Associations between adolescent and young adult External Food Cue Responsiveness (EFCR) and brand recall, product craving and product purchasing in the livestreaming food marketing environment

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Abstract

Objective: To evaluate the utility of three validated food responsiveness scales in measuring recall of, and responsiveness to, food marketing exposure on social media.

Design: Cross-sectional survey among adolescents and adults who used the social media platform Twitch.tv (Twitch). Responsiveness to food marketing was self-reported as craving or purchasing any brands participants observed on Twitch. Participants completed three validated scales of food responsiveness: the revised 18-question Three Factor Eating Questionnaire (TFEQ), the external eating sub-scale of the Dutch Eating Behavior Questionnaire (DEBQ) and the External Food Cue Responsiveness (EFCR) scale. Adjusted linear regression models assessed the predictive ability of each scale on recall and responsiveness outcomes.

Setting: Online survey.

Participants: Five hundred and sixty-eight Twitch users (90·1 % male, 60·6 % White, 43·7 % aged 18–24, 25·9 % under 18).

Results: In separate adjusted linear regression models, scores on the TFEQ were not related to any outcome, while DEBQ scores related to product cravings (OR: 1·10, 95 % CI 1·01, 1·19, $P = 0·02$). In contrast, scores on the EFCR scale were significantly associated with higher brand recall (incident rate ratio: 1·42, 95 % CI 1·20, 1·68, $P < 0·001$), product craving (OR: 3·93, 95 % CI 2·22, 7·17, $P < 0·001$) and purchasing behaviour (OR: 3·97, 95 % CI 1·99, 8·26, $P < 0·001$). A subset of three EFCR scale items related to influencer marketing were similarly associated with each outcome with greater precision in the point estimates than the overall EFCR.

Conclusions: The EFCR scale predicted recall of and responsiveness to food marketing via Twitch, suggesting its utility in monitoring the effects of food marketing on social media.

The explosion of social media has amplified opportunities for targeted and widespread food and beverage marketing. Social media can reach audiences – particularly adolescents and young adults – more readily and effectively than traditional advertising platforms such as television; as a result, advertising on social media of food and beverage products is near constant[1,2]. Previous studies among children have demonstrated that increased exposure to advertising is associated with increased consumption, an effect that is enhanced by multi-platform exposures[3,4]. While fewer studies have been conducted with a specific focus on adolescents, it is hypothesised that this group may be highly susceptible to advertising due to their state of neurobiological development, vulnerability to peer-to-peer influences and frequency of social media use[5,6]. Advertising on social media platforms may also be an

effective way to reach young adults, as usage of these platforms does not dissipate with age. Current statistics suggest that 85 % of adults in the USA report daily Internet usage, and 48 % of those between 18 and 29 report that they are online 'almost constantly'[7]. Yet, both adolescent and young adult populations are not covered by food advertising regulations in the USA, which typically only focus on children[5]. This lack of oversight has presented new opportunities to reach these demographic groups through novel marketing strategies such as influencer marketing[3]. This form of advertising relies on individuals with a high amount of 'influence' to promote products to their followers. While traditional influencers include movie celebrities or popular athletes (who are still able to successfully influence the recall of unhealthy food among adolescents who observe the advertisements), social media has made it so that anyone could become an influencer[8]. This is especially true on platforms that leverage livestreaming, a form of content delivery that allows for real-time connection between the influencer and their users.

A prominent source of livestreaming and influencer marketing is Twitch.tv (Twitch). More than 6 billion hours of content were viewed on Twitch in the first quarter of 2021, a 97 % increase from the same time in 2020. The number of sponsored streams and corresponding hours watched also increased between 2020 and 2021 by 88 and 137 %, respectively, suggesting an increased focus by marketing teams on the platform[9]. Although video games are the predominant type of content livestreamed on Twitch, popular streams have also featured sports (e.g. 1·8 million hours of viewed coverage for Thursday night US National Football League games) and politics (e.g. 51 million hours watched of US Election Day coverage)[10]. While the USA has the highest single country share of viewership (approximately 22 % as of 2022), the platform has global reach. Twitch's livestreaming environment includes audiovisual content and a real-time chat box, facilitating interactions between influencers and viewers in real time and enhancing the impact of influencer marketing.

Despite the pervasive nature of influencer marketing and advertising on Twitch, users find food and beverage marketing on the platform to be 'less bothersome' than marketing on comparable asynchronous social media platforms such as YouTube[11]. Furthermore, marketing on Twitch for unhealthy products, including energy drinks, fast food and food delivery services, candies, sugar-sweetened beverages, snack foods and alcohol, has significantly increased since 2018 (when it first comprehensively measured), especially throughout the COVID-19 pandemic. That marketing included both formal advertisements that labelled through mandated tags (such as '#ad' or '#sponsored') as well as casual mentions of the product in chat rooms, stream titles and streamer profiles[11–13]. Given that the user base of the platform predominantly consists of adolescent and young adult men, a target demographic

of many food and beverage companies that is not as easily reached through traditional forms of advertising, it is imperative to evaluate the impact of influencer marketing on this platform[14]. While some studies have begun to explore the prevalence of food and drink influencer marketing on other social media platforms, there is a lack of research that specifically focuses on its impact on livestreaming platforms[3,15–17]. Addressing this gap is critical in understanding how users respond to such tactics.

The goal of this study was to examine the predictive ability of existing, validated scales to measure cognitive and behavioural responses to food marketing exposure on social media with a large influencer presence. A scale to measure this phenomenon could be used in large, population-based studies to assess the influence of food marketing on individual behaviours, as well as in intervention studies to assess the impact of food marketing restrictions on social media. Three separate candidate scales were selected, because they were developed to measure responsivity to food or food cues in the environment. First, a disinhibited eating subscale of the Three Factor Eating Questionnaire (TFEQ-DE) was selected because it assesses respondents' food-related cognitive restraint and disinhibited eating behaviours (i.e. uncontrolled and emotional eating)[18,19]. However, this scale does not explicitly measure any sort of External Food Cue Responsiveness (EFCR), such as reactivity to food logos. Second, the external eating subscale of the Dutch Eating Behavior Questionnaire (DEBQ-EE) was included because items relate to responsiveness to external food and food cues[20]. Third, the recently designed EFCR scale was included because it measures multifaceted components of responsivity to food marketing specifically. However, the EFCR was originally designed and tested with a preschool-age population, and thus its applicability in older populations has yet to be examined[21]. A secondary goal of this study was to examine if a subset of items on the EFCR scale hypothesised to relate to the influencer marketing environments on social media would be equally predictive of user responsiveness to food marketing as the full EFCR scale.

Methods

Survey

The data for this analysis were obtained from a survey designed to evaluate users' perceptions, attitudes and recall of food and beverage marketing on Twitch[11]. The survey was promoted on Reddit, a social media platform that is organised into specific interest communities (such as news or science) and has similar user demographics as Twitch[22]. The survey was published on Twitch-specific and video gaming communities Reddit between 1 May and 23 May 2020. After clicking on the advertisement, participants were taken to a prescreening form. Participants were eligible for the study if they were

above the age of 13, used the Twitch platform and agreed to the informed, electronic consent guidelines. Survey results were anonymous, but participants could opt to share their email and enter a raffle for one of ten $50 USD Amazon gift cards. Survey questions inquired about behaviours on the Twitch platform, attitudes surrounding advertising on the platform and socio-demographic characteristics (including several age-check questions to ensure participants were above the age of 13). The full survey is available in online supplementary, Supplemental Materials A.

Candidate scales to measure food responsiveness within social media (primary exposures)

Three scales were included in the survey to measure cognitive and behavioural reactivity to food or food cues: a disinhibited eating subscale of the revised 18-question TFEQ (TFEQ-DE), the external eating subscale of the DEBQ (DEBQ-EE) and the EFCR[18,20,21]. The TFEQ-DE is a composite of twelve items related to uncontrolled (nine items) and emotional (three items) eating[19,23]. Uncontrolled eating included items such as 'Sometimes when I'm eating, I just can't seem to stop', while emotional eating included items such as 'When I feel anxious, I find myself eating'. Response options were on a four-point Likert scale ranging from 'Rarely' to 'Often'. Responses across the twelve items were averaged to reflect disinhibited eating, similar to previous studies[23]. The DEBQ-EE scale included ten items such as 'If you have something delicious to eat, do you eat it straight away?' Response options were on a four-point Likert scale ranging from 'Never' to 'Often'. Final scores were the sum across all ten items. The EFCR scale includes nine items such as 'I want foods or drinks that I see others eating'. Items for the current study were reworded to be in the first person, because the scale was initially developed for parents to report behaviours for preschool-age children. Item response options were on a four-point Likert scale from 'Never' to 'Often', and final scores averaged across all nine items[21]. All items for each scale can be found in online supplementary, Supplemental Materials A. Based on *a priori* hypotheses, three items from the EFCR scale were identified as particularly relevant to food cue reactivity and marketing within the livestreaming social media environment. The specific items selected were 'I want food or drinks that I see others eating;' 'I want to eat when people talk about food' and 'I notice restaurant signs/logos'. The first two items were selected because they directly relate to a user's experience while viewing an influencer's livestream during a food marketing campaign. For example, the user may observe the influencer speak about or consume the advertised product live on-stream. Additionally, it is common for other viewers to comment on advertised products via the live chat feature of Twitch[11]. The third item was included given that sponsored streamers readily showcase brand logos on their profile pages and stream overlays. As this subscale seeks to capture the impact of influencer marketing within the livestreaming environment, it is hereinafter referred to as the EFCR-Influencer Marketing (EFCR-IM) subscale.

Primary outcome measures

The three outcome measures of interest were the number of brands participants recalled seeing advertised on the platform, product craving after observing advertisements and product purchasing after observing advertisements. Participants identified the number of restaurant, food delivery, candy, packaged food and drink brands (referred to as 'food brands') they recalled observing on Twitch from a list of the twenty-nine most frequently mentioned food brands on Twitch, all of which could be considered 'unhealthy'[12]. The number of food brands observed for each respondent was totalled to get the final number of recalled food brands per participant. Next, participants self-reported product craving following brand exposure by responding 'yes' or 'no' to the question, 'After seeing advertisements on Twitch do you crave any of the products that you see?' Participants also reported purchasing behaviours after brand exposure by responding 'yes' or 'no' to the question, 'Do you ever purchase products because you have seen them advertised on Twitch?' Following each question, participants indicated which food brands they experienced cravings for and which products they purchased from the same list of twenty-nine most frequently mentioned food brands on Twitch[11]. Participants could consider any encounter with advertising on the platform and were not restricted to a specific period of time (e.g. the past 2 weeks).

Candidate modifiers

Two additional measures of engagement with Twitch were included to determine whether they modified the relationship between food cue responsiveness and the three primary outcome measures. The first was a measure of monetary investment in the Twitch platform; respondents were classified as 'invested' if they subscribed to at least one Twitch channel that was not connected to an Amazon Prime account (which awards users with one free subscription) or if they had purchased Bits (a Twitch-specific virtual currency that can be paid to streamers as a show of support while amplifying one's own messages in the virtual chat room)[24]. The second measure was self-reported daily use of Twitch, which was categorised into three intervals (i.e. 0–2 h a day, 2–4 h a day or over 4 h a day). These behaviours were chosen based on their associations with craving and purchasing behaviours independent of the eating behaviour scales[11]. Additional demographic variables collected and adjusted for in all multivariable models included age, gender, race and ethnicity.

Statistical analysis

The internal consistency of all scales was assessed with Cronbach's alpha (α_c). Multivariable analyses were conducted to assess the associations between food cue responsiveness as measured with each of the three scales (i.e. TFEQ-DE, DEBQ-EE and EFCR) and the three outcomes of interest (i.e. food brand recall, craving or purchasing). Scores on the three scales were included simultaneously in the models, and the models were adjusted for demographic characteristics (i.e. age, gender, race and ethnicity) and self-reported Twitch behaviours (i.e. daily hours on Twitch and investment in at least one streamer). The analysis also evaluated whether self-reported Twitch investment or daily platform usage modified the relationship between the EFCR and the outcomes, which was determined via likelihood ratio tests. Next, to compare the predictive ability of the full EFCR scale with the reduced EFCR-IM subscale, two separate multivariable models were constructed for each outcome of interest. One model used the full EFCR scale as the primary exposure (i.e. independent variable), while the other used the EFCR-IM subscale as the primary exposure. Those models were adjusted for demographic characteristics and Twitch user behaviours, but not for TEFQ-DE and DEBQ-EE. Exploratory analyses were also completed to assess the association between responses in individual items of the EFCR-IM and each outcome. In all cases, the craving and purchasing outcomes were assessed with logistic regression, while food brands observed were assessed with Poisson regression with robust SE estimates. For all analyses, $P < 0.05$ was chosen a priori as statistically significant. All hypotheses surrounding the data, including the analytic plan, were determined before the data collection process unless otherwise specified. All analyses were run in R with the RStudio integrated development environment[25,26].

Results

Participants

Of the 902 respondents who started the survey, 568 were included in the analytic data set. Respondents were excluded if they did not complete the subsections of interest (n 172), left before signing the consent form or did not consent (n 151) or provided nonsensical answers, including failed focus questions (n 10). Over 90 % of respondents (n 516) were men, and a plurality were non-Hispanic (80·5 %, n 457) and White (60·6 %, n 344, Table 1). Respondents were predominantly between 18 and 24 years of age (43·7 %, n 348), with 25·9 % under the age of 18 (n 147). More than one-third of respondents had invested money in the platform (n 214), and almost half viewed Twitch for at least 2 h a day (n 212 for 2–4 h, n 73 for over 4 h). Respondents recalled an average of 3·81 food brands (SD: 3·66). Fifteen percentage of respondents (n 83) reported craving a product after observing it on Twitch,

Table 1 Variable summary statistics

Characteristic	n	%
Age		
Under 18	147	25·9
18–24	248	43·7
25–34	153	26·9
35 and above	20	3·52
Gender		
Male	516	90·1
Female	47	8·27
Other	5	0·88
Race		
American Indian or Alaska Native	3	0·52
Asian	117	20·6
Black or African American	16	2·82
Multiple races	31	5·46
White	344	60·6
Unknown/prefer not to answer	57	10·0
Ethnicity		
Hispanic or Latino	76	12·4
Not Hispanic or Latino	457	80·5
Unknown/prefer not to answer	35	6·17
Streamer investment		
No	354	62·3
Yes	214	37·8
Daily hours on Twitch		
0–2 h	374	65·8
2–4 h	212	21·3
Over 4 h	73	12·9
Outcomes		
	Mean	SD
Food brands recalled	3·81	3·66
	n	%
Product cravings	83	15
Product purchases	46	8

and 8 % (n 46) reported purchasing a product after observing it on Twitch.

Comparison of candidate scales

The Cronbach's α for the TFEQ-DE, DEBQ-EE and EFCR was 0·88, 0·77 and 0·83, respectively. The EFCR was moderately correlated with both the TFEQ-DE ($r = 0.53$) and DEBQ-EE ($r = 0.59$). Respondents had an average TFEQ-DE score of 33·3 (SD: 21·3; range: (0, 100)), an average DEBQ-EE score of 26·4 (SD: 4·91, range: (10, 40)) and an average EFCR score of 1·94 (SD: 0·56, range: (1, 4)).

In regression models adjusting for all three scales and all covariates (Table 2), scores on the TFEQ-DE were not related to any outcome. Higher scores on the DEBQ-EE were associated with a higher odds of product craving (OR: 1·10, 95 % CI 1·01, 1·19, $P = 0.02$), but neither brand recall nor product purchasing. In contrast, higher scores on the EFCR were associated with 42 % increase in the average number of food brands recalled (incident rate ratio (IRR): 1·42, 95 % CI 1·20, 1·68, $P < 0.001$) as well as an increased odds of product craving (OR: 3·93, 95 % CI 2·22, 7·17, $P < 0.001$) and product purchasing (OR: 3·97, 95 % CI 1·99, 8·26, $P < 0.001$). When considering characteristics of Twitch use and engagement, individuals who viewed Twitch for 2-to-4 h a day had a significantly higher

Table 2 Adjusted associations between the candidate scales to measure food responsiveness within social media scales and number of food brands recalled, food product craving and food product purchasing when viewing Twitch

Covariate	Food brands recalled*			Cravings†			Purchasing‡		
	IRR§	95 % CI	P	OR¶	95 % CI	P	OR¶	95 % CI	P
EFCR**	1·42	1·20, 1·68	< 0·001	3·93	2·22, 7·17	< 0·001	3·97	1·99, 8·26	< 0·001
DEBQ-EE††	0·99	0·97, 1·02	0·57	1·10	1·01, 1·19	0·02	1·05	0·94, 1·16	0·39
TFEQ-DE‡‡	1·00	1·00, 1·01	0·84	1·01	1·00, 1·03	0·15	1·01	0·99, 1·03	0·16
Gender (reference: male)									
Female	0·91	0·67, 1·23	0·84	0·95	0·32, 2·46	0·92	0·95	0·24, 2·92	0·94
Other	0·70	0·23, 2·12	0·52	2·68	0·12, 23·8	0·43	3·63	0·16, 32·0	0·30
Race (reference: White)									
American Indian or Alaska Native	1·32	0·80, 2·18	0·28	9·23	0·27, 185.	0·17	–		0·99
Asian	0·90	0·74, 1·09	0·27	0·85	0·40, 1·75	0·68	0·50	0·16, 1·32	0·19
Black or African American	1·29	0·86, 1·94	0·22	0·96	0·05, 5·92	0·97	3·43	0·45, 16·6	0·16
Multiple races	1·61	0·85, 1·58	0·36	1·74	0·55, 4·96	0·32	1·00	0·21, 3·64	0·99
Unknown/prefer not to answer	1·00	0·73, 1·36	0·99	1·77	0·70, 4·35	0·22	1·02	0·31, 2·98	0·98
Ethnicity (reference: Not Hispanic or Latino)									
Hispanic or Latino	0·96	0·75, 1·21	0·71	0·67	0·27, 1·54	0·36	1·02	0·36, 2·59	0·97
Unknown/prefer not to answer	0·95	0·60, 1·49	0·82	2·44	0·77, 7·08	0·11	2·05	0·47, 7·34	0·30
Age (reference: 18–24)									
Under 18	1·00	0·82, 1·22	0·99	1·45	0·74, 2·83	0·28	0·83	0·33, 1·97	0·68
25–34	0·89	0·74, 1·09	0·25	1·23	0·62, 2·39	0·55	1·20	0·53, 2·66	0·66
35 and above	0·73	0·49, 1·09	0·12	0·35	0·02, 2·25	0·36	0·68	0·03, 4·37	0·73
Daily hours on Twitch (reference: 0–2 h)									
2–4 h	0·97	0·80, 1·17	0·74	1·83	0·97, 3·41	0·06	2·46	1·14, 5·26	0·02
Over 4 h	1·04	0·84, 1·30	0·70	0·50	0·20, 1·18	0·13	1·20	0·43, 3·04	0·72
Streamer investment (reference: no)									
Yes	0·98	0·84, 1·15	0·79	1·69	0·97, 2·96	0·07	1·79	0·90, 3·62	0·10

IRR, incident rate ratio; TFEQ-DE, Three Factor Eating Questionnaire – disinhibited eating subscale; DEBQ-EE, external eating subscale of the Dutch Eating Behavior Questionnaire (DEBQ-EE); EFCR, External Food Cue Responsiveness.
*Food brands recalled defined as the total number of food brands recalled by each survey participant based on an *a priori* list.
†Cravings defined as a binary (i.e. yes or no) response to the question, 'After seeing advertisements on Twitch do you crave any of the products that you see?'
‡Purchases defined as a binary (i.e. yes or no) response to the question, 'Do you ever purchase products because you have seen them advertised on Twitch?'
§Applies to the 'noticed food brands' Poisson regression models with robust SE estimates.
¶Applies to the 'craving' and 'purchasing' logistic regression models.
**EFCR scale. Exposure defined as the average of the nine scale values.
††Dutch eating behaviour questionnaire – external eating subscale. Exposure defined as per 1 unit increase in the scale.
‡‡Exposure defined as per 1 unit increase in the scale.

odds of purchasing a product (OR: 2·46, 95 % CI 1·14, 5·26, $P = 0·02$) compared with those who watched Twitch for under 2 h a day. There were no other statistically significant associations.

Effect modifiers of the relationship between the External Food Cue Responsiveness scale and Twitch viewer behaviours

Monetary investment in a streamer was a significant effect modifier on the relationship between food cue responsiveness measured with the EFCR and food brands noticed ($P = 0·011$, Fig. 1). Specifically, when stratified by investment, each point on the EFCR scale was associated with a 26 % increase in the mean number of food brands recalled in the non-investment model (IRR: 1·26, 95 % CI 1·05, 1·51, $P = 0·01$) and a 55 % increase in the mean number of food brands recalled in the investment model (IRR: 1·55, 95 % CI 1·26, 1·92, $P < 0·001$). Based on this, individuals in the target Twitch demographic (18–24-year-old non-Hispanic White men) with the minimum EFCR score were estimated to observe an average of 3·16 food brands (95 % CI 2·80, 3·56) if they had not invested in the platform and 2·53 food brands (95 % CI 2·14, 2·99) if they had invested in the

platform. However, individuals in the same demographic group with the maximum EFCR score were estimated to observe an average of 6·66 food brands (95 % CI 5·42, 8·17) if they had not invested in the platform and 9·28 food brands (95 % CI 7·40, 11·6) if they had. Yet, streamer investment did not modify the effect between EFCR scores and either product cravings ($P = 0·94$) or purchases ($P = 0·26$). Similarly, the number of daily hours an individual spent on Twitch did not modify the effect between EFCR and food brands recalled ($P = 0·22$), product cravings ($P = 0·29$) or product purchasing ($P = 0·13$).

Predictive ability of the External Food Cue Responsiveness Influencer Marketing subscale

All three items of the EFCR-IM subscale were independently and significantly associated with each of the three outcomes of interest (online supplementary, Supplemental Material B). The Cronbach's α of the EFCR-IM subscale ($\alpha_c = 0·71$) did not differ substantially from the Cronbach's α of the full EFCR ($\alpha_c = 0·83$). Associations were similar between EFCR scores and each outcome when considering the full EFCR scale or the EFCR-IM subscale (online supplementary, Supplemental Material C), although
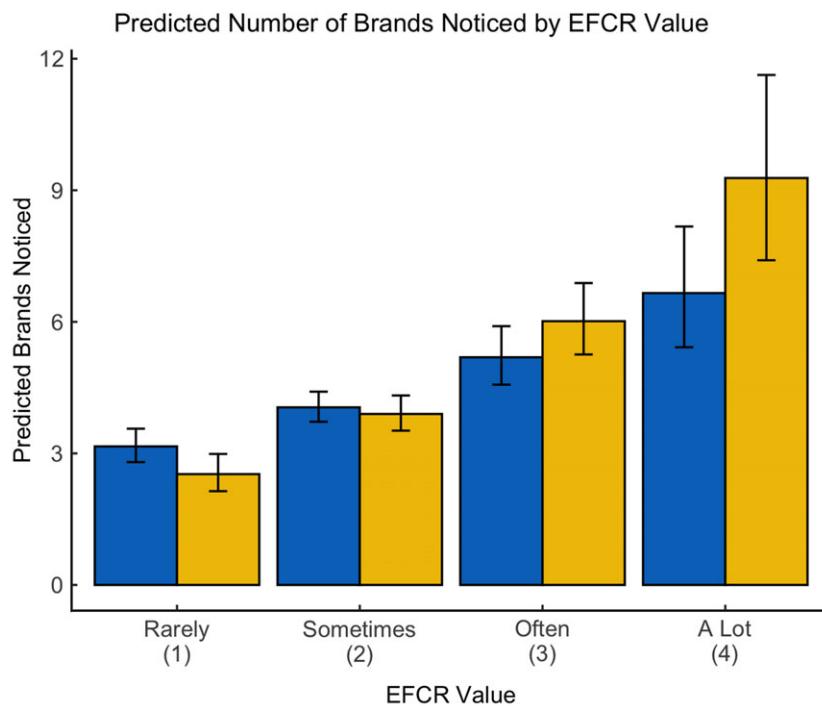
Predicted Number of Brands Noticed by EFCR Value

Fig. 1 Predicted number of food brands recalled by External Food Cue Responsiveness (EFCR) score and streamer investment. All bars include error bars corresponding to the 95 % CI. The interaction between monetary investment and number of brands noticed was significant ($P = 0.011$). ■, No investment; ■, investment

associations computed from the EFCR-IM had smaller standard errors as compared with those computed from the full EFCR. For example, on average, every additional point on the EFCR-IM subscale was associated with a 20 % increase in the average number of food brands recalled (IRR: 1·20, 95 % CI 1·03, 1·40, $P = 0.02$), 355 % increased odds of craving a product (OR: 4·55, 95 % CI 3·09, 6·86, $P < 0.001$) and 294 % increased odds of purchasing a product (OR: 3·94, 95 % CI 2·49, 6·40, $P < 0.001$). In contrast, every additional point on the full EFCR was associated with a 28 % increase in the average number of food brands recalled (IRR: 1·28, 95 % CI 1·07, 1·54, $P = 0.008$), 604 % increased odds of craving a product (OR: 7·04, 95 % CI 4·38, 11·8, $P < 0.001$) and 609 % increased odds of purchasing a product (OR: 6·09, 95 % CI 3·51, 11·0, $P < 0.001$).

Discussion

This study is the first to demonstrate the utility of a validated scale of food cue responsiveness to measure user recall of and responsiveness to food marketing on a social media platform with a large influencer presence. Specifically, this study found the previously published EFCR captured responsiveness to influencer marketing tactics and food brand recall, product craving and product purchasing. Furthermore, scores on a subset of only three items of the EFCR related specifically to influencer marketing techniques (EFCR-IM) were

equally associated with the three outcomes of interest. Associations between these three items separately followed a 'dose–response' relationship with the outcomes, whereby higher receptivity to external food cues was associated with an increased average number of food brands recalled and increased odds of product cravings or purchasing. The work presented here demonstrates that the EFCR scale – when considered as the full scale or as a subset of three items related to influencer marketing specifically – can capture an individual's susceptibility to the effects of online influencer marketing, including the impact on self-reported craving and purchasing behaviours.

In contrast to the EFCR, the TFEQ-DE and DEBQ-EE were designed to measure food responsiveness constructs such as restraint, temptation or eating in response to food cues in the environment. However, in this study, scores on the TFEQ-DE scale were not significantly associated with any of the three outcomes of interest, and scores on the DEBQ-EE were only significantly associated with product cravings. On the other hand, the EFCR scale was designed to specifically measure responsiveness to food marketing. This may be why EFCR, as measured with the EFCR, was strongly associated with each outcome in this study. Thus, while the DEBQ-EE likely measures some aspects of responsiveness related to food exposure, the study findings support that the EFCR scale is more predictive of food marketing responsiveness within an influencer environment on social media.

The EFCR was developed in a preschool-age population, yet the results presented here demonstrate that the scale can be easily adapted to older populations, particularly adolescents and young adults[21]. The new, three-question EFCR-IM subscale of the EFCR produced a similar effect size (with overlapping CI) with greater precision compared with the entire EFCR scale. This suggests that the EFCR-IM may more precisely capture the impact of specific external food cues (i.e. product or logo placements, product discussions and on-screen product consumption) on behaviours compared with the overall EFCR. At only three questions, the EFCR-IM could easily be inserted into larger surveys with only minimal additional burden to participants, and it could be analysed individually or in aggregate to get an overall sense of influencer marketing receptivity. In addition, the range of ages within the present study suggests that both the full EFCR scale and EFCR-IM subscale could be leveraged to assess the impact of influencer marketing across diverse age groups. This is particularly salient as previous works on the association between influencer marketing and consumption have predominately focused on a child population, whereas studies on adolescents have mainly focused on characterising the social media landscape and studies on adults have focused on television advertising[3,17,27–31]. Thus, the use of the EFCR-IM can easily help to fill this research gap, especially since the questions are platform agnostic.

Strengths of this study include its inclusion of multiple age groups, focus on an increasingly popular social media platform and investigation into multiple components of EFCR. However, it is not without its limitations. Survey participants were recruited through Reddit, which has a similar demographic makeup to Twitch (i.e. non-Hispanic White men) but may not be generalisable to other platforms with different demographics, such as a higher percent of female users[22,32]. Future work should therefore include other social media platforms (e.g. Instagram, TikTok) with different user demographics to determine if results are generalisable. Second, the cross-sectional design precludes the ability to establish directionality, and all measures of the study were self-reported. Therefore, it is possible that individuals did not recall all food brands they were exposed to (e.g. self-report bias) or may have not answered all EFCR questions honestly (e.g. social desirability bias), and future work could expand on this work within a controlled laboratory setting. Third, participants could be asked to think about their experiences within a particular time window (e.g. the past week, past month) or with different brands (including healthy products). Fourth, participants were not asked to report their BMI, socio-economic status or country of residence, which could be collected and modelled in future work. Country of residence may be particularly salient to explore given the international reach of Twitch, international differences in regulating digital food marketing and the likely cultural differences related to social media use. Lastly, the survey used to collect the data (including the outcome measures) has not yet been validated.

In summary, EFCR as measured with the EFCR scale was associated with increased attention to food brands and higher odds of product craving and purchasing in an adolescent and young adult population. These behaviours were captured with the entire EFCR scale as well as a three-question subset of EFCR (EFCR-IM) that focused specifically on visual cues that may be present during an influencer marketing campaign. Taken together, the results presented here suggest that the EFCR and EFCR-IM are efficient and meaningful tools that can be used to assess an individual's responsivity to external food cues. As new social media platforms emerge and social media marketing continues to grow, future regulatory policies on food marketing exposures should be expanded to include older populations (especially adolescents) and novel forms of advertising (especially social media influencer marketing).

Supplementary material

For supplementary material accompanying this paper visit https://doi.org/10.1017/S1368980022001628

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