appropriate conditions for their treatment [45].

The analysis of the number of amateur videos shows that advertising videos predominate (56%), followed by those describing personal experience and those with a recipe for a bleaching product (22% each). In terms of their impact on the public, however, it appears that promotional videos are equally predominant, with an average of 16,301,976 views, followed by videos of personal experience with 8,117,972. It seems that the audience is addicted to viewing consumption and the mentality of advertising as a news sharing agent. There are people with hyper-consumptive tendencies who use it to fill their personal void, their loneliness, their lack of self-respect and self-esteem. For many people, appearance is the main purpose in life and in this sense products that promise a bright smile can be particularly attractive [46]. And while in the past the emphasis people placed on their physical appearance was not so great, with the advent of social media and in particular the promotion of the "perfect image", this has changed. The image of the "perfect smile" and "perfect appearance" presented by influencers has had and continues to have an impact on the field of aesthetics,

particularly cosmetic dentistry with a large percentage visiting the dentist primarily to fix the aesthetics of their smile rather than the functionality [47]. Therefore, the current beauty standards promoted, mainly by brands -but also by non-brands- through online platforms justify the consumers' need to evolve and enhance their external appearance [48].

Similarly, of the professional videos, those where the steps of whitening are described in detail amount to 46%, followed by Q&A videos at 36% and finally promotional videos at 18%. In this category, the Q&A videos prevail in terms of audience preference, as demonstrated by their average number of views, and likes, which are 3,163,289 and 87,011 respectively. In general, Q&A videos seem to have more appeal when it comes to medical videos.

In terms of the characteristics of the videos studied it was found that:

- The average duration is 4:48 minutes.

Studies have shown that shorter videos (0-3 minutes) are more interesting for the viewer and may also contain higher quality educational material. In general, to maximize the effectiveness of the purpose of the videos, they should last up to six minutes at the maximum viewing time [49].

- Videos with music were: 72%.

The average number of views of videos with music is: 362.727

Average number of views of videos without music: 152.652

As can be seen from the above data, videos with music are more popular, they also constitute the majority since they occupy 72%. Background music, according to research, enhances the recall of information, also attracts interest, and has a positive effect on the assimilation of knowledge [50].

- Commentary videos were: 76%

The average number of views of videos with words is: 328,873

The average number of views of videos without words is: 224.845

The above data demonstrates that at 76%, videos with words outperform those without. It also appears that they also prevail in audience preference, since they also have more views. In general, our results prove that videos uploaded by ordinary people receive a higher number of views which is also documented by other researchers [17].

## Discussion

The findings of this study shed light on the contrasting landscape of teeth whitening information available on YouTube, emphasizing the need for critical evaluation and awareness among viewers. The two identified categories, professional and amateur videos, present divergent perspectives on teeth whitening procedures, efficacy, and associated risks. Such diverse content raises concerns about the potential misinformation and varying quality of information accessible to the public.

The first category encompasses professional videos, predominantly uploaded by dental practitioners and companies providing whitening services. These videos emphasize the safety and efficacy of teeth whitening procedures, presenting them as painless, conservative, and economical practices. However, the meticulous detailing of the steps involved may contribute to a perception that the process is straightforward and risk-free. The use of whitening agents, such as hydrogen peroxide and carbamide, is highlighted, along with different techniques, including whitening strips, splints, in-office procedures, and home whitening kits. Contradictions emerge within this category as well. While some dental professionals recommend home whitening with personalized splints as the best method, others criticize in-office whitening due to the high concentration of bleaching agents and temporary results. The mention of potential adverse effects, such as gingival hypersensitivity and external root resorption, introduces an element of caution. The importance of using materials at permitted doses and for appropriate durations is underscored, acknowledging the potential toxicity and risks associated with teeth whitening agents. Moreover, contraindications, such as pregnancy, breastfeeding, and various dental conditions, are highlighted, aligning with existing literature on the subject [42]. However, the study reveals that the information presented in professional videos aligns with scientific publications, validating the accuracy of these videos. Nevertheless, it is crucial to note the skepticism raised by another study regarding YouTube's reliability as a source of information on teeth whitening [18].

In contrast, the second category involves amateur videos, primarily shared by influencers, individuals documenting personal experiences, and those promoting whitening products. The content in this category is diverse, ranging from collaborative efforts with dentists explaining the bleaching process to the promotion of various whitening products. However, a concerning subset involves the promotion of recipes using ingredients like baking soda, water, and lemon, suggesting an unregulated approach to teeth whitening. These amateur videos often prioritize personal experiences over professional advice, potentially fostering unrealistic expectations and false impressions. The allure of at-home remedies and product promotions, driven by influencers, raises concerns about the safety and effectiveness of these approaches. The significant difference in viewership numbers between professional and amateur videos underscores the public's preference for personal narratives and relatable content over scientifically accurate information [7]. This shift in information consumption patterns on social media platforms like YouTube is reflective of a broader trend in the rise of social media as a dominant source of information [2].

As derived from our data, the intersection of healthcare and social media presents a complex landscape, offering healthcare professionals, including those in dentistry, both opportunities and challenges [23]. In the digital age, professionals are using platforms like Twitter, Facebook, and Instagram for enhanced communication, brand promotion, and education [24]. Moreover, recognition of social media's value in career amplification is growing among physicians, including dentists [15]. Scholars utilize further these platforms for academic activities, promoting collaboration and knowledge

sharing [26, 27]. Despite potential pitfalls, social media remains a powerful tool for healthcare professionals, including dentists, striking a balance between engagement and ethical considerations noting positive and negative effects [45]. As technology advances, vigilance in upholding professionalism is essential.

This study emphasizes the need for discernment in the field of professional and amateur dental content on YouTube. Nonetheless, the evolving landscape of information dissemination in dentistry requires further research, acknowledging the role of social media influencers [14]. Overall, the juxtaposition of professional and amateur teeth whitening content on YouTube underscores the need for a discerning audience. The popularity of amateur videos suggests a shift in how individuals seek and consume dental information, emphasizing the role of social media influencers. This study may serve as a critical exploration of the implications of social media on dental education and public health, urging further research to navigate the evolving landscape of information dissemination in dentistry for all stakeholders.

### Limitations of the Study

While this study provides valuable insights into the divergent approaches surrounding teeth whitening on YouTube, it is essential to acknowledge its limitations. Firstly, the focus on YouTube as the sole platform for analysis may introduce a bias, as dental information is disseminated across various social media channels. Different platforms may attract distinct demographics and content creators, potentially influencing the nature and tone of teeth whitening discussions. Additionally, the study does not account for geographical and cultural variations that might shape teeth whitening practices and perceptions. Cultural differences and regulatory frameworks could impact the accessibility and acceptance of certain whitening procedures, which the study fails to explore comprehensively. Furthermore, the study primarily distinguishes between professional and amateur videos, overlooking the potential spectrum of content that falls in between. There exists a diverse range of dental practitioners, including general dentists, cosmetic dentists, and oral care professionals, each with unique perspectives on teeth whitening. The study's broad categorization might oversimplify the complexities within the professional domain, missing valuable factors that could influence viewer perceptions. Additionally, the analysis focuses on the content itself but does not search the feedback loop between content creators and viewers, missing an opportunity to understand how viewer engagement shapes subsequent content. Finally, another noteworthy limitation focuses on the dynamic nature of social media trends. YouTube's algorithms and user preferences evolve over time, influencing the visibility and popularity of certain content. A longitudinal future analysis will provide a more detailed understanding of changing trends and their impact on public attitudes toward teeth whitening. Lastly, the study does not address potential conflicts of interest among content creators, particularly in the amateur category where influencers may have financial ties to the products they promote. This oversight is crucial, as it could impact the objectivity and reliability of the information presented, thus influencing viewer decisions regarding teeth whitening practices.

Despite limitations, the study contributes significantly to unraveling the complexities of teeth whitening content on YouTube and gives a comprehensive understanding of the relevant landscape. Future research endeavors should consider a multi-platform approach, incorporate cultural and regional variations, and explore the dynamic interplay between content creators and their audiences to capture a more broad picture of online teeth whitening discourse. They should also explore the impact of social media influences on patient decision-making in the dental context. Investigating the role of cultural factors in shaping perceptions of teeth whitening, as well as assessing the effectiveness of regulatory measures on social media dental content, can further enrich our understanding. Moreover, a longitudinal analysis could track changes in public attitudes and behaviors towards teeth whitening influenced by evolving social media trends.

## Conclusion

In professional videos the dentist can answer in detail every question that arises from the interested party while at the same time documenting or showing each step with scientific and specific knowledge on the subject. In contrast, videos by non-professionals do not, for the most part, fully and correctly inform users. At the same time, on the altar of profit and promotion, they do not hesitate to misinform and mislead by presenting invalid techniques and inappropriate products, some of which even threaten the health of the patient's mouth. According to our study, whitening videos by dentists, although the most reliable in terms of the validity of information, are disadvantaged in terms of audience appeal and preference. Stakeholders prefer videos from influencers or "YouTubers" with questionable validity of information. Given this situation and as the use of social media is growing rapidly with the use of videos occupying the lion's share of public interest, the relevant institutions and dental associations should perhaps plan the professional-level production of scientifically based public information videos, considering the preferences and specificities of dental patients.

## Author Contributions

Conceptualization, M.A.; methodology, M.A.; software, A.S.G., Z.C., and P.T.; validation, P.T., A.S.G., Z.C. and M.A.; formal analysis, A.S.G., Z.C. and P.T.; investigation, P.T., A.S.G., Z.C. and M.A.; resources, P.T., A.S.G., Z.C. and M.A.; data curation, P.T., A.S.G., Z.C. and M.A.; writing-original draft preparation, P.T., A.S.G., Z.C. and M.A.; writing-review and editing, P.T., and M.A.; visualization, M.A.; supervision, M.A.; project administration, M.A.; funding acquisition, M.A. All authors have read and agreed to the published version of the manuscript.

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## Conflicts of Interest

The authors declare no conflict of interest.

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