**Research Snapshot**

Research Question: Do advertising techniques in online games (banner advertising, advergames, or rewarded video advertising) influence children’s attitudes, choices and consumption of advertised snacks?

Key Findings: A randomized experimental study (children *n=156*, 7-12 years) identified that rewarded video advertising used to promote an unfamiliar confectionary brand, significantly influenced children’s advertising awareness and food choices. Children were not significantly aware of, or influenced by advergames or banner advertising. This study suggests that it is not only exposure to advertising in online gaming contexts that influences children, it is how the advertising messages are delivered in sophisticated techniques.

**Advertising placement in digital game design influences children’s choices of advertised snacks: a randomized trial.**

**Abstract**

Background: Children are inhabitants of a media-rich environment rife in extensive, sophisticated and persistent techniques that are used to market unhealthy food. Exposure is known to influence children’s attitudes, choices and consumption, yet further research is required to explore the impact of contemporary techniques within online games.

Objective: To explore the impact of modern advertising on children’s attitudes, choices and consumption, techniques (banner advertising, advergame, and rewarded video advertising) were used to promote an unfamiliar confectionery brand within an online game.

Design: A between-subjects randomized experimental study.

Participants/setting: Children (aged 7-12, *n*=156) were recruited in New South Wales, Australia between September and November 2017.

Intervention: Children were required to play a four-minute online game, complete some questionnaires and choose one snack to consume afterwards. Children were randomly assigned to one of four conditions: a control group with no advertising, and three experimental conditions that promoted an unfamiliar confectionery brand via a banner advertisement, advergame or rewarded video advertisement.

Main outcome measures: Questionnaires included the assessment of attitudes to the test brand pre and post the game, enjoyment of the game and children’s awareness of advertising. Food choice was recorded and food consumption was measured by weighing the snack in grams, which were translated into kilocalories.

Statistical analyses performed: Statistical tests included ANOVAs, Kruskal-Wallis and Chi-Square.

Results: Attitudes towards the perception of ‘fun’ (*p* = 0.06) and ‘taste’ (*p* = 0.21) of the test brand were not influenced by condition. Children who were exposed to the rewarded video advertising chose the test brand significantly more than children in the other three conditions (*p* < 0.002). Condition did not influence overall energy intake measured in grams (*p* = 0.78) or kcals (*p* = 0.46).

Conclusions: Children’s choice of the test brand was significantly influenced by the rewarded video advertising condition (compared to the control, banner advertising and advergame conditions). This technique is prevalent across online and application games that children play yet the effects of using rewarded video advertising to promote food brands have not been explored before from a public health perspective. Therefore this study has contributed to the understanding of modern strategies used to market unhealthy foods to children.

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**Keywords**

Childhood obesity; food marketing; online games; in-game advertising; advergames

**Advertising placement in digital game design influences children’s choices of advertised snacks: a randomized trial.**

**Introduction**

The marketing of unhealthy food and beverages is a key component of the obesity-promoting environment 1,2 and exposure to food advertising leads to an increased preference for, and consumption of, unhealthy foods, with the magnitude of effects greatest in children who have the highest exposure 3. These outcomes of exposure have been identified as critical components in the series of events that lead to an unhealthy choice or purchase, and ultimately consumption, diet and weight by the Hierarchy of Effects model 4. As such, reducing exposures to unhealthy food and beverage marketing has been prioritized as a population-based intervention to alleviate non-communicable diseases by 2025 5.

Children live in a media-saturated environment 6 in which screen time has become the predominant recreational activity 7. Society today hosts a record high number of young children online, mostly due to increased ownership of handheld devices 8. UK children aged 5-15 years spend over 15 hours per week online 8, and mobile games (tablet and smartphones) account for 43% of the games market (USD$50.4 billion in 2017) 9. Consequently, food advertising expenditures have seen a shift from child-directed television advertising to increased spending on digital advertising 10.

Advertising is ubiquitous across popular children’s websites 11-13 and in children’s online games 14. The most frequently visited children’s websites contain multiple food marketing instances, with display advertisements (online advertising that comes in many forms, e.g. banner advertisements - an electronic advertisement that appears on the top or bottom of a webpage 15) the most prominent 12, followed by product placement (the planned and unobtrusive entry of a branded product into media 16) and advergames (an online video game that promotes a particular brand or product by integrating it into a game 17) 12. Moreover, the US Rudd Center for Food Policy and Obesity have also highlighted the prevalence of display advertisements for food and beverages across children’s websites, calculating that during an 11 month period, there were more than three billion impressions for food and beverage advertisements 18. This is of concern because children experience more difficulty recognizing display advertisements online versus advertisements in television 19.

In the context of the game itself, advertising is also commonplace 14,20, which leading national advertisers implement in two main ways: in-game advertising and advergames 21. Advergames are either created by, or sponsored by a company 22 and facilitate a brand-rich gaming environment by embedding the brand product or logo into a game 20. Alternatively, in-game advertising involves the placement of an advertisers brand into an existing commercial game to promote their products or services 21. Advergames are found on two-thirds of websites belonging to food manufacturers 23 and a significant concern with children’s interactions with advergames is how easily the true intent behind the game can be disguised 24. This is likely to be because the game design allows brands to blur the boundaries between advertising and entertainment 25. These techniques operate on implicit mental processes, with the aim to increase familiarity and likeability of the brand 20,26-28. The likeability of the brand is often influenced by using branded game components 20, as enjoyment and successes in the game are associated with the brand 20,27.

In-game advertisements are predominant within the most popular children’s online games 14 and application games 29. It is believed to be the most difficult advertising practice for children to understand 30 and it is likely that the confusion is due to the integrated nature of the advertisements. Dynamic advertisements are a component of in-game advertising 31 that can be integrated into the gameplay in either a subtle or prominent manner 32. These advertisements have a playful role in the game. That is, advertisements are incorporated as a part of the game strategy, story and outcomes as a major component of play, such as an advertisement that the player must watch before progressing to the next level or unlock play items 29. This is known as ‘rewarded video advertising’ and involves the incentivized exchange of the users attention on the advertisement for additional game features 33. In-game advertising, most commonly rewarded video advertisements 34, frequently appear on games that operate on a ‘freemium’ model, providing free gameplay and rewarding players for ‘consuming’ advertising 35. This model reduces the barrier to access, as the game cost is zero, yet children are exposed to more advertising 29. This is of concern because consumers are more likely to agree to install a free game (with advertising) than a paid game (without advertising) 36,37. The link between the emotional response generated through game progression 38 and the associated advertising, influences the players’ positive affective state, thought to contribute to the ideal circumstances for viewing advertisements 39.

Previous studies have investigated the impact of advertising techniques used within gaming, and have demonstrated the influential power of advergames on children’s food choice and consumption post exposure 40-42. Studies have shown a food cue 41 or a branded food logo 42 in an advergame influences children’s subsequent food-related behavior. However, there are numerous other game design techniques 12 that are widely adopted by the food industry to promote products 43. Considering that children play a broad range of games food manufacturers can embed with advertising (in-game advertising), not only food manufacturer-owned advergames 44, more research is required to explore the power of these individual techniques on children’s food behaviors.

This study aimed to explore the impact of contemporary food advertising techniques within online games on children’s food brand attitudes, choices and consumption behaviors. It was hypothesized that, compared with children who played an online game with no food advertising, those who played the game with food advertising would:

1. Have a more favorable attitude towards the advertised brand
2. Choose the advertised brand more frequently and
3. Consume more of the advertised product immediately after playing the game

It was also hypothesized that children’s awareness of food advertising would differ across the different advertising techniques used in the online game

**Materials & Method**

### Ethical approval for this study was obtained from the University of Wollongong Human Research Ethics Committee (HE17-311) and the study was prospectively registered with the Australian and New Zealand Clinical Trials Registry (ACTRN12617001313325, on 13/09/2017).

### Participants aged 7-12 years were recruited via opportunistic sampling, including two childcare organizations (a University of Wollongong school holiday camp, and an afterschool care provider) in the Illawarra region, New South Wales, Australia. Both providers were contacted and participation of the children was voluntary. Informed written consent was obtained from parents and guardians, as well as verbal assent by the children before participation. Data were collected at the Illawarra Health and Medical Research Institute at the University of Wollongong during the school holidays, and five afterschool care centers across the Illawarra during term time between September to November 2017.

*Study design*

The study utilized a between-subject design with four conditions (control and three experimental advertising techniques). Each child was required for a one-time 25-minute visit and was randomly assigned to each condition via a computerized randomization list. The session times ran from 11 am to 5 pm and the participants were asked to refrain from eating an hour before taking part.

### Materials and measurement tools

*The test brand*

The confectionery brand ‘Rowntree’s Randoms©’ was chosen as the test brand. This is a UK product not sold in Australia, and so was highly likely to be unfamiliar to Australian children. It was crucial to use an unfamiliar brand in order to measure the effects of exposure to the experimental advertising techniques in the absence of pre-existing brand attachments or attitudes.

*The test foods*

To explore the influence of the advertising techniques on choice and consumption, participants were required to choose one snack from a selection of four items (grapes, and three types of confectionery, weighing 100g each) immediately after playing the online game for four minutes. It was important to induce a choice of one item as to determine a desire for a specific snack after playing the game. All snacks were labelled and presented in small white, opaque cardboard tubs, so that the participant’s choices were not influenced by visual cues of the product, and were made on the name or brand alone. The items were labelled with an adhesive sticky label, stating ‘Green Grapes’ or ‘Gummy Lollies’. Each tub of ‘Gummy Lollies’ included further information on the label stating either: ‘Supermarket Brand’ (text only), Rowntree’s Randoms© (text and logo) or Squashies© (text and logo). The second unfamiliar brand (not included in the game), Squashies©, was included to assess whether children were more likely to favor an unfamiliar brand over another, if they had been exposed to advertising of one of them. It was also included to explore if the effects of advertising an unfamiliar item would extend to influence the choice of another unfamiliar brand.

Food choice was measured by recording the snack that each participant chose within their condition. Participants’ energy intakes were measured by recording the weight in grams of the chosen snack before and after consumption. This amount was then converted into kcals to determine energy intake using Foodworks 8 nutrient analysis software 45.

### *The online game*

### The online game and all experimental modifications across conditions were built by a professional digital game developer. This facilitated manipulation of several elements, including the advertising techniques, the duration of the game, and most importantly, the incorporation of the test brand. The game was a web-based side-scroller game, designed to mimic other popular online games, in which the player had four minutes to help their avatar, an alien, collect as many coins as they could. The avatar, named ‘Ziggy’, was chosen to enhance the novelty of the game and provided a gender-neutral avatar to be equally appealing to all participants. The game experience was almost identical for all participants, yet varied slightly across the different conditions, dependent on the advertising technique used. The four configurations of games with their associated advertising techniques (Table 1) included a control condition and three experimental conditions, consisting of banner advertising, an advergame, and rewarded video advertising.

**Table 1**

The banner advertisement and video advertisement used were both genuine marketing collateral by Rowntree’s Randoms© (Nestlé), downloaded from the internet and YouTube.com. The game pieces were made using the Rowntree’s Randoms© logo, and an image of the confectionery that they manufacture, which were also downloaded from the internet.

*Questionnaires*

Subjective appetite ratings were recorded using a five-point Likert scale in a pictorial format for children; with the anchors “I am really hungry” and “I am not hungry at all” 46. A logo questionnaire was constructed for administration pre- and post-game intervention to assess recognition and attitudes towards the test brand. The intention of this assessment was masked by the inclusion of five other food and beverage brands for the child to rate. To record attitudes, the logo recognition questionnaire used a five-point Likert scale with two adjectives as the anchors, which had been adapted from a scale by Dixon *et al.* (2007) 47. They were asked if they thought the brand was either ‘Yucky or Yummy’ to indicate perception of taste, and ‘Boring or Fun’ to indicate perception of fun, with a higher rating indicating a more positive opinion. Participants were also asked in a post-game questionnaire about their awareness of advertising during their time playing the game, which was assessed with a ‘yes/no’ to whether they saw any, followed by several probing questions to confirm whether this response was true (e.g. confirming with the child where they saw the placement of the advertising). Enjoyment of the game was also measured on a five-point Likert scale (Boring to Fun). Demographic information was captured including sex, age and residential postcode. Residential postcode was used to identify the Socio-Economic Indexes of Areas (SEIFA) index of disadvantage 48.

*Anthropometric measures*

Many studies that have measured the influence of food marketing have found the greatest effect (and sometimes only effect) on energy intake in children with overweight 49. Participants’ height and weight were measured using scales and a stadiometer at the end of their participation to classify their weight status into body mass index (BMI) categories. The measurements were undertaken in private by trained staff using standard procedure (with clothes and no shoes) and neither the child nor any subsequent children saw the measurements recorded. BMI was classified using the World Health Organization child growth standards for age (5-19 years) 50.

**Procedure**

*Sampling*

The minimum sample size of n=136 participants was based on an estimation to ensure sufficient statistical power (80%) to assess a difference in energy consumption of 68kcal, with a significance of 0.05, derived from published data in a similar online game study using the differences in reported energy intake between conditions 41. The calculation was based on the energy intake effect because of previous television studies that have found significant outcomes in consumption 3.

**Figure 1**

In the snack component of the design, each participant was given an undisclosed eating time of ten minutes to eat their chosen snack. The researcher also gave a reason for needing to briefly leave the room so that the participants were not being watched as they ate, which aimed to make them feel more comfortable to eat the amount that they liked.

*Statistical analysis*

All data met normality assumptions and due to the variation of discrete and continuous data, both parametric and non-parametric tests were used. To test whether food advertising led children to have a more favorable attitude towards the advertised brand, perception of ‘taste’ and ‘fun’, pre and post-game, were tested using two Kruskal-Wallis tests. To determine whether food advertising influenced children’s choice of the advertised brand, snack choice was tested using Chi-Square. To test whether food advertising influenced children’s consumption of the advertised product, energy intake (for both grams and kcals) was tested using a one-way ANOVA. Enjoyment of the game was tested using Kruskal-Wallis and awareness of advertising was tested using Chi-Square. All analyses used a significance level of 0.05 and were examined using the IBM SPSS Statistics Package 51.

**Results**

*Sample characteristics*

**Table 2**

156 participants aged 7-12 years (85 males, mean age of 8.7 years (SD±1.5)) were recruited (Table 2); 46% of participants participated at the Illawarra Health and Medical Research Institute at the University of Wollongong (29% general public, 17% the University of Wollongong’s school holiday camp), and the remaining 54% of participants were recruited from five after-school centers across the Illawarra region. The SEIFA Index of Disadvantage for Wollongong City and Shellharbour City 48 indicated participants were from low (46%) and medium (55%) socio-economic areas, using postcode of residence, which was representative of the average population in the recruitment locale 48.

**Table 3**

*Attitudes*

The perceptions of the test brand as appetitive (‘tasty’ - indicated by ‘Yucky or Yummy’) and fun (indicated by ‘Fun or Boring’) are displayed in Table 3. These ratings were tested by two Kruskal-Wallis tests which showed that across groups there were no significant differences between pre- and post-game ratings of taste χ² (3), = 4.42, p = 0.21 or fun, χ² (3), = 7.42, *p* = 0.06.

*Snack choice*

Using Chi-square tests, age and BMI were not associated with snack choice. Table 3 lists the snack choices made in each condition and indicates the test brand was chosen more frequently within the conditions exposed to the test brand advertising compared with the control condition. Chi-square indicated that only one condition significantly influenced children’s snack choice; children in the Rewarded Video Advertising condition were significantly more likely to choose the test brand, Rowntree’s Randoms©, χ(9), = 25.97, *p* < 0.002.

*Consumption*

Measures of consumption included any snack chosen and consumed by the children. Overall, children ate an average of 52±31 grams and 137±104 kcal (Table 3). Consumption was tested by a one-way ANOVA which indicated no significant differences across condition groups for amount consumed (grams) (F(3,155) = 0.351, *p* = 0.789) or energy consumed (kcals) (F(3,155) = 0.861, *p* = 0.463).

*Awareness of advertising*

Participants were most aware of the advertising when this was embedded in the game interface (rewarded video advertising condition 80% and advergame condition 60%) whereas only 31% of participants in the banner advertisement condition were aware of the advertising (Table 3). Chi-square indicated that children did not significantly recall advertising in the banner advertisement condition or the advergame; children were only significantly aware of advertising in the Rewarded Video Advertising condition χ(3) = 55.50, *p* < 0.001.

*Enjoyment of the game*

The game was given a median rating of 4 (out of five) across all conditions (Table 3). Enjoyment of the game was tested by Kruskal-Wallis which indicated no significant differences between condition and enjoyment of the game χ²(3), = 1.42, *p* = 0.69.

**Discussion**

This study explored the influence of persuasive advertising techniques and placement within game designs that are commonly used in online games to promote food and beverages. The findings highlighted that persuasive and modern techniques, specifically those that overtly incorporate advertising into the game experience such as rewarded video advertising strategies, directly influence children to choose unhealthy advertised foods immediately after acute online game exposure. Comparatively, in the absence of this marketing, the healthy snack was selected by a substantial minority of children.

It was anticipated that a positive association towards the brand would be found in the conditions that incorporated an advertisement for the test brand, but contrary to the hypothesis, there were no significant differences across conditions in attitude towards the test brand.

Rewarded video advertising was significantly associated with the children’s choice of the test brand. This supported the hypothesis that children who were exposed to the game with the test brand would be more likely to choose it. This technique directly related the interaction with the brand to success in the game and offered a particularly engaging advertising experience as it focused the participants’ attention directly on the brand for a 30-second period. The content of the advertisement was rich in additional marketing techniques, such as humor, known to be commonly used in marketing to children 52 which may have increased the influential power of the strategy.

Children were only significantly aware of the test brand advertising in the rewarded video advertisement condition. This could be for several reasons: it was the most overt technique; mid-roll advertising has been previously acclaimed as the optimal position for an advertisement (versus a pre- or post-roll advertisement) for brand recognition 53 ; and dual-modality of audio-visual information is known to enhance children’s product recall 54. The Food Marketing Defense Model suggests the awareness of advertising is a significant component in providing a defense to mute the effects of advertising 55. However, children chose the test brand significantly more in the condition that they were significantly aware of the presence of advertising. This finding reflects the mechanisms underlying a Hierarchy of Effects model, which posits that awareness and preferences are critical precedents to making a purchase or consumption that may lead to individual-level weight outcomes 4.

Despite the widespread use of banner advertisements on children’s websites 18,56, this advertising technique did not significantly influence children’s food behaviors in this study. The advertisement was positioned at the bottom center of the game, in the peripheral field of vision. Proponents of banner advertising claim that players who are focusing on a game require the target stimuli to be outside of that focus so that the awareness is developed in a low state of cognitive processing 57,58. However, banner advertisements have been found to be ineffective when the player recognizes them as irrelevant content, and therefore actively avoids them 58. A majority of participants claimed to have not noticed any branding or marketing of products in this condition and therefore the participants may have been ignoring the advertisement that they thought to be immaterial or they may have not cognitively processed its presence.

In addition, a significant proportion of the participants were not aware of advertising in the advergame condition. This is consistent with previous research that shows children have difficulty in identifying advertising within advergames 59.The Food Marketing Defense Model requires children must actively recognize marketing content to activate their cognitive defenses which assist them to resist the effects of exposure 55. This model contents children would be unable to defend themselves in instances such as this embedded advertising where the advertising is not obvious.

In contrast with previous studies 41,60, children’s energy intake of their chosen snack was not significantly influenced by exposure to the test brand. The children were provided with 100g of food and on average consumed half the amount provided. Whilst the ten minute eating time was not disclosed to the participants, and they had all stopped eating before the ten minutes were finished, there is potential that the restriction on timing may have influenced their intake, as other studies who have found significant intake results had no limit on the eating periods 61. This exposure duration may have only been sufficient to influence awareness and choice which are known to be the initial factors within the Hierarchy of Effects Model 4.

*Study strengths and limitations*

The main strength of this study, which has not been common in other studies, was utilizing an unfamiliar test brand rather than local or globally popular products. This facilitated the exploration of the consumer journey and response to exposure in the absence of prior awareness, attitudes or associations with the product. Secondly, because the game was professionally designed and the marketing collateral was genuine, the content and vehicles of exposure that participants experienced were reflective of real-world interactions with online gaming and thus the findings contribute to a present-day understanding of food marketing within new media.

A limitation of this study is that it only investigated the short-term impacts of acute exposure to the food advertising techniques. As a result, this study cannot account for what children may have consumed after leaving the study. For example, they may have been inclined to eat healthier after eating the confectionery as their snack. However, due to recent research that has explored the impacts on energy intake post exposure at later occasions, it can be assumed that children would not have compensated for a less healthful or higher energy intake after exposure 60.

*Conclusion*

This research contributes new evidence that demonstrates the persuasive impacts of food marketing exposure on children’s food behaviors through the medium of online gaming. It highlights that it is not simply exposure to a brand that influences children’s brand awareness, attitudes and choices, but also how branded messages are delivered in highly sophisticated advertising techniques. Specifically, children were not influenced by banner advertising or advergames, but by a technique which rewarded the player for watching the advertisement by unlocking a lucrative level to facilitate game play (rewarded video advertising). In an era of increasing digital and mobile game use 8, this study indicates that an awareness of advertising is insufficient to protect children and they remain vulnerable to the effects of the advertisements. Moreover, rewarded video advertising has not been investigated before in academic research on children’s food behaviors and findings suggest that it should be recognized as a high priority for effective marketing regulation interventions.

**Abbreviations**

Kcal = Kilocalories, g = Gram

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