

Basic Research

Most YouTube Videos About Carpal Tunnel Syndrome Have the Potential to Reinforce Misconceptions

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Abstract

Background Studies of online health information have addressed completeness and adherence to evidence, which can be difficult because current evidence leaves room for debate about etiology, diagnosis, and treatment. Fewer studies have evaluated whether online health information can reinforce misconceptions. It can be argued that information with the potential to harm health by reinforcing unhelpful misconceptions ought to be held to a higher standard of evidence.

Questions/purposes (1) What is the prevalence and nature of health information in YouTube videos with the potential to reinforce common misconceptions about symptoms and treatment associated with carpal tunnel syndrome (CTS)? (2) What factors (such as the number of views, likes, and subscribers) are associated with Potential Reinforcement of Misconception scores of YouTube videos about CTS?

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Methods After removing all personalized data, we searched for the term “carpal tunnel syndrome” on YouTube, reviewed the first 60 English-language videos that discussed the diagnosis and treatment of CTS, and collected available metrics. The primary outcome was the number of statements that could reinforce misconceptions about CTS, rated by two authors using a checklist. As a secondary outcome, we counted the number of statements that could help patients by reorienting or balancing common misconceptions, providing agency, and facilitating decisions, and we subtracted the number of potential misconceptions from this count. A modified version of the DISCERN instrument (a validated scoring system designed to gauge the quality and reliability of health information) was used to evaluate each video. We sought factors associated with the Potential Reinforcement of Misconception score—in both the negative-only and combined (positive and negative) variations—accounting for various YouTube metrics (such as the number of views, number of likes and dislikes, and duration) and the modified DISCERN score. The interrater reliability was excellent for both the Potential Reinforcement of Misconceptions checklist (ICC = 0.97; Pearson correlation [r] = 0.97) and DISCERN information quality score (ICC = 0.96; r = 0.97).

Results Seventy-eight percent of the YouTube videos (47 of 60 videos) contained at least one statement that could reinforce common misconceptions about CTS. The median number of potentially misconception-reinforcing statements was two (range one to three), with the most common statements being that CTS is caused by hand use (38%; 23 of 60 videos) and that splints can alter the natural history of the disease (37%; 22 videos). Videos that were more popular (higher number of views or likes) did not contain less potential reinforcement of misconceptions. In the

multivariable analysis, we found a strong association between the DISCERN score and the CTS Potential Reinforcement of Misconceptions score (regression coefficient = 0.67; 95% CI 0.22-1.2; partial $r^2 = 0.13$; $p = 0.004$) and a lower number of subscribers (calculated per one million subscribers: regression coefficient = -0.91; 95% CI -1.8 to -0.023; $p = 0.045$).

Conclusion Potential reinforcement of misconceptions is prevalent in YouTube videos about CTS, more so in videos with lower information quality scores.

Clinical Relevance Online health information should be held to a standard of accuracy (alignment with best evidence), and where such evidence leaves room for debate, it should be held to a standard by which unhealthy misconceptions are not reinforced.

Introduction

YouTube, a well-known video-sharing platform, is a popular online source of information that has over two billion logged-in users each month [32]. It is a common platform for sharing health-related content [12, 22]. A number of studies have documented inaccuracies in online health information that could cause psychological, financial, and iatrogenic harm [11, 19, 21, 24, 28, 33]. For example, a person might avoid vaccination based on inaccurate information about potential harms [34]. It can be difficult to study information accuracy because current evidence often leaves room for debate regarding etiology, diagnosis, and treatment, and because even accurate information can reinforce unhealthy behaviors. For instance, the notion that an activity that causes symptoms also causes (further) harm (that is, “hurt equals harm”) is a common misconception that is known to increase symptom intensity and activity intolerance [8, 10, 25, 35].

Several examples of debatable information about carpal tunnel syndrome (CTS) are often presented as established facts [1, 5, 20]. For example, YouTube videos that state definitively that CTS is caused by hand use—a concept that is still debated [4]—can reinforce a misinterpretation of symptoms as indicating worsening of the condition, which promotes catastrophic thinking and fear of movement [8, 10]. It can be argued that information that can harm health by reinforcing unhelpful misconceptions should be held to a higher standard of evidence, and that health information should be formulated to move people toward the healthiest accurate interpretation of available evidence [36].

Therefore, we asked: (1) What is the prevalence and nature of health information in YouTube videos with the potential to reinforce common misconceptions about symptoms and treatment associated with CTS? (2) What factors (such as the number of views, likes, and

subscribers) are associated with Potential Reinforcement of Misconception scores of YouTube videos about CTS?

Materials and Methods

Study Design and Setting

We searched YouTube using the search term “carpal tunnel syndrome” on May 1, 2020. The search was performed with a browser set to private mode after the deletion of all cookies and search history to minimize personalization based on user accounts. The displayed results were sorted by relevance, and the first 60 English-language videos that discussed the potential causes, diagnosis, and/or treatment of CTS were reviewed (inclusion criteria). All videos without audio, on subjects other than CTS, on complications of CTS associated with systemic factors such as pregnancy, or without diagnosis and/or treatment information were excluded from the analysis. All duplicates were removed. Videos that had been updated after their initial publication with enhanced animation, but equivalent information, were considered duplicates. Videos uploaded as a multi-part video were counted as a single video. Seven videos were excluded from the analysis. One video was excluded because it discussed cubital tunnel syndrome. Another video was made unavailable to the public before analysis and was excluded. Two were duplicates and one had no audio. One video referenced CTS during pregnancy (that is, it was not specific to idiopathic CTS), and another had been updated with enhanced animation but equivalent information.

The primary outcome was the level of potential reinforcement of misconceptions in YouTube videos about CTS. We created a scoring checklist of statements deemed at risk for potential reinforcement of unhealthy thoughts and beliefs based on current best evidence about idiopathic CTS and cognitive bias [2, 20, 23, 26, 30, 37]. A point was deducted when a video reinforced one of the potential misconceptions on this checklist. The final score ranged from 0 to -12, with lower scores indicating more statements that could reinforce unhealthy misconceptions. We created a second checklist, adding accurate statements with the potential to reorient common misconceptions about idiopathic CTS and a second score in which a point was added for each helpful statement (for example, “[CTS] has a genetic basis”) [20]. This second score ranged from -12 to 12, with higher scores indicating lower potential to reinforce common misconceptions. The lead author of this study (RG) rated all videos according to our scoring checklist, and this process was repeated independently by another author (AEM) to determine the reliability of this scoring system. The interrater reliability was excellent for both the Potential Reinforcement of Misinformation

Table 1. Characteristics of 60 YouTube videos about CTS

Variable	Value
Search rank by relevance	33 (16-49)
Number of days since first uploaded	1197 (513-2581)
Number of views	19,812 (3940-85,946)
Number of average daily views	20 (5.6-112)
Number of likes	178 (30-513)
Number of likes per view	0.0064 (0.0036-0.011)
Number of dislikes	11 (1-33)
Duration in minutes	03:12 (2:01-5:38)
Number of comments	13 (3-35)
Number of subscribers	79,150 (11,500-480,500)
Potential Reinforcement of Misconceptions score ^a	-2 (-3 to -1)
Potential Reinforcement and Reorientation of Misconceptions score ^b	0 (-1 to 1)
Modified DISCERN score	2 (2-3)
Video source	
Healthcare organization (such as a hospital)	45 (27)
Educational health channel	20 (12)
Physical therapist	12 (7)
Physician (that is, private channel)	6.7 (4)
Chiropractor	6.7 (4)
Other (such as news channel, bracing tape advertisement)	10 (6)
Variable	
Reinforcement of Misconceptions: more than 3 points	35 (21)
Reorientation of Misconceptions: more than 3 points	35 (21)

Data presented as median (interquartile range) or % (n).

^aThe Potential Reinforcement of Misconceptions checklist is presented in Table 2; score ranges from 0 to -12, where 0 is the highest achievable score.

^bCombined score of Potential Reinforcement and Potential Reorientation items. The score ranges from -12 to 12, where 12 is the highest achievable score.

checklist (ICC = 0.97; Pearson correlation [r] = 0.97) and information quality score (ICC = 0.96; r = 0.97).

The following explanatory variables were collected: the rank number by relevance, number of days since publication, number of views, number of average daily views, number of likes and dislikes, number of likes per view, duration of the video in seconds, number of viewer comments, and number of subscribers rounded to the nearest thousand (these metrics represent the values collected in May 2020).

We collected information quality scores using a modified version of the DISCERN instrument, originally designed to assess the quality of written consumer health information regarding treatment options [6]. The adapted DISCERN tool allows for the evaluation of video content [13, 31] and contains items such as “are the aims clear and achieved?” and “are additional sources of information listed for patient reference?” The information quality score ranges from 0 to 5, with higher scores representing more reliable and higher-quality information.

Ethical Approval

Institutional review board approval was not required for this analysis of publicly available data.

Statistical Analysis

We performed a descriptive analysis of YouTube engagement metrics, including the number of views, number of likes, and number of dislikes (Table 1). Potential reinforcement and reorientation in the videos was scored based on our checklist, and we report the numbers and percentages. We calculated Spearman rank correlation coefficients to seek factors associated with the Potential Reinforcement of Misconception score—in both the negative-only and combined (positive and negative) variations—accounting for the rank number by relevance, number of days since the video was first uploaded, number of views, number of average daily views, number of likes and dislikes, number of likes per view, duration, number of viewer comments, number of subscribers, and modified DISCERN score. All variables with p values below 0.10 were moved to a multivariable linear regression analysis. Regression coefficients, 95% CIs, standard errors, and p values are reported. All p values below 0.05 were deemed statistically significant. To determine the interrater reliability, two-way random-effects analysis of variance models were constructed, and ICCs for absolute agreement are reported. Additionally, Pearson correlations between the two raters for the misinformation score and DISCERN score were calculated.

Results

Prevalence and Nature of Potential Reinforcement of Misconceptions

Seventy-eight percent of the YouTube videos (47 of 60 videos) contained at least one statement that could reinforce misconceptions about CTS. The most common

Table 2. Potential Reinforcement and Reorientation of Misconceptions checklist

	Potential misconception category	Points	% of videos (n)
Potential reorientation of misconceptions			
Is caused by repetitive motion (such as typing)	A	-1	38 (23)
Bracing is disease-modifying (curative)	A	-1	37 (22)
Exercises are disease-modifying	B	-1	27 (16)
Is an inflammatory process	C	-1	25 (15)
Pain is more prominent than numbness	C	-1	22 (13)
Corticosteroid injections are disease-modifying	A, B	-1	22 (13)
Traditional or alternative treatments are disease-modifying	B	-1	8.3 (5)
Numbness is located in the entire hand (including the small finger)	C	-1	5.0 (3)
Nonsteroidal anti-inflammatory drugs are disease-modifying	A, B	-1	3.3 (2)
Radiography is part of management	D	-1	0 (0)
Surgical release is often unsuccessful	E	-1	0 (0)
Surgical treatment requires prolonged recovery	F	-1	0 (0)
Potential reorientation of misconceptions			
The pathophysiology is median nerve compression in the carpal canal	A-E	+1	57 (34)
The main symptom is numbness or tingling	C	+1	47 (28)
Symptoms occur primarily at night	C	+1	32 (19)
It is idiopathic (has an unknown cause)	A	+1	13 (8)
Can lead to permanent muscle atrophy	E	+1	13 (8)
Typically occurs only in adults	A	+1	10 (6)
It has a genetic basis	A-E	+1	8.3 (5)
Surgery is the only known disease-modifying treatment	A-F	+1	8.3 (5)
Steroid injection is temporary at best	A, B, E, F	+1	3.3 (2)
Neuropathology advances with age	A-F	+1	3.3 (2)
It is eventually bilateral	A-F	+1	1.7 (1)
Reoccurrence after surgery is uncommon	A-F	+1	1.7 (1)

Score ranges from -12 to 12, where 12 is the highest achievable score (least amount of misinformation). A = misconception that activities that cause or reduce symptoms affect pathophysiology. B = misconception that idiopathic median neuropathy of the carpal tunnel can be modified without changing the structure of the carpal tunnel. C = misinterpretation of symptoms contributing to misinterpretation of pathologic findings. D = misconception that this is not a variation of the normal anatomy. E = misinterpretation of symptom resolution versus alteration of the natural history of the disease. F = reinforcement of fear of surgery.

forms of these cognitive biases were the ideas that CTS is caused by hand use (38% of the videos; 23 of 60) and that splints are disease-modifying (37% of the videos; 22 of 60) (Table 2). The most common correct statements about CTS were that the pathophysiology is compression of the median nerve in the carpal tunnel (57% of the videos; 34 of 60) and that the key symptom is tingling or numbness (47% of the videos; 28 of 60). Thirty-five percent of YouTube videos regarding CTS (21 videos) contained more than three notions that could reinforce misconceptions. The median number of potential misconception-reinforcing statements was two (range one to three), and the median score combining potential reinforcement and potential reorientation was zero. Nearly half the videos (45%; 27 videos) were created by reputable healthcare organizations.

Factors Associated with Potential Reinforcement of Misconception Scores

No factors were associated with the Potential Reinforcement of Misconceptions score. For the combined score (both positive and negative points), less potential reinforcement of misconceptions or more reorientation was independently associated with better information quality (higher modified DISCERN scores) (regression coefficient = 0.67; 95% CI 0.22-1.2; $p = 0.004$) and a lower number of subscribers (calculated per one million subscribers: regression coefficient = -0.91; 95% CI -1.8 to -0.023; $p = 0.045$).

Discussion

A number of studies have documented inaccuracies in online health information [11, 19, 21, 24, 33], but it can be difficult to study information accuracy because current evidence often leaves room for debate. Less is known about the degree to which online health information reinforces or reorients potential misconceptions that can arise from the mental shortcuts (heuristics) that humans use to make expedient decisions (cognitive bias), which are helpful for quick decisions (such as in times of danger) [15]. This study of YouTube videos addressing CTS identified a notable number of statements that could reinforce unhealthy misconceptions and relatively few statements with the potential to reorient misconceptions.

Limitations

The following limitations should be considered. First, video metrics such as the number of views and likes will

have changed by the time this paper is published, which might alter the strength of associations but does not affect the primary finding of potential reinforcement of misconceptions. Second, the raters were not blinded to the potential reinforcement and reorientation score because this was infeasible, but the interrater reliability for the checklists and DISCERN scores was excellent. Finally, this study only represents video information of idiopathic CTS shared in the English language. There is evidence of quality issues with patient material in other languages, and we anticipate similar findings of potential misconceptions [7, 14, 16, 27, 29].

Prevalence and Nature of Potential Reinforcement of Misconceptions

The observation that videos about CTS on YouTube usually reinforce harmful misconceptions indicates a need for content developers to employ strategies that anticipate and ameliorate potential reinforcement of misconceptions. This is similar to the evidence from a study of online information about CTS [3] that found limited quality and poor informational value by identifying notable opportunities to be more thoughtful and proactive about misconceptions that could harm health. Studies of YouTube videos addressing other illnesses such as prostate cancer [19], rheumatoid arthritis [31], dialysis [13], hip arthritis [17], and femoroacetabular impingement identified low quality of video material [21] but did not address the potential to improve health by avoiding reinforcement of potential misconceptions or did not take the opportunity to reorient them. To limit the potential of information that could harm health, evidence that links activity to pathologic findings [5] should consider the shortcomings of that evidence, continued room for debate [4], and the potential downsides of reinforcing unhealthy misconceptions with a hasty conclusion or overstatement [8]. The human mind uses mental shortcuts (heuristics) that are helpful for quick decisions (such as in times of danger) [15]. As a result of these heuristics, we are prone to misinterpretation of some types of information—a concept referred to as cognitive bias. Videos that feature potential misconceptions (for example, CTS is pain caused by typing) risk reinforcing worst-case thinking and kinesiphobia—cognitive biases with notable associations with increased symptoms and diminished capability [8, 10, 35]. One aspect of musculoskeletal healthcare is the gentle reorientation of these unhealthy cognitive biases. Nobel Prize-winning science established the importance of cognitive bias in human mentation [15] and the utility of strategies that anticipate cognitive bias (nudge theory) [36]. People with a greater awareness of cognitive bias and a corresponding greater tolerance of uncertainty (among other useful debiasing

strategies) experience less illness (lower symptom intensity) for a given pathophysiology [9]. Therefore, physicians should gently correct misconceptions that may arise from the consumption of online health information. In addition, a previous study found that patients with a lower perceived quality of communication with their physicians were more likely to visit YouTube to seek medical information [18]. This finding, combined with the findings of our study, suggests that people who do not develop trusting relationships with their clinicians are at a greater risk of encountering online health information that reinforces unhealthy cognitive biases.

Factors Associated with Potential Reinforcement of Misconception Scores

The observation that the Potential Reinforcement of Misconceptions checklist has no correlations suggests that video metrics and measure of information quality cannot substitute for a specific evaluation of potential misconceptions. The observation that the combined score of the potential reinforcement or reorientation checklist correlated with the modified DISCERN score suggests that a score that accounts for information that can reorient potential misconceptions has a stronger association with measures of information quality. If a video has numerous views and/or likes, a patient might mistakenly assume that its information is more accurate and less likely to reinforce potential misconceptions. We are under the impression that neither the creators nor the consumers of YouTube videos about CTS are sufficiently aware of the potential for health information to cause harm by reinforcing unhealthy misconceptions.

Conclusion

Our results demonstrated that reinforcement of potential misconceptions about CTS is common in YouTube videos, supporting the notion that there are substantial opportunities to improve awareness of cognitive bias and the influences of cognitive error on health. People seeking care and people providing care can benefit from anticipating and being prepared to gently and incrementally reorient common misconceptions about an illness [4]. The observation that metrics of public engagement with videos about health do not correlate with the potential for reinforcement of misconceptions suggests that these measurements do not protect people from reinforcement of potential misconceptions. Because a noteworthy proportion of patients use the internet to obtain health information [5], it is important for physicians to produce and then guide patients toward

information that anticipates unhealthy misconceptions and guides people to the healthiest possible understanding of their problem. Future studies could measure symptom intensity and activity intolerance after exposure to information that does or does not anticipate potential misconceptions about illness.

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