



A Sentiment Analysis to investigate the sentiment of users on fad diet content on Tik Tok

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Abstract

Obesity has increased significantly in the past few decades. People have utilized social media in order to share nutritional information which enabled them to lose weight. This information includes ‘fad diets’, which are typically described and claimed as quick and easy methods to lose weight, but are not accompanied by robust scientific evidence to support those claims. The weight lost using these diets is imbalanced with metabolic processes and physical activity; and consequently is temporary. Fad diet content creators are motivated to share their weight loss results as a way to grandstand and provide guidance, to obtain vindication and to connect with like-minded individuals who have achieved similar results using the same fad diet, and to obtain followers. The objective of this study was to find if the fad diet content on Tik Tok could influence adolescent users. The study utilized a sentiment analysis and analyzed 250 TikTok comments from five different popular fad diet hashtags. Ten comments were selected from each video with 5 Tik Tok videos being selected for each hashtag. The hashtags selected originated from the greatest number of views. An inclusion criterion was created in order to reduce the number of skewed data. The study found that 50.8% of comments were overwhelmingly positive and generated positive reactions, 33.6% of comments were overwhelmingly negative and generated negative reactions, and 15.6% of comments were neutral and generated neutral reactions. Followers of fad diet content are generally adolescents, who are receptive to suggestion, insecure about their body image, want fast results and generally cannot distinguish between anecdotal and scientific evidence. The negative impact and detrimental effects of fad diet content can therefore be easily permeated and disseminated using the large reach of this social media platform throughout this susceptible audience.

Keywords

Sentiment analysis, TikTok, Fad diet, Obesity, Social media, Ketogenic diet, Mediterranean diet, Vegan diet, Atkins diet, Detox diet

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Introduction

Prevalence of obesity

Obesity is a disorder where an individual has “weight that is higher than what is considered healthy for a given height (1). Throughout recent years, the US obesity prevalence rate has increased: from 1999 through 2020, the US obesity prevalence increased from 30.5% to 41.9%. Additionally, during the same time period, the prevalence of severe obesity increased from 4.7% to 9.2% (1). Comorbidities accompanying obesity include heart disease, stroke, type 2 diabetes, and certain types of cancer, which are the leading causes of preventable, premature death (1). There is significant and growing interest in dieting (2) because of the various permutations and combinations of food categories (fats, carbohydrates, proteins, dairy, fiber, minerals, water etc.) that are possible and adoptable at will without needing a physician’s prescription. The results can be easily measured at home by weighing oneself and the permutations /combinations can be readily changed if the weight loss does not meet the dieter’s expectations – therefore the ‘fad’ moniker. Teng et al. found that internet searches related to weight loss increased significantly from 2004 to 2018 (3). These people believe that adopting these diets into their lifestyle is their way to solve their long term problems of weight and body image. However, the fad diets that are prevalent on social media as a means to reverse or prevent obesity exploit users by often encouraging un-natural eating habits in order to meet unachievable body images (4).

Fad diets

A fad diet is a weight loss plan that utilizes specific nutritional content in order to lose weight rapidly (2). These diets have frequently

not been rigorously scientifically researched, and end up providing followers with less calories and nutrients, or with unhealthy and unnatural ratios of food groups, or macro-to-micronutrients, with unpredictable, deleterious metabolic consequences; which may include weight-loss (2). Although not all fad diets may be downright unhealthy, the potential long term consequences of these diets are still not clear (2). In social media, fad diets are popularized, influencing individuals to partake in them to improve their body image or to prevent obesity. This has caused a large base of users to have disproportionate exposure to an equally large number of influencers and weight/food related content. This in turn causes individuals to be “at risk of having internalized body image and disordered eating behaviors” (5). Interacting with this type of content also causes individuals to develop a glorification of weight loss, causing them to resort to “maladaptive measures [such as] very restrictive diets, use of laxatives, [and] voluntary induction of vomiting” (4). A large number of users and followers of such diets are adolescents and/or children. These younger audiences are more susceptible towards developing eating patterns due to peer pressure and trying to fit in with society’s image of a perfect body (6). They want to obtain the ideal body image that is glorified on social media. If they cannot, it leads to feelings of inferiority, depression, and low self esteem (7). Additionally, these methods of losing weight rapidly have been correlated with many health risk factors such as heart disease, cancer, diabetes, increased LDL cholesterol as well as reduced muscle and energy (8,9). All of these factors contribute to the high number of deaths correlated with eating disorders, being highlighted as the second leading cause of death by the Eating

Disorders Coalition (10). The negative implications of fad diets on social media usage like Instagram and Snapchat are well documented. However, less is known about how and to what extent these fad diets negatively influence adolescents on the social media app, Tik Tok.

Tik Tok

There are currently ~ 150 million users on Tik Tok (11). In a survey conducted by Pew Research, ~ 63% of teenagers ages 13 to 17 in the United States have reported using Tik Tok. 78% of those same teenagers in the same demographic have also reported utilizing Tik Tok several times a day or almost constantly (12). With Tik Tok being a large part of a majority of teenagers' lives in the United States, these teenagers constantly interact with the variety of content available on this platform. This variety includes the popular rise of nutritional and health content specifically regarding fad diets. These videos typically accumulate ~ millions of views with most pushing unhealthy eating habits onto their audience. Examples include #keto – 13 billion views, #detoxdiet – 20 million views, and #mediterraneandiet – 243 million views.

Objective of research

Several studies in the public domain demonstrate a negative correlation between fad diets and users' health. However, there is considerably less research and information available on how exactly users perceive this type of content on the social media app, Tik Tok. In an attempt to determine the perception of Tik Tok users on fad diet content, this study utilized a sentiment analysis in order to understand the reactions of users by analyzing their comments. It is important to understand

how these users react towards fad diet content on social media in order to obtain a better understanding of the impact that these fad diets can have. Oh et al. found that depending on the polarity of the sentiment of users, the propensity to share content increased. Consequently, the interactions of users with fad diet content increased (13). Additionally, the general view of fad diets can be identified in order to find if there is a constant positive reinforcement of these dietary patterns, which can lead to more users adopting these potentially harmful diets (14). This research collected 250 comments from 5 popular fad diet hashtags on Tik Tok and determined the tone/reactions of these comments using a sentiment analysis.

Five Fad Diets

The five fad diets that were investigated were the Atkins, Ketogenic, Mediterranean, Vegetarian, and Detox diet. The Atkins diet, it is a diet that consists of low carbohydrates to achieve weight loss. It primarily focuses on consuming fats and protein, consisting of foods like fish, meats, and avocados (15). The Ketogenic diet, focuses on low carbohydrates and high amounts of fats to achieve a state of ketosis. The diet included fats like avocado, yogurt, and coconuts (16). The Mediterranean diet focuses on consuming food in countries that surround the Mediterranean Sea. Specifically, it focuses on healthy food, emphasizing healthy fats, plant-based food, and proteins such as olive oil, nuts, or fish (17). The Vegetarian diet consists solely of consuming plant-based foods, including fruits, vegetables, and nuts (18). The final diet, the Detox diet is a diet that focuses on removing the toxins from the body through consuming liquids like smoothies, broths, or water (19).

Methods

In social media apps, hashtags are used to classify videos into certain categories. In Tik Tok specifically, content creators incorporate hashtags in the videos they create in order to categorize their content through a word or phrase. In this study, in order to collect the comments of users specifically directed toward fad diet content, hashtags were collected based off of popular fad diets that are present on Tik Tok. These popular fad diets were based on Aaiza Tahreem's study, a researcher in the National Institute of Food Science and Technology (2). These fad diets which were all promoted to be a quick way to lose weight include the Atkins, Ketogenic, Mediterranean,

Vegetarian, and Detox Diet. A total of five hashtags were collected. These hashtags were then based off of the most popular hashtags on the search bar in Tik Tok. Each fad diet was written into Tik Tok's search bar and the hashtag with the most total views were included for video collection. Only one exception was made, which was the Atkins Diet hashtag since the videos listed on the hashtag were in different languages. In this case, the second most viewed hashtag was utilized instead, since English was primarily the main language to be utilized in these videos to understand the context of the video, comments, and to be able to cross-check the analyses.

Table 1. List of fad diet hashtags

Fad diets	Hashtags	View count (M, million. B, billion)
Atkins Diet	#atkinsdiet	10M
Ketogenic Diet	#keto	13.1B
Mediterranean Diet	#mediterraneandiet	243.3M
Vegetarian Diet	#vegetariandiet	7.2M
Detox Diet	#detoxdiet	19.7M

After collecting the hashtags, a random selection method was then utilized in order to select ten videos from each hashtag. The random selection was utilized on Google and had a range from 1 through 100. A total of 5 videos were collected from each hashtag, totaling up to a total of 25 videos from all five hashtags. However, a challenge that existed with the hashtag feature was that often videos that were tagged with a hashtag did not discuss the topic of the hashtag. Users would either include plenty of hashtags in their videos where they would not discuss the entirety of the

hashtags or include a few to reach out towards specific audiences, or incorporate the wrong hashtags. In order to circumvent this problem, only those videos were selected whose hashtag language fit into the codes developed by Marisa Minadeo (Table 2). In her research, Minadeo developed codes for food, nutrition, and weight-related posts that were popular on TikTok. This type of content forms core aspects of the fad diet content. When collecting the videos, a code from Minadeo's research had to match the video chosen. For example, if there was a video about the Keto diet, where

the content creator discussed a recipe from the Keto diet, this would match with the “Food” code. This would mean that the video would be suitable to collect comments for analysis. Additionally, another requirement for video selection was that the video needed to have > 10 comments.

Table 2. List of codes from Marisa Minadeo

Codes	Definitions
Nutritional Advice	Creator provides nutrition guidance or beliefs
Food	Food is present in video
Body Image	Body image is discussed or portrayed in the video
Health	Video contains the hashtag health or the creator discusses a health behavior
Diet	Portrays or references a diet such as keto, paleo, intermittent fasting, weight watchers, Atkins, etc.
Eating disorder promotion	Video glorifies an eating disorder or gives strategies for perpetuating the eating disorder
Eating disorder recovery	Video shows recovery steps or encourages recovery from an eating disorder
Health halo	A food is glorified for its health qualities such as salad or granola
Calories	Creator mentions calories
Weight loss	Creator mentions weight loss
Physical activity	Video portrays or mentions physical activity including dance
Weight Bias/Fat Stigma	Video explicitly combats weight bias/fat stigma by explaining the negative impacts of weight bias, or how to stop bias towards fat people and weight gain from occurring Video perpetuates weight bias/fat stigma by displaying dislike or assigning negative attributes towards fat people or gaining weight.
Culinary Instruction	Video teaches viewers how to make a recipe

Once all 25 videos were collected from the five hashtags, ten comments were selected from each video. These comments were again selected by a random selection process, where the range included 1 to $X > 10$ (the number of comments on the video exceeding 10). Similar to the video selection, a challenge that was often encountered when searching for comments was that there existed irrelevant comments which provided no information about the users’ input. These comments included random phrases completely irrelevant to the videos (Examples included: “I farted,” “.” and “ketogenicdiet24”) or a mention of other users. If these comments were encountered when utilizing the random number generator, that particular comment was skipped. Additionally, comments embedded as comment threads were not considered because comments in these threads would generally be expected to follow the same polarity as the first or originator comment. Thus, all the comments analyzed were “first comments,” being the first comment that started a thread.

Table 3. Number of views per video (K=thousand, M=million)

-----	Video #1	Video #2	Video #3	Video #4	Video #5	All Videos
Keto	1.2M	62.7K	454.5K	327.9K	248.6K	2.3M
Atkins	343.7K	2974	10.7K	112.8K	79.5K	549.7K
Mediterranean	556K	13.2K	235.8K	3.6M	3.4M	7.8M
Vegan	166.6K	662.8K	82.4K	704.5K	96.8K	1.7M
Detox	132.9K	2.5M	831.8K	99.6K	1.1M	4.7M
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Subsequent to all the 250 TikTok comments collected from the 25 videos, these comments were then inserted into MeaningCloud. MeaningCloud is a text analytic software that includes a variety of application programming interfaces or APIs that allow for analysis of different texts (20). The application that was utilized in MeaningCloud was MeaningCloud's Sentiment Analysis API, which allows for "a detailed, multilingual sentiment analysis on information from different sources" (20). The API operated on each of the comments and sorted them into five different categories: polarity, agreement, subjectivity, confidence, and irony. The polarities generated included seven different values; P+, P, NEU, N, N+, and None (+=overwhelmingly, P=positive, N=negative, NEU=neutral). In order to maximize the most amount of data results, ChatGPT was then utilized to analyze the comments classified as None to re-classify them into one of the different polarities which were the same as the one from MeaningCloud. The version that was utilized was ChatGPT 3.5 and the parameters were all set on default settings. The prompt that was used to classify was "(Comment) Analyze this comment by utilizing a sentiment analysis and categorize it by either P+, P, NEU, N, and N+." Once all the comments were analyzed, a single ANOVA statistical test was run in order to determine if there was any statistical difference between the values of polarity among all of the five fad diets. Subsequently, a Post Hoc Tukey HSD was utilized as well to determine if there were statistical differences in polarity between pairs of fad diets.

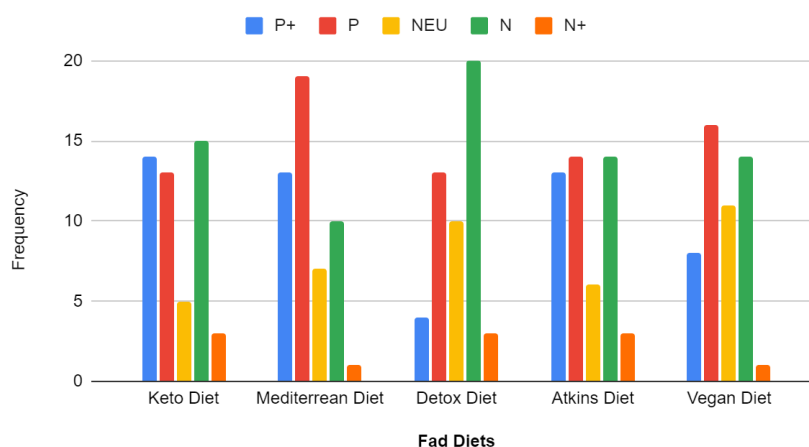
Statistical analysis

Assuming an adolescent population of 42 million, a confidence interval of 95% and a sample size of 250, yielded a margin of error of 6.2%. Therefore, the results obtained could not be more precise than $\pm 6.2\%$, when translating from the sample to the population. Results were assumed to be statistically significant at $p < 0.05$.

Results

Figure 2 shows the frequency of each sentiment for each fad diet. The maximum frequency of P+, P, Neu, N and N+ sentiments can be attributed to the keto, Mediterranean, Vegan, Detox and Atkins diets respectively.

Frequency of the Sentiment of Different Fad Diets

**Figure 2.** The frequency of the sentiment of different fad diets for all of the 250 comments**Table 4.** The numbers of the sentiment of the comments for each of the hashtags for the sample of 250 responses

Fad diets	P+	P	NEU	N	N+
Keto diet	14	13	5	15	3
Mediterranean diet	13	19	7	10	1
Detox diet	4	13	10	20	3
Atkins diet	13	14	6	14	3
Vegan diet	8	16	11	14	1

Table 5. The numbers of the sentiment $\pm 6.2\%$ margin of error of the comments for each of the hashtags adjusted for the entire population of 42 million adolescents

Fad diets	P+	P	NEU	N	N+
Keto diet	13.1, 14, 14.9	12.2, 13, 13.8	4.7, 5, 5.3	14.1, 15, 15.9	2.8, 3, 3.2
Mediterranean diet	12.2, 13, 13.8	18, 19, 20	6.6, 7, 7.4	9.4, 10, 10.6	0.94, 1, 1.06
Detox diet	3.8, 4, 4.2	12.2, 13, 13.8	9.4, 10, 10.6	18.8, 20, 21.2	2.8, 3, 3.2
Atkins diet	12.2, 13, 13.8	13.1, 14, 14.9	5.6, 6, 6.4	13.1, 14, 14.9	2.8, 3, 3.2
Vegan diet	7.5, 8, 8.5	15, 16, 17	10.3, 11, 11.7	13.1, 14, 14.9	0.94, 1, 1.06

Text	Polarity	Agreement	Subjectivity	Confidence	Irony
my mom and dad went on it and they did lose a lot of weight.... however my mom did have to have triple bypass... so healthy	P+	AGREEMENT	OBJECTIVE	100	NONIRONIC
I could never give up carbs - bread and pasta are my fave	P	AGREEMENT	OBJECTIVE	100	NONIRONIC
I ate the snack bars at night when I had gestational diabetes It actually helped my blood sugar levels in the AM	NEU	AGREEMENT	OBJECTIVE	100	NONIRONIC
Somebody I used to work with did it - the smell of broccoli and cauliflower with cheese for breakfast still lingers in my brain	None	AGREEMENT	OBJECTIVE	100	NONIRONIC
I went on Atkins at one time and lost 30 lbs. I'm Southern so all our family events center around good food of all kinds. Lasted about 3 months.	N	DISAGREEMENT	SUBJECTIVE	94	NONIRONIC
I lose 60 pounds in high school, I never really ate Atkins products but it works! Not long lasting though.	N+	DISAGREEMENT	OBJECTIVE	94	NONIRONIC
My mom still tells me to eat these I hate the taste Omg	N	AGREEMENT	SUBJECTIVE	100	NONIRONIC
I think it depends on the blood type, O type is meat, A vegetarian ect. Also anything in the "industry" is for money. We can't win.	N	AGREEMENT	SUBJECTIVE	92	NONIRONIC
Been eating Atkins since 1999. It works	P	AGREEMENT	OBJECTIVE	100	NONIRONIC
ATKINS % WORKS!!!! I've lost over 30 lbs more than once on Atkinsa!	NEU	DISAGREEMENT	OBJECTIVE	94	NONIRONIC

Figure 3. Example of results provided by MeaningCloud for the 50 comments collected in the #AtkinsDiet hashtag. (10 out of 50 Comments Shown)

As shown in Table 4, MeaningCloud analyzed that 13 out of 50 comments presented with an overwhelming positive polarity, 14 out of the 50 comments presented with a positive polarity, 6 comments presented with a neutral polarity, 14 comments with a negative polarity, and 3 comments with an overwhelming negative polarity when discussing the Atkins Diet. Additionally, from the full sample set of Figure 3, MeaningCloud analyzed that 27 out of 50 comments were written objectively, while 23 out of 50 comments were written subjectively. In total there was a 98.24% confidence in the accuracy of the sentiment

analysis of the comments. Overall, the polarity of the comments regarding the Atkins Diet were largely positive. These comments that were deemed positive had an optimist view about the content they had just watched, expressing gratitude towards the content creator. The comments also encouraged and praised the growth of the creator if it was a video about their progress in trying out the diet. From an outside perspective, an individual who watched this video and scrolled through the comments, would be exposed to positive reinforcement.

Text	Polarity	Agreement	Subjectivity	Confidence	Irony
We all tried to tell ya	P	AGREEMENT	OBJECTIVE	100	NONIRONIC
The fact that we tried for AGES TO TELL HER THIS	N	AGREEMENT	OBJECTIVE	100	NONIRONIC
I feel like keto is a temporary fix... long term isn't ideal I couldn't do it	N	AGREEMENT	OBJECTIVE	92	NONIRONIC
I just started my keto journey. Day 3 Week 4 I'm down 16 pounds. To me, this is one of the hardest things I've done	NEU	DISAGREEMENT	OBJECTIVE	94	NONIRONIC
To each their own. Everyone has to find what works for them. For me, Keto saved my life. 5 years and never going back.	P	AGREEMENT	OBJECTIVE	100	NONIRONIC
Even better lettuce wrapped	P+	AGREEMENT	SUBJECTIVE	98	NONIRONIC
I keep forgetting about egg salad !!	NEU	DISAGREEMENT	SUBJECTIVE	94	NONIRONIC
I love egg salad...I wrap it up in a large romaine leaf, same thing with chicken salad... YUM !...	P+	AGREEMENT	SUBJECTIVE	100	NONIRONIC
egg salad is going to be crucial in my diet now	P	AGREEMENT	SUBJECTIVE	100	NONIRONIC
I love pickles! Now I need to try it in egg salad	P+	AGREEMENT	SUBJECTIVE	100	NONIRONIC

Figure 4. Results provided by MeaningCloud for the 50 comments collected in the #Keto hashtag. (10 out of 50 Comments Shown)

As shown in Table 4, MeaningCloud analyzed that 14 comments presented with an overwhelming positive polarity, 13 comments with a positive polarity, 5 comments with a neutral polarity, 15 comments with a negative polarity, and 3 comments with an overwhelming negative polarity out of 50 comments when discussing the Keto Diet. Additionally, from the full sample set of Figure 4, MeaningCloud analyzed that 26 out 50 comments were written objectively, while 34 out of 50 comments were written subjectively.

In total, there was a 98.2% confidence in the accuracy of the sentiment analysis of the comments. Overall, the polarity of the comments regarding the Keto Diet were largely positive. Most comments consisted of a praise of recipes or the progress an individual made throughout their keto journey. These comments added on to the video, telling the creator other alternatives to improve upon the recipes, creating a community in these keto videos of positivity and encouragement.

Text	Polarity	Agreement	Subjectivity	Confidence	Irony
It's just a way of eating...Mediterranean people and Middle Easterners eat this way. It's not a fad or trend. Hope everyone enjoys!	P	AGREEMENT	SUBJECTIVE	100	NONIRONIC
This all just sounds like a normal balanced diet	NEU	DISAGREEMENT	OBJECTIVE	94	NONIRONIC
I didn't realize I have a Mediterranean diet until now	N	AGREEMENT	OBJECTIVE	100	NONIRONIC
mediterranean food is so good	P	AGREEMENT	SUBJECTIVE	100	NONIRONIC
dairy in moderation??? nah we're literally eating yogurt as a side with everything	N	AGREEMENT	OBJECTIVE	100	NONIRONIC

I can get over veggies but I CANNOT do fish or seafood	NEU	DISAGREEMENT	OBJECTIVE	86	NONIRONIC
was recently diagnosed with MS & heard that an “anti inflammatory” diet might ease symptoms, this is very helpful & very organized video!! tysm!	P	DISAGREEMENT	OBJECTIVE	92	NONIRONIC
my favorite diet and after w lot of research also shows great benefits for hormone regulation and endometriosis	P+	AGREEMENT	SUBJECTIVE	98	NONIRONIC
What if you don’t like seafood at all, like won’t eat it. Suggestions? Chicken maybe?	P	AGREEMENT	SUBJECTIVE	100	NONIRONIC
Can you do a video of just cheese. Which ones are good and which aren’t	P	AGREEMENT	SUBJECTIVE	100	NONIRONIC

Figure 5. Results provided by MeaningCloud of the 50 comments collected in the #MediterraneanDiet. (10 out of 50 Comments Shown)

As shown in Table 4, MeaningCloud analyzed that 13 comments presented with an overwhelming positive polarity, 19 comments with a positive polarity, 7 comments with a neutral polarity, 10 comments with a negative polarity, and 1 comment with an overwhelming negative polarity out of the 50 comments when discussing the Mediterranean Diet. Additionally, from the full sample set of Figure 5, MeaningCloud analyzed that 26 out of the 50 comments were written objectively, while 34 out of 50 comments were written subjectively. In total, there was a 98.96% confidence in the accuracy of the sentiment analysis of the comments. Overall, the polarity of the comments regarding the Mediterranean Diet were largely positive. Most of these comments consisted of expressing their love for the food of the Mediterranean diet and their willingness to attempt to try this diet in the future. There were also comments on other messages of positivity, expressing how much their families and themselves enjoyed the food when creating these recipes, setting a positive atmosphere around the Mediterranean dieting community.

Text	Polarity	Agreement	Subjectivity	Confidence	Irony
Pea protein is the best for u. Peas are super nutritious	P+	AGREEMENT	SUBJECTIVE	100	NONIRONIC
What am even supposed to eat then fam	N	AGREEMENT	SUBJECTIVE	100	NONIRONIC
Vegetarianism has made Sikhs weak!!! Please reintroduce jhatja	N	AGREEMENT	SUBJECTIVE	100	NONIRONIC
I live off plant based food lmao	P	AGREEMENT	OBJECTIVE	100	NONIRONIC
Are you a doctor bhaji?	NEU	AGREEMENT	OBJECTIVE	100	NONIRONIC
Can you do soya milk if yes please tag me	NEU	AGREEMENT	OBJECTIVE	100	NONIRONIC
Next pls tag me	NEU	AGREEMENT	OBJECTIVE	100	NONIRONIC
U made me love this	P+	AGREEMENT	SUBJECTIVE	100	NONIRONIC
Pls are you in Accra? I would like to purchase some	P	AGREEMENT	SUBJECTIVE	100	NONIRONIC
Pls what is in the pepper	NEU	AGREEMENT	OBJECTIVE	100	NONIRONIC

Figure 6. Results provided by MeaningCloud of the 50 comments collected in the #vegandiet (10 out of 50 Comments Shown)

As shown in Figure 6, MeaningCloud analyzed that 8 comments presented with an overwhelming positive polarity, 16 comments with a positive polarity, 11 comments with a neutral polarity, 14 comments with a negative polarity, and 1 comment with an overwhelming negative polarity out of the 50 comments when discussing the Vegan Diet. Additionally, from the full sample set of Figure 6, MeaningCloud analyzed that 29 out of the 50 comments were written objectively, while 31 out of 50 comments were written subjectively. In total, there was a 96.86% confidence in the accuracy

of the sentiment analysis of the comments. Overall, the polarity of the comments regarding the Vegan Diet were largely positive. Most of these comments consisted of praise and appreciation about the content they had viewed. Individuals commented about the foods they just saw and mentioned about the overall healthiness of these foods. They also mentioned how these foods made them crave for them and how it made them want to follow through with these diets. Users also expressed their gratitude towards the content creator and urged them to keep sharing more.

Text	Polarity	Agreement	Subjectivity	Confidence	Irony
100% true I found out I had fattie liver and started detox natural Remedies and I've lost 58lb since 7/22♥	NEU	DISAGREEMENT	OBJECTIVE	94	NONIRONIC
The livers job is to detox isnt it	NEU	AGREEMENT	OBJECTIVE	100	NONIRONIC
My trainer made me do blood work before starting anything	P	AGREEMENT	OBJECTIVE	100	NONIRONIC
Do you just drink the smoothie for 6 weeks? And have meals too?	NEU	AGREEMENT	OBJECTIVE	100	NONIRONIC
This! but also focus on your mental health! Not many talk about this, and I lost 80lbs and this was the biggest contributor, and still is!	N	AGREEMENT	OBJECTIVE	100	NONIRONIC
i think detox is just what she calls her ed ♀	N	AGREEMENT	SUBJECTIVE	100	NONIRONIC
She looks tired. So very tired.	N+	AGREEMENT	SUBJECTIVE	98	NONIRONIC
she looks so empty and tired	N	AGREEMENT	OBJECTIVE	100	NONIRONIC
And she's just casually hooked up to a IV during this interview	N	AGREEMENT	OBJECTIVE	100	NONIRONIC
The second anyone says the word detox	N	AGREEMENT	OBJECTIVE	100	NONIRONIC

Figure 7. Results provided by MeaningCloud of the 50 comments collected in the #detoxdiet. (10 out of 50 Comments Shown)

As shown in Table 4, MeaningCloud analyzed that 4 comments presented with an overwhelming positive polarity, 13 comments with a positive polarity, 10 comments with a neutral polarity, 20 comments with a negative

polarity, and 3 comments with an overwhelming negative polarity out of the 50 comments when discussing the Detox Diet. Additionally, from the full sample set of Figure 7, MeaningCloud analyzed that 20 out of the 50

comments were written objectively, while 30 out of 50 comments were written subjectively. In total, there was a 98.52% confidence in the accuracy of the sentiment analysis of the comments. Overall, the polarity of the comments regarding the Detox Diet were largely negative. As the only diet to consist of a largely negative view, most of these comments consisted of questioning the type of content that was watched. The viewers expressed their discontent about the actual nutritional value of attempting this diet and were strongly against trying the Detox diet. They also expressed how the content creator of these videos looked lifeless and tired.

Complete Sample Set

Of the 250 comments analyzed out of the five fad diets, MeaningCloud analyzed 52 comments as presenting with an overwhelming positive polarity (20.8%), 75 comments with positive polarity (30%), 39 comments with neutral polarity (15.6%), 73 comments with negative polarity (29.2%), and 11 comments with overwhelming negative polarity (4.4%) (Figure 8). Additionally, the algorithm analyzed that 128 comments (51.2%) were written objectively, while 122 comments (48.8%) were written subjectively. From all of the comments analyzed, there was an average of 98.16% confidence in the results of the sentiment analysis.

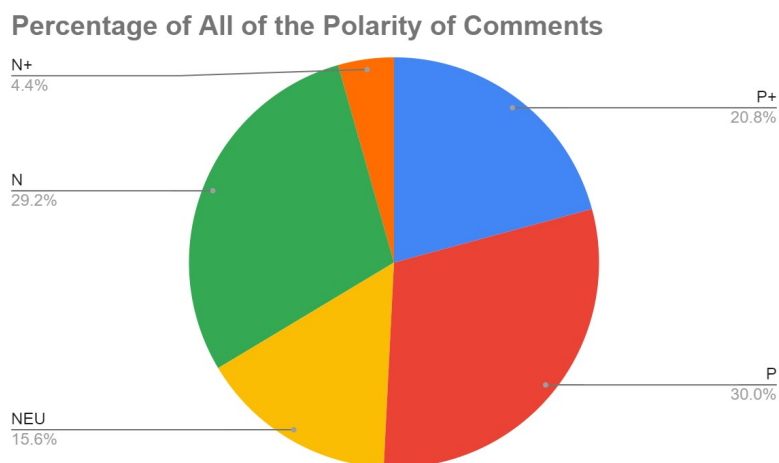


Figure 8. The percentage of all of the polarity of the 250 comments.

Statistical analysis

After collecting all of the responses and implementing MeaningCloud to conduct a sentiment analysis, an ANOVA Single Factor test was run in order to determine if there was a statistically significant difference between the values in polarity among all of the five fad diets. Since only one number for each sentiment category was experimentally

obtained (Table 4), and Table 5 was derived with a 6.2% margin of error for each of the responses across all the categories, there was no heteroskedasticity in the data and Levine's test was not performed. The p values obtained were all $< 1 \times 10^{-5}$, which made the data statistically significant at the 0.05 level. Thus, since the average variability for the different polarities between the five diets was

significantly different than the average diets (Table 6). This implied that the users variability within the (similar categories of) perceived one fad diet to be significantly better different polarities, there was a statistical (or worse) than another. difference between sentiments for different fad

Table 6. The f-ratio and p-value retrieved from the ANOVA statistical test calculations.

Response category	f-ratio	p-value
P+	384.4	$< 1 \times 10^{-5}$
P	79.5	$< 1 \times 10^{-5}$
NEU	265.9	$< 1 \times 10^{-5}$
N	151.3	$< 1 \times 10^{-5}$
N+	471.7	$< 1 \times 10^{-5}$

Table 7. The Post Hoc Tukey HSD calculations for the diets, T₁, T₂, T₃, T₄ and T₅ refer to the Keto, Mediterranean, Detox, Atkins and Vegan diets respectively.

Response category	T ₁ T ₂	T ₁ T ₃	T ₁ T ₄	T ₁ T ₅	T ₂ T ₃	T ₂ T ₄	T ₂ T ₅	T ₃ T ₄	T ₃ T ₅	T ₄ T ₅
P+	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05
P	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05
NEU	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05
N	< .05	< .05	0.15	0.15	< .05	< .05	< .05	< .05	< .05	< .05
N-	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05	< .05

In addition to the ANOVA test, Tukey's HSD the N response category of the Keto-Atkins and (honestly significant difference) was Keto-Vegan diet pairs, there was no statistical calculated. This procedure facilitates pairwise difference between any of the paired diets comparison between the diets and provided across any response categories (Table 7). This information on whether or not there was a again implied that users sentiments (across all significant difference between the sentiment for the categories) significantly differed among any given pair of diets. With the exception of different pairs of diets.

Table 8. The ratio of Positive [$P^+ + P + (NEU/2)$] to Negative [$N^+ + N + (NEU/2)$] sentiment for the different diets derived from Table 4.

Diet type	Keto	Mediterranean	Detox	Atkins	Vegan
Ratio of positive to negative sentiment	1.4	1.6	0.8	1.5	1.4

The NEU sentiments were divided equally among the positive and negative sentiments.

As shown in Table 8, the positive to negative sentiment for all the diets was >1 except for the Detox diet. The Detox diet was hence associated with more negative than positive sentiment.

Discussion

From the sentiment analysis of the 250 comments collected from the five different fad diets, it was evident that there existed a disparity between the polarity of the comments. For all of the comments from all of the different fad diets, the majority of the comments contained a positive polarity, followed by a negative polarity, then a neutral polarity. This finding was reinforced by the p value obtained by the results of the ANOVA Single Statistical Test and the Post Hoc Tukey's HSD calculations.

Depending on the popularity of the fad diet, there was a difference between the polarity of the comments. For example, the Keto Diet, the diet which was associated with the greatest number of views in the hashtag presented with less negative polarity (36%) compared to the Detox Diet (46%), a diet that had a smaller number of views compared to the Keto Diet. These results showed that; in general; the more popular (more posts and views) the diet, the more positive sentiment it generated. This was important to understand because hashtags that contained more posts presented with greater positive sentiment, meaning that there was constant reinforcement of positivity of these fad diets. Most of the comments analyzed consisted of praise and approval of the diets, showing the willingness of the viewers to attempt to try these diets. These users also commented on the overall body of the content creator and recipes, being impressed with the

results and taste. These comments created a positive sense of community towards individuals scrolling through the comments of these videos within these dieting videos (excluding the detox diet). As Zheng et al. found, positive reinforcement has a strong influence on its users, the overall positivity within these dieting communities increased the tendency of users to try these fad diets due to constant positive reinforcement (14). Furthermore, Oh et al. found that the positive sentiment of users increased the tendency of users to share content with other users (13). In relation to the studies performed in this research, the positive sentiment of users regarding fad diet content on Tik Tok is hence anticipated to cause more interaction with this content. All of these factors would lead towards more users developing a negative body image, unhealthy eating habits and increased mental health issues, which are all detrimental health effects that can increase the chance of severe metabolic disability or death (5). The prevalence of inaccurate nutritional information and the lack of understanding of the inaccurate information causes users to adopt unnatural eating patterns with no benefits that harm their overall health (21).

This is especially significant to consider when a majority of the users on Tik Tok are adolescents or children. Compared to adults, these younger audiences are more likely to adopt these eating patterns as they constantly surround themselves with these types of content and have a more desire to fit in with societal norms (4,22). They feel pressured to change their body in order to fit in with the glorified body image that is encouraged on social media (6). Both the mental and physical health of these users decline significantly after

adopting the unhealthy and unnatural eating patterns (2). Users tended to adopt diets that presented with more positive sentiments more readily than they adopted those which presented with largely negative sentiment.

In the Detox diet hashtag (largely negative polarity), users could be found questioning the actual validity of nutritional content that they were presented with. This implied that in regard to content that had a greater negative sentiment, users were more aware and skeptical and questioned the actual validity of the information provided. Example of these comments included “The second anyone says the word detox ” and Distilled water is not for drinking guys!”. This is also represented in the ratio of positive and negative sentiment of all the diets as seen in Table 8. The Detox diet was the only diet with a ratio < 1 , having more negative than positive sentiment, while the other diets all had ratios > 1 .

Considering the < 1 ratio, the Detox diet was one of the diets with the least amount of likes and views. This is important to consider as the diets with the higher ratios all almost had more likes and views than the Detox diet. As users continue to interact with these types of content, not only is the positive reinforcement associated with these diets increased, but the interactions make the TikTok algorithm push this content towards more individuals. With TikTok’s algorithm, being built solely around pushing contents that garners a high amount of likes and views, users are more likely to be exposed to these types of content. This ultimately creates an endless cycle of engagement and positivity that pushes fad diets onto users, leading to unhealthy practices.

In promoting such practices, the influence of TikTok extends beyond individuals’ choices, connecting towards broader public health concerns. From an increased number of eating disorders and body image conflicts among adolescents, to higher rates of obesity and unhealthy dietary practices, Tik Tok plays a role in shaping broader public health concerns. Understanding and regulating age appropriate use of TikTok is a necessity for the benefit of future generations. More importantly, educating adolescents to distinguish between scientific and anecdotal evidence is equally important to debunk and discredit ‘fad’ phenomena; not only on Tik Tok but on social media in general.

Limitations

MeaningCloud, the application utilized to analyze the sentiment of the comments may not be accurate. There was a high accuracy score throughout all the 250 comments, averaging a total of 98.16%, however, the algorithm could have incorrectly analyzed and classified polarity. The comments and the analysis provided by MeaningCloud, did contain some instances when there were discrepancies. In some instances, MeaningCloud provided the incorrect polarity because it was not able to understand the context or discern certain human-like aspects like humor, satire and irony. Similarly to MeaningCloud, ChatGPT has similar challenges. As an artificial intelligence chatbot that utilizes a natural language processing model, it could not pick up on certain human-like linguistic semantic such as irony or understand the contextual meaning of the comments. Additionally, although a random selection and an inclusion criterion was utilized for analysis, comments from users varied from all different levels of

experience; ranging from the inexperienced to experienced. A person inexperienced would be an individual with no prior knowledge of fad diets or someone who had never incorporated one in their life. A person experienced would be an individual who had tried the fad diet prior to watching the video. Most comments out of the 250 comments seemed to originate from more experienced than from inexperienced individuals, which could have had an effect on the polarity. This was mostly demonstrated by the prevalence of questions left by inexperienced users, which provided a more neutral polarity. Experienced users; on the other hand; generally tended to always lean towards a positive or negative polarity due to already having incorporated some of these eating habits in their lifestyle. All of these factors overall could have skewed the results of the research process due to the fact that if all of the comments selected for a video generally consisted of inexperienced users, the polarity would be more neutral, only accounting for one side of the audience. While for the other side, if the comments consisted of only experienced users, the polarity would shift towards either a positive or negative polarity.

Assuming 42 million adolescents, the target sample size needed in order to obtain results with 95% confidence and a margin of error of 0.064 was calculated at 250. Therefore, the study could only analyze at a margin of error of $\pm 6.4\%$. This did not pose a large enough limitation however, since the ANOVA p-values were still orders-of-magnitude below 0.05. The pair-wise diets also presented with p-values of $< .05$, with the exception of one response category for two diet pairs (Table 7).

Conclusion

This research found that out of 250 TikTok comments collected from 5 different fad diet hashtags, around half of the users demonstrated a positive polarity, one third of users presented with a negative polarity, and $\sim 15\%$ of users presented with a neutral polarity. These results show that the collective view of fad diet content on TikTok is generally positive. Additionally, the p-value obtained from the ANOVA Single Factor Statistical Test provided evidence that the data from the sentiment analysis was statistically significant, thereby reinforcing the polarity found among the TikTok comments. It is therefore concerning that the copious fad diet content on TikTok is perceived as positive despite there being no scientific evidence. The content hence poses detrimental health risks for impressionable adolescents. The young audience that interacts with this content that struggle to maintain their body weight and strive for the body image that social media promotes are frequently engaging and sharing media to other users. This has an end result of not only harming themselves, but also other users, exacerbating the influence these fad diet videos have on TikTok.

This work provided data on the sentiment analysis of TikTok comments on fad diet videos. Since the sentiment generally was more positive than negative for most diets, younger users on TikTok were more likely to be vulnerable to the influence of fad diet content. Future work and action to address this challenge may include State or Federal level informational moderated content embedded in the most viewed TikTok sites about the credibility of content creators, posting scientific studies regarding fad diet content or fact checking recipes. Another way to expand

on this research would be to utilize human analysis rather than relying on AI or other text analysis tools in order to obtain more accurate results from the sentiment of users. Performing this work with a lower margin of error may be able to provide clearer results and increase the reliability of the findings.

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