

RESEARCH ARTICLE

# Exposure to digital marketing enhances young adults' interest in energy drinks: An exploratory investigation

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## Abstract

Young adults experience faster weight gain and consume more unhealthy food than any other age groups. The impact of online food marketing on “digital native” young adults is unclear. This study examined the effects of online marketing on young adults' consumption behaviours, using energy drinks as a case example. The elaboration likelihood model of persuasion was used as the theoretical basis. A pre-test post-test experimental research design was adopted using mixed-methods. Participants (aged 18–24) were randomly assigned to control or experimental groups ( $N = 30$  each). Experimental group participants' attitudes towards and intended purchase and consumption of energy drinks were examined via surveys and semi-structured interviews after their exposure to two popular energy drink brands' websites and social media sites (exposure time 8 minutes). Exposure to digital marketing contents of energy drinks improved the experimental group participants' attitudes towards and purchase and consumption intention of energy drinks. This study indicates the influential power of unhealthy online marketing on cognitively mature young adults. This study draws public health attentions to young adults, who to date have been less of a focus of researchers but are influenced by online food advertising.

## OPEN ACCESS

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## Introduction

Young adults are experiencing rapid weight gain [1–2] and are at greater risks of developing weight-related non-communicable diseases over time. Data from the Australian National Health Survey 2014–15 indicated that approximately 39% young adults aged 18–24 years were overweight or obese [3] and this age group consumed more unhealthy food and beverages than any other age groups [4]. Despite the growing health issues among this age group, research about influences on young adults' consumption behaviours is scarce.

This study defined “young adults” as those aged 18 to 24 years, consistent with Australian National Health Survey 2014–15 classification and also previous publications on young Australians' health-related behaviours [5–7]. The years from 18 to 24 years mark a distinct life stage. Some have defined this stage as “emerging adulthood”, a transitional stage between

adolescence and full adult status [8]. Legally, they are adults, but they are still on the learning stage of becoming adults where many experience transitions from high school to work or college, from the parental home to their own accommodation, from passive meal recipients to first time food purchasers and preparers [9, 10]. The fact that this age group may face new challenges in life such as food purchase and preparation, but legally no one holds responsibilities over them, may open up new marketing opportunities for food and beverage industry. As indicated by Freeman et al. [10], the food industry may shift their promotional target from children to young adults in response to the increasing scrutiny over children's unhealthy food marketing exposures.

Unhealthy food and beverage marketing towards young adults through the digital media is of particular relevance. This form of marketing is less scrutinised than the traditional marketing on television or in newspapers [11] but is pervasive for young adults who have grown up surrounded by digital technologies and have a strong online presence [12]. The more engaging and invasive forms of advertising on digital platforms, such as through social media sites and advergames, have been linked to unhealthy food consumption among children [13–14]. Such online advertising may also be appealing to young adults. It is unknown how the persuasive messages of online food marketing influence young adults, as it is often assumed they have developed cognitive capabilities to critically interpret the persuasive intent of marketers [15].

Unhealthy products that are particularly relevant to digital food marketing and young adults are energy drinks. Energy drinks are a new beverage category, defined as “a non-alcoholic caffeine containing beverage typically consumed to provide an energy boost or for mental alertness” [16]. Common examples of these drinks in the Australian market include Red Bull, Mother, V, Monster and Rockstar. Energy drinks were selected as a case example in this study due to a number of reasons. Firstly, consumption of energy drink is a public health concern. These drinks contain high amounts of caffeine and stimulants such as guarana, ginseng, and B groups vitamins, with varying amounts of sugar and protein, which can be linked to weight gain and a range of adverse health events such as headache and irritation [17–19]. A recent review conducted by Visram and colleagues [20] further suggested that the consumption of energy drinks are associated with risky behaviours, including sensation-seeking and self-destructive behaviours. Secondly, these drinks are marketed to improve alertness, concentration, and stamina [21] and may therefore be especially popular among young people, students and party-goers. Thirdly, energy drink brands predominantly utilise digital media for promotional purposes, for example, website, online games and social media platforms such as Facebook, Twitter, and YouTube [22]. Lastly, marketing of energy drinks is not strictly regulated in Australia. Energy drinks are regulated under the Food Standard Australia New Zealand (FSANZ) code in relation to product composition and labelling [23]. The advertising and marketing code established by the Australian Association of National Advertiser (AANA) does not cover marketing activities on digital platforms [24].

The mechanisms of the influences of digital marketing on food-related behaviours are not well understood. Marketing literature exploring tobacco, alcohol, and fast food products adopted the notion of marketing receptivity to understand consumers' responses to marketing contents [25–27]. This approach suggested that consumers' responses progress through several stages before any behaviour change. Responses range from low receptivity (exposure to marketing contents), to medium receptivity (attend to and understand the marketing contents), and then high receptivity (development of a cognitive or affective response to the marketed products or brands) [25–27]. Evidence of consumers' receptivity to the marketing contents includes indications of positive cognitive or affective responses to the marketing contents or communications [25], such as a change in attitude towards the marketed product or brand

[28]. Attitude changes have been recognised by numerous psychological theories as one of the intermediate mental effects of marketing exposure [28, 29].

The present study applied the concept of marketing receptivity to explore the possible causal pathway where exposure to digital food marketing may prompt a mental response (attitude change) as well as intermediate cued purchase and consumption intentions of the marketed brands and products. We hypothesised that exposure to digital marketing of energy drinks would enhance young adults' attitudes towards, and intended purchase and consumption of, these drinks. Findings from our study indicated that digital food marketing has impacts on young adults' attitude towards and their intended purchase and consumption of energy drinks.

## Materials and methods

This study adopted a pre-test post-test control group experimental model. A mixed-methods design was employed utilising a quantitative survey technique complemented by qualitative semi-structured interviews. All materials and procedures were approved by the University of Wollongong Human Research Ethics Committee (HE15-280). Participant Information Sheets were provided to the participants and their written consents were obtained before their participation in the study.

### Participants

Young adults aged 18 to 24 years were recruited in the Illawarra region of New South Wales, Australia, between July 2015 and March 2016. Recruitment included promoting the study through handing out flyers in university lectures and community colleges, at bus-stops, community centres, local sports clubs and a local theme park; posts and tweets on social media sites; and snowball sampling. The study was promoted as a study about Internet usage and food consumption. The advertisement did not make it explicit that it would be asking questions about energy drinks marketing in order to recruit both energy drinks users and non-users. Any young adults aged 18 to 24 years and knew how to use the Internet met the inclusion criteria. Individuals who were interested to participate in the study contacted the lead author via email or phone. Times and venues (all public spaces) were then arranged for the study at participants' convenience. Participants were randomly assigned to either the control or experimental group. Randomisation was performed after the study sessions were booked; the lead author randomly picked out sealed envelopes that contained control or experimental surveys. Participants who completed the study were entered into a lucky draw of iTunes and Coles (major supermarket) vouchers of different values (\$10-\$50) as recognition for their time.

### Materials

**Exposure experiment.** The selected exposure materials to examine the impact of digital marketing on the participants in the experimental group were the websites and social media sites of two popular energy drinks brands: *Red Bull* and *V Energy*. These two brands were selected due to their popularity [30] and their distinctive marketing appeal strategies, as revealed in a previous content analysis of a range of energy drinks' websites and social media sites [31]; *Red Bull* positions their brand as a high budget, sophisticated energy drink product by sponsoring high risk, expensive sports such as Formula 1 car racing, while *V Energy* used sophomoric humour such as superheroes to attract audiences. Control group participants were exposed to the websites and social media sites of two nut bars brands; *Carman's* and *Go Natural*. An online search of beverage products for the healthy comparison was conducted but

beverage options such as soft drinks, sports drinks and water products do not use online brand images promotion. The two nut bar brands were selected as they were relatively healthy food products in comparison to energy drinks and their use of positive brand images as marketing strategies was similar to the selected energy drink brands. All of the selected sites were publicly accessible. The researcher audited the sites every fortnight to ensure the exposed materials were consistent across the period between the first participant, who completed in July 2015, and the final participant, who completed in March 2016.

**Pre- and post-test surveys.** Experimental and control group participants self-completed the paper-based surveys at pre- (S1 Fig) and post-test (S2 and S3 Figs). Participants' attitudes towards, and purchase intention of, the two test energy drinks brands and energy drinks products in general were measured at both time points. Nut bars, soft drinks and muesli bars brands were included in the surveys as distractors. Participants' attitudes towards the energy drinks were measured by the mean of five 7-point semantic-differential scales; "bad/good", "unfavourable/favourable", "unappealing/appealing", "likeable/unlikeable", "pleasant/unpleasant". This scale had previously been used by other studies to measure brand attitudes [32–33] and was derived from Batra and Stayman [34]. The internal consistency of these measures was (Cronbach Alpha Analysis)  $\alpha = 0.941$ . Participants' purchase intentions of energy drinks were measured by the widely used 5-point intention scale [35], ranging from "definitely will not purchase" to "definitely will purchase". Demographic and Internet usage questions were also included in the pre-test survey.

**Post-test semi-structured interview.** The post-test quantitative survey was supplemented by a semi-structured interview (S4 and S5 Figs). The audio-recorded interviews were conducted by the lead author, who also wrote field notes during the interviews. Research into young adults' beliefs and attitudes towards digital marketing of food and beverage products is scarce and hence the interview was used to provide insights into participants' thoughts and feelings about the exposed materials, brands and energy drinks products in general. The interview questions were categorised into two main sections: (i) perceptions of brands, where participants were asked their views of the test energy drink brands, as well as the exposed websites and social media sites, and (ii) perception of energy drinks, where participants were asked about their own experiences and thoughts of energy drinks products and the consumption of these drinks among young people. Questions about nut bar products were included for the control group participants.

## Procedures

Participants took approximately 30 minutes to complete the study: pre-test survey (approximately 10 minutes), exposure experiment (fixed length- 8 minutes; 4 minutes on each brand), and post-test survey and semi-structured interview (approximately 10-15minutes). Participants filled in the pre-test survey before they were asked to browse the two selected energy drinks brands' websites and social media sites (nut bar brands for control group). Participants were told to browse the sites freely using a laptop; they were allowed to browse whatever contents on the sites they chose, e.g. photos, videos, company information, advergames, recipes, as long as they stayed within the same website. After browsing the online materials, participants were asked to fill in the post-test survey and to participate in the interview. To measure participants' food and beverage products preferences, participants were asked to select one food or drink item from a range of food and beverage products photos displayed on a poster before and after the experiment. To mimic a real-life 'unsupervised' web browsing scenario, the study was conducted at community settings (e.g., meeting rooms, cafes and parks) and participants were not 'supervised' during the study. Participants in the experimental group were given a

Fact Sheet about the negative impacts of energy drinks consumption [36] after the completion of the study.

## Statistical analysis

**Quantitative data analysis.** A pilot study ( $N = 16$ ) was conducted to pre-test the research instruments and to calculate the required sample size using G-Power statistical analysis software [37]. The input parameters entered into the software were effect size = .8,  $\alpha = .05$ , and between-groups comparison effect size of attitude change towards energy drinks observed in the pilot study ( $d = .52$ ). A total sample size of 60, 30 each in two groups, was needed to obtain statistical power of .92 level [38].

Statistical analysis was undertaken using the Statistical Package for Social Sciences (SPSS) for Windows, version 21. The internal consistency of the previously standardised attitude scale was examined by Cronbach Alpha Analysis. Based on data distribution, Independent sample *t*-tests or Mann-Whitney *U* tests were utilised to determine the changes in attitudes towards, and purchase intention of, energy drinks. Fisher-exact test was used to examine the changes in intended consumption of energy drinks before and after the experiment. *P* values of  $< 0.05$  were considered statistically significant.

**Qualitative data analysis.** Qualitative data were analysed based on the field notes taken by the lead author during the interviews. The audio-recordings were used to check the completeness of written field notes as soon as the interviews were completed and while the reflections remained fresh [39]. The primary purpose of the semi-structured interview was to identify key factors which had led to the changes in attitudes measured after the experiment and verbatim transcription of the audio data was not undertaken. The benefits of using written field notes during the interview have been demonstrated by several researchers [39–40]; not only that it may improve the efficiency, it may also ease the difficulties of data coding. Content analysis [41] was then conducted to elicit common themes arising from the participants' responses about their perceptions of the energy drinks brands as well as the exposed online materials. Content analysis involved: (i) open coding where the written notes were read through several times and (ii) grouping and categorisation where the headings were assigned to related contents before they were grouped into higher order categories [41]. The co-author who was not involved in the data collection reviewed the established themes and the respective responses. The established themes were categorised based on the elaboration likelihood model (ELM) of persuasion as discussed below.

## Theoretical framework

The elaboration likelihood model (ELM) of persuasion as proposed by Cacioppo and Petty [42] has particular relevance to the examination of food marketing impacts. Various studies have used ELM to understand the influences of product advertising [43–45]. ELM is a framework that describes the thinking processes that might occur when an individual is exposed to persuasive communication. ELM highlights dual routes of information processing, central and peripheral, that may lead to changes in an individual's attitudes and behaviours [44–45]. In the central route, an individual engages in high level information processing, that is, he/she carefully thinks about the persuasive message. An example of a central cue is the nutrition claims of a food product. In contrast, a peripheral route involves low level of information processing. An individual processes the message without much cognitive effort. A common peripheral cue used by advertisers is emotional appeals, such as fun and happiness [45]. The more pertinent element of ELM in this study was anticipated to be the peripheral route, as previous analyses of the digital marketing contents of energy drinks brands [31] have found that the energy drinks

**Table 1. Characteristics of study participants at pre-test.**

| Characteristics                               | Experimental (N= 30) | Control (N= 30) | P value | Total (N= 60) |
|---|----------------------|-----------------|---------|---------------|
| Gender <sup>a</sup>                           |                      |                 | .194    |               |
| Male  | 16                   | 11              |         | 27            |
| Female  | 14                   | 19              |         | 33            |
| Age <sup>b</sup> , Mean yr                    | 20                   | 20              | .892    | 20            |
| Education level <sup>c</sup>                  |                      |                 | .643    |               |
| High school or equivalent                     | 3                    | 4               |         | 7             |
| TAFE qualification or equivalent              | 3                    | 5               |         | 8             |
| Bachelor's degree                             | 21                   | 17              |         | 38            |
| Postgraduate qualification                    | 3                    | 4               |         | 7             |
| Internet usage <sup>c</sup>                   |                      |                 | .068    |               |
| Several times a week                          | 2                    | 1               |         | 3             |
| Every day                                     | 13                   | 7               |         | 20            |
| Several times a day                           | 15                   | 22              |         | 37            |
| Usual Internet activity <sup>c</sup>          |                      |                 |         |               |
| Emails  | 28                   | 26              | .977    | 54            |
| Online games                                  | 9                    | 10              | .783    | 19            |
| Facebook                                      | 28                   | 28              | 1.000   | 56            |
| YouTube                                       | 23                   | 24              | .756    | 47            |
| Twitter                                       | 6                    | 4               | .492    | 10            |
| Online shopping                               | 16                   | 17              | .442    | 29            |
| News  | 15                   | 17              | .608    | 22            |
| Attitude <sup>b</sup> Mean± SD                |                      |                 |         |               |
| Red Bull                                      | - 0.5 ± 1.4          | - 0.5 ± 1.7     | .947    | - 0.5 ± 1.5   |
| V Energy                                      | - 0.5 ± 1.4          | - 0.8 ± 1.4     | .402    | - 0.7 ± 1.4   |
| Energy drink products (general)               | - 0.4 ± 1.5          | - 0.5 ± 1.8     | .824    | - 0.5 ± 1.6   |
| Purchase Intention <sup>c</sup> Median (mode) |                      |                 |         |               |
| Red Bull                                      | -1.0 (-2.0)          | -1.0 (-2.0)     | .588    | -1.0 (-2.0)   |
| V Energy                                      | -1.0 (-2.0)          | -1.5 (-2.0)     | .753    | -1.0 (-2.0)   |
| Energy drink products (general)               | -1.0 (-2.0)          | -1.0 (-2.0)     | .545    | -1.0 (-2.0)   |

<sup>a</sup>Pearson Chi-square test

<sup>b</sup>Independent sample t-test

<sup>c</sup>Mann-Whitney U test

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industry steered away from actual product promotions/information and used emotional appeals like excitement to engage young adults.

## Results

Participants in the experimental and control groups were similar (statistically) in gender, age, education levels, Internet usage, and their usual Internet activities (Table 1). Although attempts were made to recruit participants from various demographic backgrounds, the majority of the study participants were university students (N = 49/60). At pre-test, participants' attitudes towards, and purchase intention of, the test energy drinks brands and energy drinks products in general were similar between experimental and control groups (Table 1).



**Table 2. Comparisons of participants' attitudes towards and purchase intention of, energy drinks after the experiment.**

| Measures   | Post-test–Pre-test (N = 60) | Test result                            |
|--|-----------------------------|--|
| Attitude <sup>a</sup> Mean ± SD                              |                             |  |
| Red Bull   | 0.3 ± 1.0                   | <i>t</i> (42) = -4.1, <i>p</i> = .000* |
| V Energy   | 0.3 ± 1.1                   | <i>t</i> (53) = -3.5, <i>p</i> = .001* |
| Energy drinks products (general)                             | 0.2 ± 0.8                   | <i>t</i> (50) = -4.5, <i>p</i> = .000* |
| Purchase Intention <sup>b</sup> Median (Interquartile range) |                             |  |
| Red Bull   | 0.0 (0.0–1.0)               | <i>U</i> = 222.5, <i>p</i> = .000*     |
| V Energy   | 0.0 (0.0–1.0)               | <i>U</i> = 243.5, <i>p</i> = .000*     |
| Energy drinks products (general)                             | 0.0 (0.0–1.0)               | <i>U</i> = 395.5, <i>p</i> = .300*     |

\*Significantly different when *p* < .05

<sup>a</sup>Independent- samples t-test

<sup>b</sup>Mann-Whitney U Test

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### Attitudes and purchase intention

Effect sizes of the study were calculated based on the attitudes changed; the between group effect size was *d* = 0.71 while the within group effect was *d* = 0.55. Both were medium effect sizes [38].

Participants in the experimental group had significantly better attitudes towards the two test energy drink brands *Red Bull* (*t*(42) = -4.1, *p* = .000) and *V Energy* (*t*(53) = -3.5, *p* = .001), as well as energy drinks products in general (*t*(50) = -4.5, *p* = .000) than the control group participants after the experiment. After the experiment, participants in the experimental group compared with control group participants also showed significantly greater purchase intention of the two test energy drinks brands *Red Bull* (*U* = 222.5, *p* = .000) and *V Energy* (*U* = 243.5, *p* = .000), as well as energy drinks products in general (*U* = 395.5, *p* = .300) (Table 2).

Between group comparisons showed that at post-test, the participants in the experimental group showed significantly more positive attitudes towards the two test energy drink brands (*Red Bull*'s mean difference of an average of 5 x 7-point semantic scales = 1.0±1.8, *p* = .038; *V Energy*'s mean difference = 1.2±1.6, *p* = .006) and energy drinks products in general (mean difference = 1.0±1.6, *p* = .028), and slightly greater purchase intention of *V Energy* (*Z* = -2.01, *p* = .044) as compared to the control group (Table 3).

Attitudes of the experimental group participants towards the two test energy drink brands (*Red Bull*'s mean difference = 0.8±1.5, *p* = .001; *V Energy*'s mean difference 0.8±1.6,

**Table 3. Between group comparisons at post-test.**

|  | Brand/Product                   | Experimental | Control     | P value |
|--|---------------------------------|--------------|-------------|---------|
| Attitude <sup>b</sup> (5 item; -3 to 3)Mean ± SD       | Red Bull                        | 0.3 ± 1.7    | - 0.7 ± 1.8 | .038*   |
|  | V Energy                        | 0.2 ± 1.7    | - 1.0 ± 1.5 | .006*   |
|  | Energy drink products (general) | 0.2 ± 1.5    | - 0.8 ± 1.7 | .028*   |
| Purchase intention <sup>a</sup> (-2 to 2)Median (mode) | Red Bull                        | 0.0 (-2.0)   | -1.0 (-2.0) | .087    |
|  | V Energy                        | -0.5 (-2.0)  | -2.0 (-2.0) | .044*   |
|  | Energy drink products (general) | -1.0 (1.0)   | -1.5 (-2.0) | .108    |

\*Significantly different when *p* < .05

<sup>a</sup> Mann-Whitney U Test

<sup>b</sup> Independent- samples t-test

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Table 4. Within group comparisons.

| Experimental  |                                 |             |             |         |
|---|---------------------------------|-------------|-------------|---------|
|   | Brand/Product                   | Pre-test    | Post-test   | P value |
| <b>Attitude</b> <sup>b</sup> (5 item; -3 to 3)Mean ± SD       | Red Bull                        | -0.5 ± 1.4  | 0.3 ± 1.7   | .001*   |
|   | V Energy                        | -0.5 ± 1.4  | 0.2 ± 1.7   | .001*   |
|   | Energy drink products (general) | -0.4 ± 1.5  | 0.2 ± 1.5   | .000*   |
| <b>Purchase intention</b> <sup>a</sup> (-2 to 2)Median (mode) | Red Bull                        | -1.0 (-2.0) | 0.0 (-2.0)  | .006*   |
|   | V Energy                        | -1.0 (-2.0) | -0.5 (-2.0) | .003*   |
|   | Energy drink products (general) | -1.0 (-2.0) | -1.0 (1.0)  | .223    |
| Control   |                                 |             |             |         |
| <b>Attitude</b> <sup>b</sup> (5 item; -3 to 3)Mean ± SD       | Red Bull                        | -0.5 ± 1.7  | -0.7 ± 1.8  | .129    |
|   | V Energy                        | -0.8 ± 1.4  | -1.0 ± 1.5  | .447    |
|   | Energy drink products (general) | -0.5 ± 1.8  | -0.8 ± 1.7  | .036*   |
|   | Carmans' nut bar                | 1.0 ± 1.3   | 1.8 ± 1.0   | .000*   |
|   | Go Natural's nut bar            | 0.7 ± 1.2   | 1.2 ± 1.2   | .068    |
|   | Nut bar products (general)      | 1.2 ± 1.1   | 1.4 ± 1.0   | .108    |
| <b>Purchase intention</b> <sup>a</sup> (-2 to 2)Median (Mode) | Red Bull                        | -1.0 (-2.0) | -1.0 (-2.0) | .046*   |
|   | V Energy                        | -1.5 (-2.0) | -2.0 (-2.0) | .046*   |
|   | Energy drink products (general) | -1.0 (-2.0) | -1.5 (-2.0) | .589    |
|   | Carmans' nut bar                | 1.0 (1.0)   | 1.0 (1.0)   | .003*   |
|   | Go Natural's nut bar            | 1.0 (1.0)   | 1.0 (1.0)   | .951    |
|   | Nut bar products (general)      | 1.0 (1.0)   | 1.0 (1.0)   | .052    |

\*Significantly different when  $p < .05$

<sup>a</sup> Wilconxon- Signed Rank Test

<sup>b</sup> Paired-samples t-test

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$p = .001$ ), as well as energy drink products in general (mean difference =  $0.6 \pm 1.5$ ,  $p = .000$ ) were all significantly improved after the experiment (Table 4). Participants' average attitude scale values all moved from the negative to positive ends. Although the experimental group participants' purchase intentions towards the energy drinks remained negative, their purchase intentions of the two test energy drink brands (*Red Bull*  $Z = -2.724$ ,  $p = .006$ ; *V Energy*  $Z = -3.000$ ,  $p = .003$ ) were improved statistically significantly after the test. Surprisingly, control group attitudes towards energy drinks products in general, and their purchase intention towards the two energy drinks brands were significantly worsened at post-test although they were not exposed to any energy drinks materials. As a side note, control group participants showed better attitude towards and greater purchase intention towards one of the test nut bar brands.

### Consumption intention

The participants involved in the exposure experiment had significantly enhanced intention to consume energy drinks at post-test. Seven participants showed positive change, from no intention to consume energy drinks at pre-test to intended to consume energy drinks at post-test,  $\chi^2(1) = 7.9$ ,  $p = .005$  (Table 5). The number of participants in the experimental group who selected energy drinks from the poster rose from four to eleven after the experiment. Control group participants had greater intention to consume nut bar products after the experiment  $\chi^2(1) = 16.6$ ,  $p = .000$ .



**Table 5. Participants' intended consumption of the energy drinks and nut bar products after the experiment.**

| Consumption Intention <sup>a</sup><br>Count | Experimental (N = 30) | Control (N = 30) | Positive change from pre-test to post-test <sup>b</sup><br>(N = 60) | Test result                    |
|---|-----------------------|------------------|---|--------------------------------|
| Energy drinks products (general)            |                       |                  |   |                                |
| Pre-test                                    | 4                     | 2                |   |                                |
| Post-test                                   | 11                    | 0                | 7   | $\chi^2(1) = 7.9, p = .005^*$  |
| Nut bars products (general)                 |                       |                  |   |                                |
| Pre-test                                    | 4                     | 6                |   |                                |
| Post-test                                   | 2                     | 19               | 13  | $\chi^2(1) = 16.6, p = .000^*$ |

\*Significantly different when  $p < .05$

<sup>a</sup>Fisher's exact Test

<sup>b</sup>Weight cases command was conducted before chi-square analysis on a contingency table. Due to the small sample size, Fisher's exact Test was used.

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### Qualitative interview findings

**Appealing factors of the exposed online materials and brands.** Consistent with the quantitative survey findings, a number of participants in the experimental group reported the exposure to the online materials had somewhat improved their feelings towards the test brands, with the majority of the participants showing more positive attitudes towards at least one of the test energy drink brands. A range of appealing elements (Fig 1) on the test brands digital platforms changed participants' attitudes towards these brands. The most widely mentioned factors were the corporate social responsibility initiatives reported by the brands, community involvement and sponsorship from *Red Bull*. For instance one participant (*participant a, male, 18 years*) noted,

*"Feel like they are trying to do good stuff for the environment; their cans are 100% recycled, and minimise transportation. . .that's a good thing, also they sponsored a lot of sports. . ."*

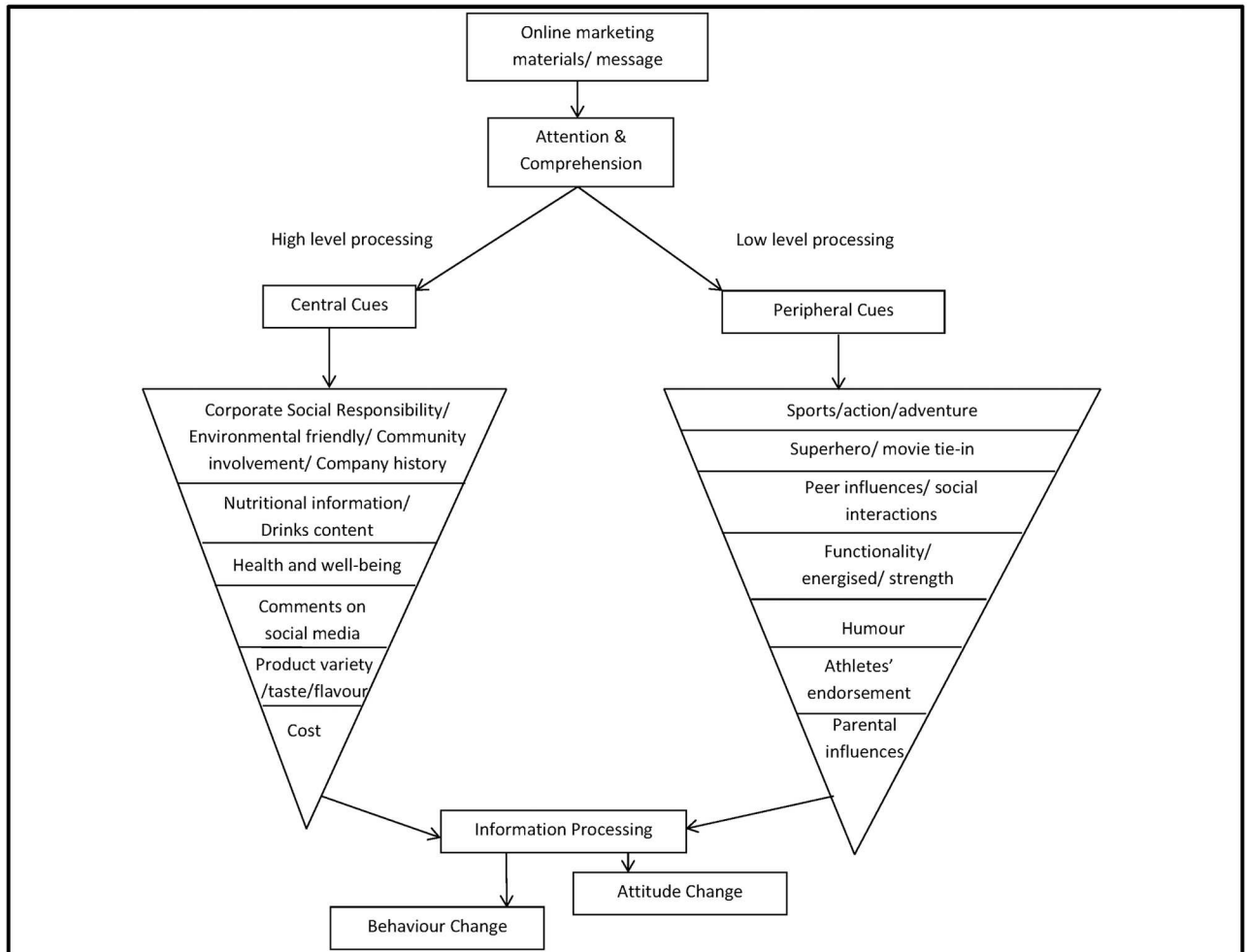
Both brands listed their drink products' nutritional information on their websites. The majority of participants favoured the "honesty" of the brands, for example,

*"V showed their nutrient contents, I was surprised by the low guarana content, it is not shady at all, really appealing"*  
(*participant b, male, 18 years*)

Only a minority of the participants took a more critical approach towards the nutritional claims made by the brands,

*"I looked at the ingredients of both brands, so superficial, no scientific proof benefits. . . some of them are just a sentence, don't believe that it will help me to concentrate at all"*  
(*participant c, male, 22 years*)

The superhero theme of V Energy appeared to be a selling point for some participants. *"I am into Avengers (movie) that would convince me to purchase V over Red Bull. . ."* (*participant d, female, 18 years*). The majority of the participants visited the test brands' social media sites



**Fig 1. Qualitative findings using ELM as a theoretical basis.**

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(mainly Facebook) during the experiment. The comments that were posted from other Facebook users seemed to have greater influence on the participants than posts by the companies;

*“V’s Facebook page was filled with positive comments from the others and the website was more engaging (not just about sports)...”, “Red Bull’s Facebook page made it even more unappealing, a lot of people left negative comments on their Facebook page...”*  
(participant e, female, 22 years).

**Views on energy drinks.** Relatively few frequent energy drinks users participated in the study.

The majority of the participants reported they had their first energy drinks when they were teenagers, usually under peer influence,

*“I first tried energy drinks in year8 or 9, friends bought me the drink, felt cool to drink it, we were under 18, can’t drink alcohol, so it was the next best thing...”*  
(participant f, female, 18 years).

Although most of the participants reported they had 'grown out of' / no longer consumed these drinks, many reported consuming energy drinks for functionality purposes, such as for stamina for assignments, computer games, shift work and parties. Almost all participants were aware of the 'practice' of mixing alcohol with energy drinks and many reported they had consumed these drinks when going out parties with friends, despite reporting they knew the drinks were 'bad' for them.

## Discussion

This study demonstrated the potential influential power of food and beverage digital marketing on cognitively mature young adults. After a short exposure to digital marketing materials, participants had a better impression of, greater purchase intention and were more likely to consume energy drinks. Of surprise was the revelation that central cues, such as corporate social responsibility as demonstrated by the brands, was reported by the participants in a manner that implied they had greater impacts on the young adults than the peripheral cues like emotional appeals.

The positive association between digital marketing and attitudes towards the beverage brands observed in this study contributes new insights into the influences of online environments on young adults' food-related behaviour. There have been a growing number of studies reporting on the use of digital platforms for marketing that have established the association between online alcohol marketing and consumption behaviours [46–50]. These studies, however, were cross-sectional designs and could not determine the direction of causality. There was one controlled intervention where the authors compared the effects of alcohol marketing online between states in the United States of America (USA) that do or do not have bans on advertising alcohol. This study found digital marketing of alcohol reduced the effectiveness of alcohol advertising bans [51], which indicated the influential power of online marketing materials on consumers' attitudes towards food products. Previous studies on alcohol have argued that exposure to marketing contents enhanced consumers' receptivity to alcohol marketing [28, 47]. Although not the same product category, our findings contribute to this literature showing how young adults may become receptive to risky product marketing.

The study reported here found that young adults' attitudes towards, purchase and consumption intentions of the brands were influenced by digital marketing. Online content that was most highly reported to have influenced their attitudes towards the brands were linked to central information processing cues, that information cognitively elaborated through the central route, as described in the ELM framework. There is a general assumption that young adults are cognitively mature and possess the ability to understand the persuasive intention of marketers [52]. However, our findings suggest that although young adults realised the online materials were designed to promote energy drinks products, they were not necessarily capable to defend themselves against marketing content such as the brands' community involvement, contribution to charities, and environmentally friendly efforts (i.e. corporate social responsibility). Young adults also valued the 'honesty' of the brands by declaring the contents of their drink.

The ability of these central cues to distort the promotion intentions of the online marketing among young adults was unexpected. Previous assessments of the content of food advertising, especially among children, has generally found that emotionally evocative peripheral cues in television advertisements were used to attract audiences [45, 53]. Our experiment only included a short exposure and the improvements in attitudes towards brands may only have a short lasting effect. However, this finding was significant since central cues are believed to have more profound impact on attitude changes and more predictive of future behaviour than

the peripheral cues [42]. Additionally, participants in this study were mainly educated young adults who reported to be aware of the health problems of energy drinks products. The impact of online marketing could be greater among young adults who are less educated or less health conscious.

The classification of central cues in this study was based on the assumption that participants may take more time to evaluate information such as the brands' contributions to the environment. Although literature on corporate image advertising has previously discussed the notion of the processing of corporate social responsibility messages from the ELM insights [54–55], none have explored whether these messages are evaluated through the central or peripheral route. Participants' pre-existing attitudes and personal values towards corporate social responsibility issues may influence how they assess these messages [56]. For instance, an individual who does not favour corporate social responsibility work may automatically process the message as sceptical (peripheral route to persuasion) whereas an individual who favours the notion of corporate social responsibility may scrutinise the information further (central route to persuasion) [55]. Given that the corporate social responsibility practices portrayed on the websites were mainly written contents and required participants' thoughtful assessment, corporate social responsibility practices were classified as central cues in this study.

The interviews in this study also revealed other factors that contributed to young adults' consumption of energy drinks, including peer influences and social opportunities involving mixing alcohol with energy drinks at parties. It was unknown whether these factors were induced by the peripheral cues of the online marketing messages (e.g. energised, fun). Many participants reported to have first started consuming energy drinks during adolescence. Future studies may need to include participants from a younger age group.

Although not the main focus of this study, control group participants showed more positive feelings, greater purchase and consumption intentions towards one of the nut bar brands. Oddly, they also reported more negative attitudes towards the energy drinks brands although they were not exposed to any energy drinks related online materials. One possible explanation for this was that the healthy messages delivered on the nut bar brands sites may have counteracted participants' desire to have unhealthy products. This unexpected finding highlighted a potential avenue for public health intervention. Positive brand image portrayed by the food companies may be effective in increasing healthy food consumption while reducing unhealthy food consumption. Future studies may explore further on this.

## Strengths and limitations

The strengths of this study included the use of qualitative interviews to supplement the findings of quantitative surveys, and the application of ELM as a theoretical framework to better understand the variables that might have influenced young adults during the online exposure. Our pre-test post-test control group experimental trial was sufficiently powered and statistically significant changes were found on participants' attitudes, purchase and consumption intentions. However, these findings need to be interpreted with caution since the regional, non-representative convenience sample may limit the generalisability of our findings. Recruitment of young people from lower socio-economic backgrounds remains a challenge but the impact of online unhealthy food marketing on this cohort warrants further investigation. The medium effect size of this study was in accordance with other research on attitudes towards food advertising where small to moderate effect sizes were found [57–58]. Participants in the control group were more likely to be females and have higher Internet usage. These differences were not statistically significant but could potentially influence the findings, for example, female participants may have different responses to the macho image (extreme sports) of

energy drinks brands. Another limitation of the study was that participants were given a task to browse the sites during the experiment and thus may have paid more attention than normal to the information presented online. This might explain the highly reported processing of central cues in this study. This could also potentially introduce bias if the participants felt that the researcher anticipated some changes at post-test, although the true motive of the study was masked. As pointed out by other relevant advertising literature, digital marketing exposure is only one of the many factors that influence consumers' receptivity to the marketing contents [26, 29]. Further studies are required to explore other precursors or influences that lead to young adults' consumption of risky food or beverage products.

## Conclusions

With the greater interactions of young people with online environments and social media, it is important to understand how young people's consumption patterns and health behaviours may be affected. This study provides useful insights into the online environment that may contribute to unhealthy behaviours of young adults. Greater understanding of the types of cues and their influences on young adults' attitudes and potentially also their behaviours can inform professional practice and regulatory policies relating to online environments.

## Supporting information

**S1 Fig. Pre-test survey.** Self-administered survey for both the experimental and control groups' participants before the exposure experiment.  
(DOC)

**S2 Fig. Post-test survey (experimental group).** Self-administered survey for experimental group participants after the exposure experiment.  
(DOCX)

**S3 Fig. Post-test survey (control group).** Self-administered survey for control group participants after the exposure experiment.  
(DOCX)

**S4 Fig. Post-test interview guide (experimental group).** Semi-structured interview guide for the experimental group participants after the exposure experiment.  
(DOCX)

**S5 Fig. Post-test interview guide (control group).** Semi-structured interview guide for the control group participants after the exposure experiment.  
(DOCX)

**S1 File. Minimal dataset.** Minimal dataset obtained from pre- and post-test surveys.  
(XLSX)

## Author Contributions

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**Formal analysis:** LB.

**Funding acquisition:** LB.

**Investigation:** LB.

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