




User engagement with a popular food brand before, during and after a multi-day interactive marketing campaign on a popular live streaming platform

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Abstract

Objective: To assess viewer engagement of a food advertising campaign on the live streaming platform Twitch.tv, a social media platform that allows creators to live stream content and communicate with their audience in real time.

Design: Observational analysis of chat comments across the Twitch platform containing the word ‘Wendy’s’ or ‘Wendys’ during a 5-day ad campaign compared with two 5-day non-campaign time periods. Comments were categorised as positive, negative or neutral in how their sentiment pertained to the brand Wendy’s.

Setting: Twitch chatrooms.

Participants: None.

Results: There were significantly more chatroom messages related to the Wendy’s brand during the campaign period. When considering all messages, the proportion of messages was statistically different ($\chi^2 = 1417.41$, $P < 0.001$) across time periods, with a higher proportion of neutral and positive messages and a lower proportion of negative messages during the campaign compared with the comparison periods. Additionally, the proportion of negative messages following the campaign was lower than before the campaign. When considering only positive and negative messages, the proportion of messages was statistically different ($\chi^2 = 366.38$, $P < 0.001$) across each time period with a higher proportion of positive messages and a lower proportion of negative messages during the campaign when compared with the other time periods. Additionally, there was a higher proportion of positive messages and a lower portion of negative messages following the campaign when compared with before the campaign.

Conclusions: This study demonstrates the impact and sustained impact of a fast-food brand ad campaign on brand engagement on the live streaming platform Twitch.

Keywords
Food marketing
Twitch
Streaming
User engagement
Digital marketing

Social media has expanded the marketing landscape by creating new methods and opportunities for companies to reach their audience. Food advertisements across a variety of entertainment platforms typically feature energy-dense, nutrient-poor foods⁽¹⁾ and exposure to this type of advertising has been associated with poorer dietary behaviours and an elevated BMI in young people^(2–4). The advent of social media has increased the presence of advertising, particularly among youth⁽⁵⁾. Similar to food marketing in offline contexts, online marketing has been shown to have adverse health and

behavioural consequences⁽⁶⁾. For example, exposure to food brands online has been associated with a higher consumption of unhealthy foods and beverages in adolescents⁽⁷⁾. A relatively new form of marketing that has become increasingly popular is influencer marketing, in which popular content creators work with brands to endorse and promote targeted products to their audiences⁽⁵⁾. Similar to traditional food marketing, the foods advertised by these influencers are commonly high in fat, sugar and salt⁽⁸⁾. Additionally, the use of influencer marketing to push these types of foods has also been

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shown to significantly increase the consumption of them, particularly in children^(8,9).

Live streaming platforms are hybrid digital platforms that combine social media and live entertainment content. The platforms rely on community-generated live audio-video content, colloquially known as streams, alongside live chatrooms. The live chatrooms serve as a way for audience members to communicate with the streamer and other audience members. This combination of live video and chat allows for real-time interaction between the content creators, known as streamers and their viewers⁽¹⁰⁾. It is important to note that streamers are typical community members who enjoy making content for others in the community, some of which may reach celebrity-type status within the community. Further, the live interaction between the creator and the audience allows the audience to engage in and become a part of the experience, building a sense of community⁽¹⁰⁾. Previous work has suggested that this interaction between user and streamer removes inherent barriers, which may make advertising on Twitch more acceptable compared with other online media outlets such as YouTube^(11,12). Further, one study has shown that engaging with digital marketing significantly increases the consumption of the advertised item⁽¹³⁾. In addition, the study found that exposure to digital marketing alone did not significantly increase consumption, exemplifying the important role engagement can have on consumer behaviour⁽¹³⁾.

Major live streaming platforms have experienced substantial growth in recent years. For example, it is estimated that 7.5 billion hours of content was streamed across all live streaming platforms in 2020, a 91.8% growth from the same time period of 2019⁽¹⁴⁾. Twitch, YouTube Gaming and Facebook Gaming are currently the major three live streaming platforms, with Twitch accounting for 65.8% of the hours watched, YouTube Gaming accounting for 23.3% and Facebook Gaming accounting for 10.9%⁽¹⁵⁾. Similarly, food marketing on these platforms has been steadily increasing and was shown to accelerate substantially during the COVID-19 pandemic⁽¹⁶⁾. Overall, the large reach and interactive nature of these platforms make them prime outlets for food marketers.

The live nature and unique content produced on live streaming platforms are a distinctive opportunity for food marketing due to the variety of advertising techniques (e.g. video and static ads, endorsement and product placement) that can be used simultaneously⁽¹⁷⁾. Twitch claims that 64% of viewers purchase the products that are recommended to them by their streams⁽¹⁸⁾. Advertising techniques used on Twitch have been associated with increases in a product's perceived trustworthiness, attractiveness and purchase intention^(19,20). This has implications for food marketing as the majority of food advertised on Twitch is for energy-dense, nutrient-poor items, such as processed foods, candies and energy drinks⁽²¹⁾. Further, fast-food companies, such as Wendy's, are commonly advertised on Twitch^(16,22). This unhealthy food environment is also

of increased concern, given that the users of these platforms are largely adolescents and young adults who are developing lifelong habits related to diet and health^(18,23). While it is clear that marketing, specifically energy-dense, nutrient-poor food products, is prevalent on Twitch, there is no literature regarding how the audience interacts with this marketing in real time.

Given the unique interactions that occur between streamers and their audience during ad campaigns, we aimed to assess the impact of one targeted food marketing campaign on user engagement. We hypothesised that this targeted food marketing campaign would result in significantly more brand engagement with the advertised fast-food brand. We chose to measure this engagement by quantifying the use of the Wendy's brand name in the live chatrooms during the campaign period. We also identified two comparison periods, before and after, in order to be able to determine the magnitude of the campaign on engagement. We specifically hypothesised that there would be significantly more positive comments made by viewers regarding Wendy's and significantly fewer negative comments during the campaign period compared with both before and after comparison periods. Additionally, we hypothesised that the increased positive brand engagement and decrease in negative engagement due to the campaign would persist into the week following the campaign.

Methods

To analyse user engagement with a food marketing campaign on a live streaming platform, we selected a 5-day ad campaign run by the popular fast-food brand Wendy's that they titled 'Never Stop Gaming'. The 'Never Stop Gaming' campaign involved five major Twitch streamers and was conducted over 5 days in December 2020. During sponsored periods, streamers would display custom Wendy's brand logos on their stream. In addition, pre- and mid-stream video advertisements ran targeted Wendy's ads highlighting the streamers themselves who appeared in the ads with customised meals that they had designed (Fig. 1). The streamers would also order custom 'streamer branded' meals at some point during the stream and would consume this custom meal live, encouraging their audience members to follow their example. In short, logos were consistently present on the screen, and the streamer's conversation revolved heavily around the marketing campaign during the sponsored period. Uber Eats was also associated with the campaign but served as the delivery method for audience members to acquire Wendy's products and was not promoting other food products in competition with Wendy's on Twitch and was therefore not considered in our analysis.

We specifically chose to analyse this Twitch campaign as Twitch has the largest live streaming audience of any live streaming-specific platform.¹² Given the high prevalence of

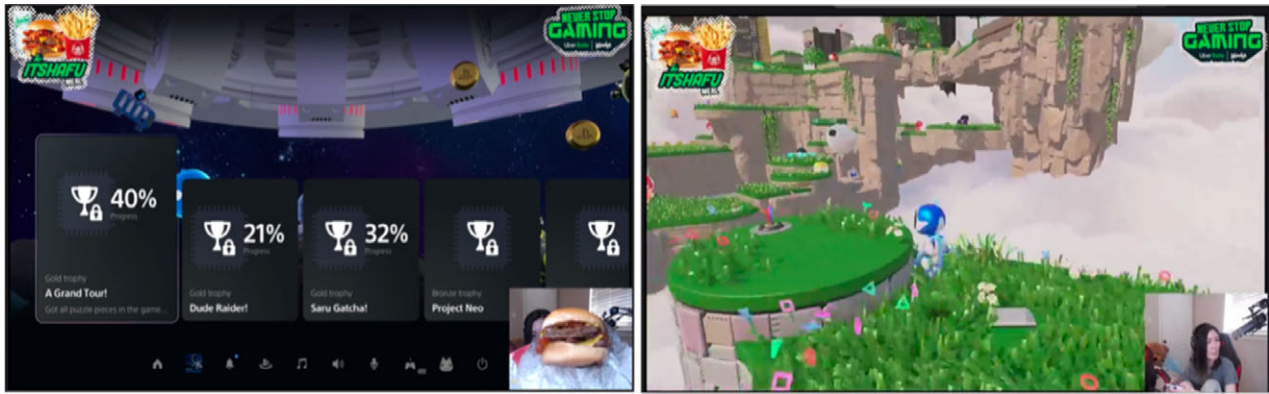


Fig. 1 Example of overlay logos during the ad campaign

nutrient-poor, energy-dense foods marketed on Twitch, we chose to analyse the Wendy's campaign, as Wendy's is often marketed on Twitch and Wendy's has its own Twitch channel. In addition, the campaign ran during a time when the researchers were able to watch the streams and collect the required data. Further, the campaign utilised multiple advertising techniques simultaneously, which exemplified the unique advertising opportunity available on live streaming platforms.

To assess the effect of the campaign, we used the online analytics platform Stream Hatchet™ to pull anonymised archived messaging data as well as total viewership hours of the streams participating in the Wendy's and Uber Eats campaign. The anonymised archived messages were publicly displayed chatroom messages that were sent live during the stream and were able to be seen by anyone watching the stream or who watched archived footage of the channel. All channels allowed all audience members to type in the chat during the campaign period.

After all time periods of interest had passed, data pulling was done via a Python 3 Script implementing the Selenium package. The code used to pull the chatroom messages and hours watched is available at <http://github.com/caitylnewards/twitch>. The messages were pulled from all chatrooms across the Twitch platform, including those not associated with the campaign, during the time periods of interest that contained at least one of the search terms. The search terms used for the analysis are described below. All messages sent in any chatroom that contained a search term were pulled throughout the duration of the 5-day campaign (Tuesday, December 8th–Saturday December 12th, 2020). For comparison purposes, the same message and viewership data were also pulled from two non-campaign time periods, the same 5 days of the week 1 week before (Tuesday, December 1st–Saturday December 5th) and 1 week following the ad campaign (Tuesday, December 15th–Saturday December 19th, 2020). To understand the sentiment of viewer engagement with the ad campaign, the pulled comments were categorised as positive, negative or neutral. Criteria for the categorisation of each comment are described below.

Message search terms

As the purpose of this analysis was to assess direct sentiment and engagement with the fast-food brand marketed, chatroom messages containing the word 'Wendy's' or the common misspelling 'Wendys' were pulled from the larger database of chatroom messages. To ensure all messages were interpreted correctly, messages were only included if they were written in the English language. We did not analyse the audience engagement with Uber Eats as it served only as a delivery service within the context of this campaign.

Data collection period viewership check

To ensure that the actual campaign period was captured, we assessed the number of aggregated hours watched (total hours of content viewed for each unique user) of any stream which contained the words 'Wendy's' or 'Wendys'. The raw number of hours watching from the three time periods was compared.

Chatroom message categorisation

Chatroom messages were scored twice independently by two research assistants to indicate if the message was generally positive, negative or neutral towards the Wendy's brand. To accomplish this, specific standards were developed by the study team. In general, messages were regarded as positive if they endorsed the consumption or purchase of the Wendy's brand or of Wendy's food (e.g. 'I'm getting Wendy's breakfast today', 'I love eating Wendy's food', 'The Wendy's four for four is a good deal') or used a positive adjective to describe the Wendy's brand or food (e.g. 'Wendy's is cool', 'Wendy is top tier'). Messages were regarded as negative if they spoke poorly of the Wendy's brand or Wendy's food in any way (e.g. 'Wendy's is terrible', 'I got food poisoning from Wendy's', 'I hate Wendy's food', 'Wendy's is too expensive'). Messages were deemed to be neutral if there was not enough context to determine the intention behind the statement (e.g. the common spamming of the word 'Wendy's' in response to a steamer request), or if it was



used to trigger information related to the ad campaign (e.g. 'Wendy's', another common request on Twitch). Emotes, emoticons and other graphic elements on Twitch, if included in a message with a search term, were also considered in the analysis. These elements were classified by the researchers beforehand as to which category (positive or negative) it would fit within (e.g. smiley faces were considered positive and frowny faces were considered negative). Any conflicts in scoring were resolved by a third investigator but this only applied to 6.9% of messages.

Data analysis

To assess viewership hours before, during and after the campaign descriptive statistics were derived, including percent differences between time periods, for hours watched with 'Wendy's' or 'Wendys' present in the stream title. To broadly assess whether the total number of messages from Twitch chatrooms containing the words 'Wendy's' or 'Wendys' differed between campaign time periods (before, during and after), a one-way chi-square test was used. An additional one-way chi-square test was used to broadly compare the total number of messages between each type of message (positive, negative and neutral). Subsequently, a comprehensive 3×3 chi-square test was employed using the three time periods (before, during and after) and the three message categories (positive, negative and neutral) to evaluate if the proportion of messages between each of the categories was different across the three time periods. Since there was a substantial increase in neutral messaging during the campaign period, a follow-up 3×2 chi-square test was conducted using only the positive and negative message categories across the three time periods to assess changes in the proportions of these specific types of messages specifically in relation to each other.

For all significant chi-square tests, follow-up post hoc pairwise post hoc analyses were conducted using Bonferroni corrected P -values of < 0.05 to determine which cells differed significantly from the expected counts. Raw viewership hours for stream titles containing 'Wendy's' or 'Wendys' during each time period are also reported to demonstrate differences in brand exposure for each of the time periods. All data was analysed using SPSS Statistics (version 27.0.1.0) with an a priori P -value of $P < 0.05$.

Results

Overall hours of viewership on Twitch

Before the campaign, there were 257 h watched of streams containing the word 'Wendy's' or 'Wendys' in the title, during the campaign there were 1 433 645 h watched, and after the campaign, there were 542 h watched. Therefore, there were 5578.39% more hours watched during the campaign compared with before and 2645.10%

more hours watched during the campaign compared with after. When comparing the before and after periods, there were 2.1 times more hours watched under these titles after the campaign than before the campaign.

Overall engagement

There were significantly more messages during the campaign period *v.* the non-campaign periods ($\chi^2 = 28\,688.71$, $P < 0.0001$). When evaluating differences in messages by message tone (positive, negative, neutral), collapsed across all time periods, there were statistically more ($\chi^2 = 52\,798.88$, $P < 0.001$) neutral messages than would be expected compared with positive and negative messages. There were 3.19 times more messages during the ad campaign compared with the week before and 2.95 times more messages than the week after. The week after experienced 1.08 times more messages than the period before. Raw counts of messages can be seen in Table 1.

Positive, negative and neutral engagement between time periods

There were 2.54 and 2.32 times more positive messages during the campaign compared with before and after the campaign, and there were 1.10 times more positive messages following the campaign compared with before the campaign. Total message counts for positive messages across the three time periods are presented in Table 1. There were 1.11 and 1.25 times more negative messages during the campaign compared with before and after the campaign, respectively, and there were 1.12 times more negative messages before the campaign than after. Total negative message counts are presented in Table 1. There were 3.76 and 3.46 times more neutral messages during the campaign compared with before and after, respectively, and there were 1.09 more neutral messages after the campaign than before. Total message counts for neutral messages are also presented in Table 1. When considering the proportion of messages, there were statistical differences across time periods ($\chi^2 = 1417.41$, $P < 0.001$). The proportion of neutral messages was higher during the campaign (ad hoc analysis, Bonferroni corrected $P < 0.05$) compared with the other two time periods. The proportion of positive messages was also statistically higher (ad hoc analysis Bonferroni corrected $P < 0.05$) during the campaign compared with before or after the campaign. Results are summarised in Table 1 and visualised in Fig. 2.

When considering only positive and negative messages, the proportion of messages was statistically different ($\chi^2 = 366.38$, $P < 0.001$) across each time period, with the highest proportion of messages being positive during the campaign (ad hoc analysis Bonferroni corrected $P < 0.05$) and the highest percentage of negative messages observed before the campaign (ad hoc analysis Bonferroni corrected $P < 0.05$). Table 2 summarises the chi-square tests across time periods when only considering positive and negative

Table 1 Chi-square results for each tone across each time period

	Observed before		Observed during		Observed after		Chi-square	P-value
	n	%	n	%	n	%		
Positive	5427	33.3 _a	13 810	26.6 _b	5955	33.9 _a	1417.41	<.001
Negative	1006	6.2 _a	1116	2.1 _b	894	5.1 _c		
Neutral	9853	60.5 _a	37 089	71.3 _b	10 733	61.0 _a		
Total		16 286		52 015		17 582		

Lowercase letters denote significant differences from the ad hoc pairwise post hoc analysis with a Bonferroni adjusted *P*-value of < 0.05.

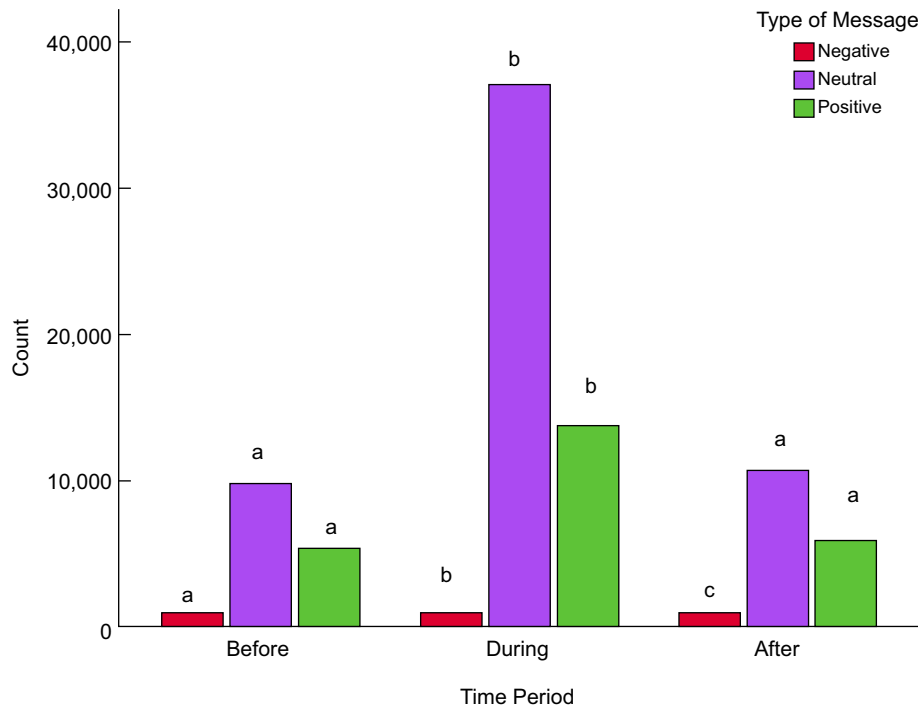


Fig. 2 Message counts for negative, neutral and positive comments across all three time periods. Lowercase letters denote significant differences from the ad hoc pairwise post hoc analysis between message type per time period with a Bonferroni adjusted *P*-value of < 0.05

messages. Overall, there was a higher proportion of positive messages and a lower proportion of negative messages during the campaign when compared with before or after the campaign. Additionally, there was a sustained higher proportion of positive messages and a lower portion of negative messages following the campaign when compared with before the campaign.

Discussion

The aim of this analysis was to assess the amount of brand engagement generated by the 'Never Stop Gaming' Wendy's ad campaign. Overall, the results of our message analyses show that the ad campaign generated significant brand exposure and engagement during the 5-day period that it was active compared with comparable time periods a week before and a week after the campaign. More specifically, the campaign appears to have more than doubled the

total number of messages being sent referencing the advertised brand. Specifically, there was a shift in the proportion of positive messages compared with negative messages being sent when compared with the baseline period. Additionally, our data suggest that positive engagement with the brand appeared to persist following the conclusion of the ad campaign, although at a much lower level. These results generally indicate that a successful food marketing campaign within a live streaming environment can have a significant effect on viewer engagement with the brand and that these effects can persist even after the campaign has concluded. The results of the hours viewed of streams using 'Wendy's' or 'Wendys' in the stream title for each time period indicates that we did indeed capture the anticipated ad campaign and that the before and after periods comparison periods were suitable evaluation periods that did not have similar marketing campaigns occurring.

We do note that when evaluating the types of messages sent, regardless of the time period, most messages were

Table 2 Chi-Square results for positive and negative messages across each time period

	Observed before		Observed during		Observed after		Chi-square	P-value
	n	%	n	%	n	%		
Positive	5427	84.4 _a	13 810	92.5 _b	5955	86.9 _c	366.38	< 0.001
Negative	1006	15.6 _a	1116	7.5 _b	894	13.1 _c		
Total		6433		14 926		6849		

Lowercase letters denote significant differences from the ad hoc pairwise post hoc analysis with a Bonferroni adjusted P-value of < 0.05.

considered neutral. This is not completely surprising as the neutral messages mainly consisted of the stand-alone phrase ‘Wendys’ or ‘Wendy’s’. In our observation, this stand-alone phrase was likely in response to the streamer asking the audience to spam the phrase in the chatroom, a common way to drive engagement on the Twitch platform. For example, the request, ‘Everyone throw Wendy’s in the chat’, was observed during our monitoring of the campaign. While simplistic in its nature, the fact that viewers are willing to type the message in the chatroom shows how easily and frequently the interactive nature of the campaign can be and how it works to engage the audience with the brand in a variety of ways. Another neutral phrase frequently observed in the chat was the phrase ‘!Wendys’. In the Twitch platform, the exclamation point before a word triggers an automated response by a chatbot that leads to more information about the ad campaign and products being sold. Therefore, while we considered these words neutral in our analysis, they should not be considered benign but rather lacking emotional context.

During the campaign, there was a significant decrease in the proportion of negative messages, regardless of whether all or just positive and negative messages were considered. Of note, the actual number of negative messages appeared to remain consistent across all three-time points, indicating that the campaign did not encourage more negative sentiment from viewers even though the brand was being discussed more often. This may be because the campaign primarily encourages positive discussion around the brand, which is also likely to discourage audience members from expressing negative emotions about the brand. Additionally, it has been noted previously that live streaming platforms can censor what is being said about a brand⁽¹²⁾ and that this type of censorship is likely hard to detect compared with asynchronous platforms⁽²⁴⁾. The increase in positive messages is not unique to advertising on the Twitch platform as increases in positive commenting have been reported from other advertising campaigns on other social media platforms^(24,25).

Food marketing has some special considerations as it has been shown to be able to nudge consumers to over-consume energy-dense, nutrient-poor products, which can ultimately impact health outcomes. As noted in the Introduction section, studies have shown that food marketing may affect eating behaviour, leading to increased

intakes of nutrient-poor, energy-dense foods^(2,3,26,27). Previous studies have shown that increased exposure to advertising can increase food cravings and food consumption and is associated with higher rates of obesity^(2,3,26). In addition, studies on asynchronous platforms, such as Facebook, have shown a significant association between repeated exposure to advertisements and increased user engagement⁽²⁸⁾.

Further, increased engagement on social media platforms has been associated with an increased likelihood of purchasing the product advertised⁽²⁸⁾. Other studies on asynchronous platforms found that increased engagement with food brands, such as watching videos, purchasing online food and food advertisements on YouTube, were all significantly associated with a higher consumption of unhealthy food and beverages⁽⁷⁾. However, previous research has suggested that advertising on live streaming platforms may be more acceptable than asynchronous platforms, as a smaller percentage of Twitch users reported negative emotions when encountering advertisements on Twitch compared with YouTube users encountering advertisements on YouTube⁽¹¹⁾. Given how effective advertising on asynchronous platforms has been in driving consumer behaviour, there is a need to understand how advertising campaigns on live streaming platforms, such as Twitch, drive behaviour and if these behaviours lead to adverse effects on the health of their audience. Future studies are needed to assess the impact of live streaming marketing on eating behaviour in a variety of demographic groups.

It is also important to note that previous research has suggested that brands often target minority groups^(29,30). Therefore, these minority groups are at an increased risk for marketing exposure and the influence of this type of messaging⁽³¹⁾. In the case of our study, four out of the five streamers who participated in the campaign self-identify with a minority group. Of those four, three of them list their ethnicity on their Twitch page. While it is unclear whether this was intentionally done by the companies, there is still a need to consider the targeting strategies that may be employed by food companies on these platforms.

Wendy’s has a large national and global presence. In the USA, Wendy’s had the second most sales among burger chains in 2021 and ranked twelfth among fast-food chains in 2019^(32,33). Additionally, Twitch reaches a global audience, therefore, the enhanced interactive advertising seen



from this campaign could have implications on a global level. Wendy's has also recently changed their social media strategy to target millennials and boomers, who respectively make up 25 % and 33 % of quick-service restaurant customers⁽³⁴⁾. Further, Wendy's menu has also reflected this targeting by offering a variety of menu items to younger consumers, as seen in the campaign analysed by this study⁽³⁴⁾. These evolving menu strategies aim to appeal across generations, expanding the reach of Wendy's⁽³⁴⁾.

Finally, it is important to note the role policy can play in food marketing. Policies limiting the marketing of food and non-alcoholic beverages, particularly to children, may reduce engagement with energy-dense, nutrient-poor food brands and the purchases of such foods⁽³⁵⁾. Further, reduced purchasing of energy-dense, nutrient-poor foods would likely reduce consumption, and thus reduce the negative post-consumption effects, such as weight gain and diet-related diseases⁽³⁶⁾. However, there are many challenges to implementing digital marketing regulations. As highlighted in the 2016 World Health Organization report on digital marketing, the internet is borderless, meaning digital marketing can encompass multiple countries and multiple jurisdictions. Therefore, unless many countries have similar restrictions, a national-level regulation is unlikely to be sufficient to regulate digital marketing. In addition, as mentioned in the Introduction, marketing is present in multiple different mediums, such as television and billboards. With multiple mediums, it becomes increasingly difficult to instil regulations that apply to all possible forms of marketing⁽³⁷⁾.

On Twitch, there is currently no policy regarding what can be marketed, meaning the audience can be exposed to nutrient-poor, energy-dense foods without any regulation. Restricting marketing to minors in online spaces can also be difficult as there is no secure system for age verification on most major social media platforms. While Twitch could have more direct control over the allowance of sponsorships with food brands, it seems unlikely that they would adopt such a policy given they have incentives and requirements for streamers to run a certain number of ads per hour^(38,39). However, since Twitch and other live streaming platforms are community-based, there is potential for these communities, alongside their content creators, to determine what advertising content they are willing to subject themselves to.

Strength and limitations

While the strength of this study stems from the qualitative and quantitative analysis of the ad campaign, it also has limitations. The timing of the campaign was during the COVID-19 pandemic, and so the campaign captured a time of increased use of social media for entertainment. However, this study was a naturalistic observation, and it demonstrates the impact of a real campaign. Another limitation of this study was the choice to only analyse chat messages that contained the word 'Wendys' or 'Wendy's'. Some

comments about specific Wendy's products were likely missed as they did not include these words. Therefore, our results are likely an underrepresentation of the actual effect of the campaign. A final limitation is that we evaluated raw messages and were not able to assess them within the overall context of the chat, which could lead to some additional amount of misreporting. For example, a message that could have been responding to the question 'What's your favorite restaurant?' could have been answered with the word 'Wendy's', but since we did not capture the previous message, we would have considered this message to be neutral rather than positive.

Future directions

To fully capture all engagement with the campaign, future studies should focus on one specific campaign day in order to analyse all verbal and non-verbal communication from both the streamers and the audience. Additionally, future studies may also be able to use automated language processing for analyses, reducing the number of hours needed to analyse and categorise messages for a complete analysis of the full chatroom log. Future studies are also needed to assess the impact of these interactive influencer-driven campaigns on eating behaviour in controlled laboratory settings.

Conclusion

In conclusion, we observed an increase in overall and positive engagement during the campaign period, and these positive sentiments persisted for up to a week following the campaign. Increased engagement with brands has been previously associated with increases in brand loyalty, brand awareness and product purchase intention, and therefore, we provide the first evidence of the antecedent of these behaviours on live streaming platforms. In addition, it is known that general exposure to food advertising campaigns is associated with increased food cravings, higher caloric intake and obesity. Therefore, future research is needed to assess if advertising campaigns on live streaming platforms can acutely or longitudinally alter food choice and food consumption, particularly in children and adolescents.

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K.H. and T.D.M. were responsible for data analysis. *Ethics of human subject participation*: No data were collected from individuals. Only publicly available aggregate data were analysed.

References

- Kelly B, Halford JCG, Boyland EJ *et al.* (2010) Television food advertising to children: a global perspective. *Am J Public Health* **100**, 1730–1736.
- Powell LM, Wada R, Khan T *et al.* (2017) Food and beverage television advertising exposure and youth consumption, body mass index and adiposity outcomes. *Can J Econ Can d'économique* **50**, 345–364.
- Delfino LD, Tebar WR, Silva DAS *et al.* (2020) Food advertisements on television and eating habits in adolescents: a school-based study. *Rev Saude Publica* **54**, 55.
- Boyland E, McGale L, Maden M *et al.* (2022) Association of food and nonalcoholic beverage marketing with children and adolescents' eating behaviors and health: a systematic review and meta-analysis. *JAMA Pediatr* **176**, e221037.
- Bragg MA, Pageot YK, Amico A *et al.* (2020) Fast food, beverage, and snack brands on social media in the United States: an examination of marketing techniques utilized in 2000 brand posts. *Pediatr Obes* **15**, e12606.
- Coates AE, Hardman CA, Halford JCG *et al.* (2019) Social media influencer marketing and children's food intake: a randomized trial. *Pediatric* **143**, e20182554.
- Baldwin HJ, Freeman B & Kelly B (2018) Like and share: associations between social media engagement and dietary choices in children. *Public Health Nutr* **21**, 3210–3215.
- Packer J, Russell SJ, Siovolgyi G *et al.* (2022) The impact on dietary outcomes of celebrities and influencers in marketing unhealthy foods to children: a systematic review and meta-analysis. *Nutrition* **14**, 434.
- Murphy G, Corcoran C, Tatlow-Golden M *et al.* (2020) See, like, share, remember: adolescents' responses to unhealthy, healthy- and non-food advertising in social media. *Int J Environ Res Public Health* **17**, 2181.
- Hamilton W, Garreston O & Kerne A (2014) Streaming on Twitch: Fostering Participation Communities of Play within Live Mixed Media. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*.
- Pollack CC, Gilbert-Diamond D, Emond JA *et al.* (2021) Twitch user perceptions, attitudes and behaviours in relation to food and beverage marketing on Twitch compared with YouTube. *J Nutr Sci* **10**, e32.
- Edwards CG, Pollack CC, Boyland EJ *et al.* (2020) Online food marketing in the livestream environment: what is the role of censorship? *Ann Nutr Metab* **76**, 371–374.
- Buchanan L, Yeatman H, Kelly B *et al.* (2018) Digital promotion of energy drinks to young adults is more strongly linked to consumption than other media. *J Nutr Educ Behav* **50**, 888–895.
- Streamlabs (2020) Streamlabs & Stream Hatchet Q3 2020 Live Streaming Industry Report. <https://streamlabs.com/content-hub/post/streamlabs-and-stream-hatchet-q3-2020-live-streaming-industry-report> (accessed March 2022).
- Streamlabs Blog (2021) Streamlabs and Stream Hatchet Q4 Live Streaming Industry Report | by Ethan May. <https://blog.streamlabs.com/streamlabs-and-stream-hatchet-q4-live-streaming-industry-report-a898c98e73f1> (accessed April 2022).
- Edwards CG, Pollack CC, Pritschet SJ *et al.* (2022) Prevalence and comparisons of alcohol, candy, energy drink, snack, soda, and restaurant brand and product marketing on Twitch, Facebook Gaming and YouTube Gaming. *Public Health Nutr* **25**, 1–12.
- DrLupo (2018) Best Duo: Hershey's & Reese's, Ninja & DrLupo- November 2018, DrLupo. YouTube. <https://www.youtube.com/watch?v=9wr0HypRBH0> (accessed March 2022).
- Twitch Sales (2021) Where Brands and Communities Intersect. <https://twitchadvertising.tv/> (accessed March 2022).
- Park HJ & Lin LM (2020) The effects of match-ups on the consumer attitudes toward internet celebrities and their live streaming contents in the context of product endorsement. *J Retail Consum Serv* **52**, 101934.
- Auty S & Lewis C (2004) Exploring children's choice: the reminder effect of product placement. *Psychol Mark* **21**, 697–713.
- Pollack CC, Kim J, Emond JA *et al.* (2020) Prevalence and strategies of energy drink, soda, processed snack, candy and restaurant product marketing on the online streaming platform Twitch. *Public Health Nutr* **23**, 2793–2803.
- Stream Hatchet (2022) Brands in Gaming and Esports. https://5918623.fs1.hubspotusercontent-na1.net/hubfs/5918623/StreamHatchetBrandsinGamingandEsports.pdf?utm_campaign=Reports&utm_medium=email&_hsmt=219241612&_hsenc=p2ANqtz-81m-ggcYz3LlZJjvxNAwOBKOz0tnnzv916ahYA0XzBm3HziDm3Y_pTX9LyuCqMlll1INj0Yvf03 (accessed July 2022).
- Center for Health Statistics (2019) Health, United States 2019. <https://www.cdc.gov/nchs/index.htm> (accessed March 2022).
- The Guardian (2010) Nestlé Hit by Facebook 'Anti-Social' Media Surge | Guardian Sustainable Business. <https://www.theguardian.com/sustainable-business/nestle-facebook> (accessed February 2022).
- Montgomery KC, Chester J, Grier SA *et al.* (2012) The new threat of digital marketing. *Pediatr Clin North Am* **59**, 659–675.
- Yau A, Adams J, Boyland EJ *et al.* (2021) Sociodemographic differences in self-reported exposure to high fat, salt and sugar food and drink advertising: a cross-sectional analysis of 2019 UK panel data. *BMJ Open* **11**, e048139.
- Qutteina Y, Hallez L, Raedschelders M *et al.* (2022) Food for teens: how social media is associated with adolescent eating outcomes. *Public Health Nutr* **25**, 290–302.
- Lim H, Bright LF & Wilcox GB (2022) Is repetition really the key to success? The impact of ad repetition and the power of 'Likes' on facebook. *J Interactive Advertising* **22**, 238–248. doi: 10.1080/15252019.2022.2106327
- Rideout VJ, Ulla MA, Foehr G *et al.* (2010) Generation M²: Media in the Lives of 8- to 18-Year-Olds. Kaiser Family Foundation. <http://www.kff.org/entmedia/> (accessed March 2022).
- JSTOR (2006) Targeting Interventions for Ethnic Minority and Low-Income Populations on JSTOR. <https://www.jstor.org/stable/3556556> (accessed November 2022).
- Petersen R, Pan L & Blanck HM (2019) Peer reviewed: racial and ethnic disparities in adult obesity in the United States: CDC's tracking to inform state and local action. *Prev Chronic Dis* **16**, 180579.
- Forbes (2022) How Wendy's Dethroned Burger King To Become The No 2 Burger Chain. <https://www.forbes.com/sites/aliciakelso/2021/04/21/how-wendys-dethroned-burger-king-to-become-the-no-2-burger-chain/?sh=5b45fe015049> (accessed February 2022).
- WorldAtlas (2019) The World's Largest Fast Food Restaurant Chains. <https://www.worldatlas.com/articles/the-world-s-largest-fast-food-restaurant-chains.html> (accessed February 2022).
- CSMonitor.com (2014) Wendy's Moves to Target Millennials. <https://www.csmonitor.com/Business/The-Bite/2014/0512/>



- Wendy-s-moves-to-target-Millennials (accessed February 2022).
35. Boyland E, McGale L, Maden M *et al.* (2022) Systematic review of the effect of policies to restrict the marketing of foods and non-alcoholic beverages to which children are exposed. *Obes Rev* **23**, e13447.
 36. Kelly B, King L, Chapman K *et al.* (2015) A hierarchy of unhealthy food promotion effects: Identifying methodological approaches and knowledge gaps. *Am J Public Health* **105**, e86–e95.
 37. Health Organization Regional Office for Europe W (2016) Tackling Food Marketing to Children in a Digital World: Trans-Disciplinary Perspectives Children's Rights, Evidence of Impact, Methodological Challenges, Regulatory Options and Policy Implications for the WHO European Region. https://www.euro.who.int/__data/assets/pdf_file/0017/322226/Tackling-food-marketing-children-digital-world-trans-disciplinary-perspectives-en.pdf (accessed March 2022).
 38. The Verge (2020) Twitch is Testing Mid-Roll Ads that Streamers Can't Control. <https://www.theverge.com/2020/9/15/21437787/twitch-midroll-ad-affiliate-partner-cpm> (accessed November 2022).
 39. StreamerSquare (2022) Everything You Need to Know About 'Affiliate' on Twitch. <https://streamersquare.com/everything-you-need-to-know-about-affiliate-on-twitch/> (accessed November 2022).