

The impact of unhealthy food marketing on children on social media platforms

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Abstract: Social media platforms, with their unique creative style, are rapidly gaining popularity and occupying more and more of children's time. However, when it comes to food-related behaviors, few studies have explored their effects on children. Therefore, a study on the impact of unhealthy food marketing on children on social media platforms was proposed. This review aims to assess the evidence on how children's exposure to unhealthy food marketing on social media platforms affects their cognitive, emotional and behavioural responses to food and food brands. A systematic review and meta-analysis based on research questions centered on the effects of online food marketing techniques on food attitudes, preferences, and consumption among children (0-18 years of age), and whether there is a covariate effect on outcomes due to children's vulnerability. Under the guidance of PRISMA, a systematic review was conducted through a variety of research methods, such as qualitative and quantitative methods. The results of the study showed that a total of 31 articles were included to identify negative outcomes of the social media influence of unhealthy food marketing, such as unhealthy food brand preference, consumption preference, tendency to skip breakfast (heterogeneity 97.8%, large, SMD:0.38, medium, etc.). 95% CI:0.33,0.40), higher frequency of consumption of unhealthy foods (heterogeneity 95.6%, SMD:0.5, 95% CI:0.35,0.55), and subgroup analysis stratified by age and exposure conditions. It is concluded that exposure to unhealthy food advertisements on social media can increase the consumption and preference of unhealthy food among children and adolescents. These data provide support for public health researchers to explore more consistent research methods and collect more data.

Keywords: Children; Teenagers; Food; Ill-health

1. Introduction

The prevalence of obesity among children aged 5 to 19 years has risen dramatically globally, with increased consumption of food and beverages being one of the leading causes of obesity. WHO recommends limiting the exposure of children and adolescents to all forms of food marketing, including marketing on digital media. The marketing of high-calorie foods creates a poor health environment that leads to unhealthy eating behaviors and habits. TV viewing was associated with unhealthy eating behaviors, such as consumption of high-sugar foods, insufficient intake of vegetables and fruits, and skipping breakfast.

According to the hierarchy of effects model, Kelly et al. supported by literature evidence, food advertisements manipulate by drawing attention, bringing awareness, creating emotional affirmation, and developing positive preference, leading to purchasing and consumption (Kelly et al. 2015)^[1]. Despite the prior research on new media and its effects on different outcomes, there have been few reviews conducted on the evidence of how the unhealthful food marketing on social media platforms contributes to the diets and related outcomes of children and adolescents.

In many of the studies exploring the effects of digital media food marketing, the focus is placed on 'advergaming' which is defined as fully gamified advertising messages and viewed as a type of advertising that leverages game thinking and game mechanics (van Berlo et al. 2021).^[2] There are studies showing that advergaming had a significant impact on those children who played advergence with energy-dense food (Cohen's $f = 0.37, p < 0.01$) than those with non-food product (Folkvord et al. 2013).^[3] Furthermore, there remains a scarcity of field research and experiments carried out to investigate the fast-changing environment of social media platforms. (Coates et al. 2019)^[4]

2. Methods

After a search of the PROSPERO—international register for prosperous reviews and protocols for keywords such as ‘unhealthy food, children, social media’, there are only a few related reviews found with the most relevant topics (Sina et al. 2022)^[5]:

By combining the PICO for quantitative review questions — traditional for systematic reviews — and SPIDER for qualitative and mixed questions, followed by the FINER, opportunities were provided to contact marketing operating on social media platforms.

PRISMA(Page et al. 2021),^[6] the Cochrane Handbook for Systematic Reviews of Interventions (Cumpston et al. 2019) and courses of systematic review online guidance’s from universities’ websites are taken as the main sources of guidance, as are some targeted literature as retrieved from databases.^[7]

3. Database

Six databases were selected for search through the UOW library based on public health databases and social marketing databases to identify the relevant publications including: Scopus, PubMed, ProQuest Medline, CINAHL Plus, Business Source Complete, and PsycINFO.

4. Data extraction

Study specifics (title, authors, year of publication, country and platform type); study design, participant information (number and age); the methods, exposure and outcomes of interest, and key findings. The data was extracted independently for the eligible publications and a final decision was taken for the final extract without conflict. The column of research outcomes was used to summarize the primary and secondary findings grouped by outcomes as follows: 1) smartphone or internet use, food intake, and dietary behaviours (e.g., unhealthy food consumption); 2) social media exposure and unhealthy food choice (e.g., fruit and vegetable vs unhealthy food) and nutrition literacy; 3) social media exposure and unhealthy food intake (frequency and quantity) and dietary practices (e.g., breakfast skipping); 4) the exposure to influencers, peers and companies as well as unhealthy food related behaviours; and 5) the gender differences in the aforementioned associations.

5. Meta analysis

5.1 Method

Due to heterogeneity in the types of measurement scales adopted for the major outcome of interest, the standard mean difference (SMD) was calculated to evaluate the criterion of effect size in experimental research analysis, with odd ratios and SE calculated for each trial in the observational research analysis by using Revman. Software. SMD is interpreted as 0.2 to denote a minor effect, 0.5 to denote a moderate effect, and 0.8 to denote a significant effect(Cohen 2013).^[8] Additionally, the scores were displayed separately for each food types or exposure conditions because of the difficulty in extracting the mean and SD values for the total effect size of outcomes across studies. The I² statistic was used to evaluate the statistical heterogeneity between studies. Due to the variety in study design and methodology, random-effects models were observed for all meta-analyses. Moreover, there was evidence suggesting a considerable heterogeneity in the analysis. With exploratory group analysis conducted of the specific participant and study characteristics that might be contributory to heterogeneity, publication bias were evaluated through Egger regression (Lin & Chu 2018).^[9]

5.2 Quality assessment

The risk of bias of the included studies were assessed. The Cochran Collaboration’s Tool for Assessing Risk of Bias was applied to assess the risk of selection bias, performance bias, detection bias, attrition bias, reporting bias, and other bias through experimental studies(Armijo-Olivo et al. 2012).^[10]

The CASP checklist for qualitative studies were used to conduct interventional studies, with appraisal checklists provided for Systematic Reviews, Randomized Controlled Trials, Cohort Studies, Case Control Studies, Economic Evaluations, Diagnostic Studies, Qualitative Studies, and Clinical Prediction Rules .

The Newcastle-Ottawa Scale (NOS) was adopted to assess those non-randomized studies in meta-analyses: observational studies; included in the research on the influence of unhealthy food and beverage marketing on diet-related outcomes among the target groups via social media.

6. Data analysis and synthesis

6.1 Recall and recognition

There were one cross-sectional study and three RCT experiments conducted to assess the outcome in relation to brand recall and recognition.

A cross-sectional survey was conducted in the Netherlands to explore children's awareness and understanding of the brand or product placement in vlogs (online video blogs), revealing that the participants aged 10-13 years recalled 112 food brands and products in the vlog they watched most frequently in total. Nearly all of the most recognized products were unhealthful snack foods (e.g., confectionery, energy drinks and chocolate). The most frequently named brands were fast-food restaurant chains or energy drink manufacturers. Two RCTs revealed advertisement disclosure and exposure to children would get a significantly negative outcome when compared to those who were not exposed to the advertisement disclosure (Boerman & Van, 2020).^[11] One RCT experiment was conducted to demonstrate that unhealthy brands (1.75) were five times higher than healthy brands (0.36) on the mean rate of recalling prompted recognition and free recall.

6.2 Diet

There were fourteen observational studies and eight RCT experiments conducted to assess the outcome of purchasing intention and consumption.

The frequency and time of using the internet or a smart phone were associated with the consumption of unhealthy foods intake such as unhealthy food, sugar, caffeine beverages fast food, sugar sweetened beverage, energy drinks potato chips, and instant noodles. Also, they were linked to unhealthy eating behaviours, like skipping breakfast, generating more purchasing Intention, and intaking more Calories.

A higher recall on general social media platforms was associated with the higher weekly consumption of or likelihood to consume sugared-sweetened drinks, cakes/biscuits, and crisp, while watching or using special platforms like YouTube, WhatsApp, SNS (Social networking sites) was related to the higher frequency of unhealthy food consumption. Through an exploration into the exposure on food choice, two RCTs led to the conclusion that the exposure to a sweet snack video reduced the tendency to choose a fruit snack over a cookie.

Only two articles yielded no significant results about the influence of pop-up ad shown on the internet and multi-screen on food choice, but they were conducted prior to the emergence of social media platforms.

7. Meta-analysis

The full meta-analysis was divided into five groups of results, with 17 studies included to provide 68 effect size data, the participants in total, seven RCTs with continuous results, and ten cross-sectional studies. There were six studies excluded because of the missing data or data such as means or odd ratios that cannot be completely exacted. In terms of exposure, only two studies involved television as other platforms that could not be removed from the total data. The outcomes summarized various aspects such as liking, intention, consumption of unhealthy food and drinks (only one studied beverage intake.) and related unhealthy behaviour (skipping breakfast). There were 6 main perspectives of analysis, including the frequency of consumption related to exposure (heterogeneity 95.6%, seemingly symmetrical, SMD:0.5 moderate, 95% CI:0.35,0.55), the liking of unhealthy food (cross sectional:heterogeneity 96.6%, large, SMD:0.08, not statistically significant, 95% CI:-0.44,0.59); liking unhealthy food (RCT:heterogeneity 66%, SMD:0.11, 95% CI:-0.09,0.30,no publication bias), the intake energy of unhealthy food (heterogeneity 92.7%, large, SMD:0.18, not obvious, 95% CI:-0.05,0.40), the intention of consumption (heterogeneity 78.9%, medium, SMD:0.15 ,not obvious, 95% CI:-0.13,0.43), and skipping breakfast (heterogeneity 97.8%, large, SMD:0.38, moderate, 95% CI:0.33,0.40).

8. Subgroup analysis

Age stratification. The subgroup analysis as stratified by age of children (8-12 years) and adolescents (12-17 years) was conducted in three groups. For group 1, there were only two studies conducted by observing the age group of less than 12 years, with one being 6-12 year and another being 10-17 year without subgroup data of 10-12 years. Therefore, it is difficult to conduct the age grouping analysis. In group 3, there was no significant effect of exposure on the food intake by children ($I^2=90\%$, $SMD=0.19$) after removal of the data with adolescents. However, when compared with children ($I^2=99\%$, $SMD=-2.1$, $P=0.3$), it was observed that social media exposure had an obvious effect on adolescents liking unhealthy food ($I^2=0\%$, $SMD=0.19$, $P=0.12$). In terms of group 6 of skipping breakfast, all studies were the cross-sectional studies with a relatively large number of participants and the stratification of age groups could not be extracted.

9. Discussion

Combined with the above findings, exposure to unhealthy food marketing has an impact on consumption, attitudes, intentions and unhealthy behaviors, especially when it comes to unhealthy behaviors, such as skipping breakfast. However, the effect results in other areas were not significant, suggesting that media food marketing had a limited effect on unhealthy diet outcomes. Adolescents show a more positive attitude towards unhealthy food and may be attracted by unhealthy food marketing. The more information about unhealthy foods posted by influencers and celebrities on social media, the more likely participants were to have preferences and intake of unhealthy foods, and peer influence also had an impact on adolescents' food preferences and intake (Ye et al. 2021)^[12]. Eye-tracking studies have shown that teenagers spend more time looking at images of unhealthy foods posted by celebrities or companies than by their peers. In terms of trust, peers are more trustworthy than celebrities and influencers. Analyzing the impact of food marketing in the social media environment on food choices and preferences is important for us to better understand this issue. However, more research is needed to delve deeper into the effects of unhealthy food marketing on children and adolescents, with larger sample sizes and uniform measurements to address the heterogeneity of outcomes (Li & Ling)^[13].

Exposure to food advertising was associated with larger food preference trends, with prolonged use of smartphones as primary devices to access social media and the Internet leading to reduced consumption of fruits, vegetables and increased consumption of sweets, fast food and sweet drinks. Simultaneous exposure to multiple digital media marketing may accelerate the deterioration of adolescent nutrition patterns. Food cues in advertising are related to food choice and children's intake, especially snacks. Fast food advertising elicits more attention and reward-related neural responses (Bruce et al. 2014)^[14]. All electronic device use, except for educational computers, was associated with increased daily sugar and caffeine consumption. Online activity and participation with rural children increased the likelihood of eating at fast food restaurants. Spending time on specific social networking sites increases the likelihood of skipping breakfast and drinking sugary drinks and energy drinks. Children and adolescents are exposed to food marketing, and not just to unhealthy foods. The overall effect may be more significant (Potvin Kent, Pauze, Roy, de Billy, et al. 2019)^[15].

10. Implication

In this paper, a review is conducted of the knowledge used to identify and summarize the research focusing on the association between social media exposure and food-related behaviours among children and adolescents. A robust and extensive search strategy is applied to 6 databases, by being adherence to PRISMA principles, using of pre-tested and standardized data extraction templates, and applying pre-test methods when conducting data extraction and quality assessment. In addition, a wide age range (0-18 years) was also included to account for the developmental differences in age, which facilitates the analysis of SM usage behaviours and their relationship with food response from childhood to adolescence. There were different study designs included, such as observational studies and randomized controlled trials.

Another finding is from the studies with no significant results as they were conducted before social media emerged. It is suggested that there is a necessity to measure the impact of persistent stimuli in the future, and to assess the impacts of accumulative exposure, responses, and long-term outcomes as well as how children respond to repeat promotions that occur in life, as well as whether children

compensate for the advertised diet in subsequent meals. Demonstrating the long-term effects on body weight and diet patterns, the diet outcomes related to obesity can be taken into account for policymaking.

Acknowledgements

I would like to express my sincere thanks to the teachers in the teaching and Research Department. I have benefited a lot from your help.

Thanks to my family for their care and support all the time. Your selfless love is the strength that keeps me moving forward.

Finally, I would like to thank everyone who cares, supports and helps me.

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