

EXPOSURE TO FAD DIET ADVERTISING AMONG YOUTH AND YOUNG ADULTS IN CANADA

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

Background: The prevalence of obesity in Canada continues to increase. Although many Canadians report trying to manage their weight, few follow dietary guidelines recommended by health authorities. In contrast, many consumers use ‘fad’ diets to help with weight-loss. Fad diets are widely promoted as ‘quick and easy’ ways to lose weight, despite little evidence of efficacy and potential adverse health effects. A range of media sources, including traditional and digital media channels, are pervasive platforms for diet advertising, through which many young people are exposed to dieting trends and information that promotes unhealthy eating behaviours.

Purpose: To date, there is little evidence on the extent to which young Canadians are exposed to advertising related to fad dieting, and the effect of fad diet advertising exposure on perceived diet risk, perceived diet effectiveness, and fad diet use. The current study aims to examine the relationship between exposure to fad dieting advertisements (ads), fad dieting behaviours, and perceptions of fad diet risk and effectiveness.

Methods: Cross-sectional data were drawn from Wave 2 of the Canada Food Study, a national prospective cohort survey conducted annually to monitor eating patterns and trends among youth and young adults in Canada over time (n=932). Specifically, fad diets were examined including fasting and skipping meals, liquid diets, cleanses and detoxes, non-prescription diet pills, laxatives or vomiting, and smoking. Respondents from Wave 1 of the Canada Food Study were recruited in-person from one of five Canadian cities including Vancouver (BC), Edmonton (AB), Toronto (ON), Montreal (QC), and Halifax (NS), aged 16-32.

Analysis: Respondents reported sociodemographic information, and information on: *Weight Behaviour and Fad Diet Use; Ad Exposure; Ad Source; Response to Ad; Celebrity Promotion Status; Perceived Risk; and Perceived Effectiveness*. Data were analysed using descriptive statistics, repeated measures linear and logistic regression models, and bivariate correlations.

Results: Almost two-thirds of respondents (61.2%) reported exposure to a fad diet ad, and 1 in 5 reported using a fad diet in the past 12 months (20.9%). Respondents were most likely to report exposure to ads for cleanses and detoxes, and least likely to report exposure to ads for smoking and laxatives or vomiting. The internet and social media were the most common sources of ad exposure compared to other media sources. Exposure was greater among respondents who were female, had a higher BMI, and had adequate health literacy. Those exposed to fad diet ads were less likely to perceive them as risky (AOR=0.7, 95% CI=0.6, 0.8) and more likely to perceive them as effective (AOR=1.3, 95% CI=1.0, 1.6). In response to an ad, respondents most commonly reported that they were not interested in or ignored the ad for each diet type. Respondents with low body satisfaction and a higher number of symptoms of eating disorders were more likely to take action, such as engaging in fad diet behaviours or purchasing commercial diets, in response to ads. Respondents were more likely to report fasting or skipping meals compared to the other diet types, and less likely to report using liquid diets compared to cleanses or detoxes and non-prescription diet pills. Fad diet use was greater among respondents who were exposed to fad diet ads, female respondents, respondents with a higher BMI, and respondents with more symptoms of eating disorders. Bivariate correlations determined that perceptions of risk and perceptions of effectiveness were significantly associated with exposure to fad diet ads ($\chi^2=12.5$, $\chi^2=5.7$, respectively). Perceptions of risk and

effectiveness were both associated with fad diet use: respondents who perceived fad diets as riskier were less likely to use fad diets (AOR=0.4, 95% CI=0.3, 0.6), and respondents who perceived fad diets as effective were more likely to use fad diets (AOR=4.4, 95% CI=3.1, 6.2) ($p<0.05$ for all).

Conclusions: The findings suggest that many young urban Canadians report exposure to ads for fad diets, and many report using fad diets. Most respondents generally perceive fad diets as risky and ineffective; however, contrary to available research, a considerable amount perceived fad diets as safe and effective for weight-loss. Exposure to fad diet ads was associated with greater fad diet use, which may be mediated by perceptions of risk and effectiveness: ads may help to reassure young people that fad diets are both safe and an effective method for weight-loss. However, the current study uses cross-sectional data, and therefore it is unclear whether exposure to fad diet ads causes fad diet use, or whether those who are using fad diets are more likely to view and recall exposure to ads. If the former is true, then the relationship between fad diet ad exposure and use may warrant advertising regulations for commercial diets.

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INTRODUCTION

Diet

Importance of proper nutrition and prevalence of diet-related disease

Proper nutrition is necessary to promote good health and wellbeing. Maintaining a healthy diet can aid in the prevention and treatment of diet-related diseases, including cancer, cardiovascular disease, diabetes, and obesity¹. In Canada and worldwide, the second leading risk factor for premature death is an unhealthy diet². Rates of chronic disease related to diet are increasing^{3,4}. For example, 7% of Canadians over the age of 12 were living with diabetes in 2016⁵. The prevalence of diabetes is estimated to have increased by 72% from 2006-2016, and is expected to grow another 41% in 2026³. Similarly, it has been projected that the number of Canadians experiencing the effects of a stroke will increase by at least 62% from 2013-2038⁶.

Most Canadians are not consuming the types or quantities of foods recommended by Health Canada⁷. Specifically, Canadians are not consuming enough fruits and vegetables, but are exceeding the recommended limits for fat, sodium, and sugar⁸⁻¹⁰. For example, Canadians consume about 3500mg of sodium per day, which is more than double the recommended amount⁹. Similarly, more than a quarter of adults exceed the recommended upper limit of 35% of total calories in fat⁸. One fifth of total calories consumed by Canadians are from foods not recommended by Canada's Food Guide, instead often coming from soft drinks, dressings, and other sources of free sugar and fat⁸. In addition, Canadians consume between 11-13% of their calories from added sugar, and while Health Canada does not provide guidelines for sugar

intake, the World Health Organization (WHO) recommends that no more than 10% of calories come from added sugars ^{10,11}.

Poor diet has led to health and economic consequences in Canada. A major health consequence of poor diet is obesity: 20% of Canadians over the age of 18 were categorized as obese in 2014, an increase from the 14% reported in 1978 ^{12,13}. When combined with overweight, the prevalence of excess weight is 62% for men and 46% for women ¹³. Excess weight has been associated with type 2 diabetes, cancer, cardiovascular diseases, asthma, gallbladder disease, osteoarthritis, chronic back pain, and mental illness ^{14,15}, resulting in an increase in Canadian health care expenses. Consequently, excess weight was estimated to have cost Canada over \$11 billion in 2006 in direct and indirect costs ¹⁶. The current economic burden is expected to be significantly higher due to population growth and increased medical costs ¹⁶.

Evidence suggests that maintaining weight loss is very difficult, and that preventing weight gain may be particularly important in decreasing the prevalence of obesity ¹⁷. Childhood and adolescence has been identified as a key time period for establishing healthy eating behaviours ¹⁸. Instilling healthy habits in children such as increased physical activity, reduced time spent sedentary, proper sleep, and healthy eating habits may help to prevent obesity in adulthood ¹⁹.

Dietary and weight-loss recommendations

More than one third of Canadians report trying to lose weight ²⁰. General dietary recommendations include eating the suggested amount of calories for one's sex, age, and energy expenditure, and monitoring portion sizes ^{21,22}. Limiting the intake of particular foods

including those high in fat, sugar, sodium, and processed foods is also generally recommended¹¹.

For weight-loss, Dietitians of Canada suggests finding a plan that encourages a healthy lifestyle that is both flexible and easily maintained²³. A healthy diet plan should include a component of physical activity, and should aim for a weight-loss goal of no more than two pounds every week²³. Dietitians of Canada discourages weight-loss programs promoting rapid weight-loss, fasting, cleansing, skipping meals, very low-calorie diets, and products or supplements that have not been thoroughly researched, as these weight-loss methods may not be effective, safe, or realistic for long-term weight-loss²³. Special foods or supplements that are purchased from a weight-loss company should also be avoided, and dieters are encouraged to instead follow guidelines laid out by Canada's Food Guide²³.

Canada's Food Guide is organized around four food groups: 'fruits and vegetables', 'grain products', 'milk and alternatives', and 'meat and alternatives'. The guide suggests eating a variety of foods from the four food groups and recommends that adults get 7-8 servings of fruit and vegetables per day²⁴. However, a recent review of current nutrition-related evidence determined that Canada's Food Guide is outdated, and warrants changes to the guidelines²⁵. Thus, revisions to Canada's Food Guide have been proposed to take place between 2018 and 2019²⁶. The proposed revisions are based on three guiding principles: (1) a variety of nutritious foods and beverages are the foundation for healthy eating; (2) processed or prepared foods and beverages high in sodium, sugars, or saturated fat undermine healthy eating; and (3) knowledge and skills are needed to navigate the complex food environment and support healthy eating²⁷. These guiding principles encourage regular consumption of a variety of foods

including vegetables, fruits, whole grains, protein (especially plant-based), water, and food with unsaturated (rather than saturated) fat, and explicitly discourage the consumption of processed foods and sugar-sweetened beverages. The revisions to Canada's Food Guide seek to increase consumer understanding of dietary guidelines and servings to help Canadians select healthy options when preparing meals or eating out ²⁷.

Fad diets: efficacy

Although many Canadians try to manage their weight, few are following recommendations by health authorities ⁷. Some people, however, are turning to unconventional weight-loss methods or 'fad' diets to manage their weight ^{28,29}. Fad dieting is a broad term referring to the use of dieting methods that are currently trendy, which are often times restrictive and difficult to maintain ³⁰. Most fad diets promise easy and rapid weight-loss, and focus on short-term rather than long-term weight-loss ^{23,30}. The popularity of fad diets is problematic as they are often ineffective, and may have adverse health effects ³⁰, and thus are not generally recommended by health professionals. However, given that the term fad diet is used broadly and encompasses many different types of diets, it is difficult to say with certainty that all fad diets are ineffective and should be avoided. On the contrary, some diets that may be dubbed as fads, such as the Weight Watchers program, have been shown to be effective and safe methods for long-term weight-loss ³¹⁻³³. Thus, for the purposes of this review and research, the term 'fad diet' will refer to unconventional weight-loss methods that are promoted (by industry or popular opinion) as quick and easy ways to lose weight, that are generally ineffective for long-term

weight loss and have associated risks. Popular fad diets include cleanses and detoxes, fasting or low-calorie diets, liquid diets, low-carb diets, smoking, and pills and supplements.

Cleanses and detox diets

Cleanses and detox diets are treatments that claim to help clear the body of environmental toxins and assist in weight-loss^{34,35}. Treatments come in the form of pills or supplements, powders, teas, laxatives, juices, and fasting, to name a few^{34,35}. However, cleanses and detoxes for weight-loss remain unsupported by quality research^{34,35}. The studies that do show favourable effects of detoxes on the elimination of bodily toxins have been criticised for poor methodology including lack of randomization and blinding, and small sample sizes³⁴.

Additionally, there is currently no clinical evidence suggesting that cleanses or detoxes lead to sustained weight loss^{34,35}. Some have criticised the use of cleanses and detoxes, saying that the assisted removal of environmental toxins in the body is unnecessary, and that any weight-loss is likely attributable to the low caloric intake that is typically associated with these diets^{36,37}.

Fasting and very low calorie diets

Very low calorie diets (VLCDs) are diets that provide less than 800 calories per day³⁸. Examples of VLCDs may include liquid diets, fasting, or foods including soups or bars³⁹. VLCDs may be effective when used for a short period of time in people who are obese, but are not recommended without supervision from a medical professional³⁹. VLCDs do not always lead to long-term weight loss, and it is common for people to regain weight after dieting³⁹.

Liquid diets

Liquid diets are those that eliminate solid foods and depend upon liquids as the sole or dominant source of calories. Some liquid diet plans are flexible, allowing for solid snacks and foods in addition to liquids, while other liquid diet plans are strict and allow for water and beverages only^{40,41}. Liquid diets may be very low in calories³⁹. *SlimFast* and *OPTIFAST* are popular commercial diets that offer liquid meal replacements^{40,41}. Research suggests that while *SlimFast* may be superior to control groups in producing weight-loss, it is no better than behavioural counselling³³. *OPTIFAST* is also capable of producing short-term weight-loss superior to counselling, but long-term results have not yet been determined³³. Research on non-commercial liquid diets, such as juice fasts, is lacking.

Low-carbohydrate diets

Different fad diets have circulated promoting the consumption of macronutrients in proportions not recommended by health authorities. It is generally recommended that adults receive most of their calories from carbohydrates rather than fat or protein⁴². Diets that deviate from this recommendation include the *Atkins* diet and other low-carb diets⁴³. By decreasing the amount of carbohydrates consumed, dieters may consume higher levels of protein and fat than considered healthy. The efficacy of low-carb diets for weight-loss has been considered by researchers with mixed results. Some have found that the *Atkins* diet produces long-term weight and fat-loss, while other research suggests that weight-loss is mostly attributed to the loss of water or a reduction in calories^{31,33,44-49}. A systematic review of the evidence found that there was insufficient evidence to recommend low-carb diets for weight-loss⁵⁰.

Cigarette smoking

Other less conventional weight-loss methods include cigarette smoking. Cigarette smoking is known to increase metabolic rate and suppress appetite, potentially explaining its use for weight-loss^{51,52}. Multiple studies have observed the effect that smoking has on weight-loss, as well as the inverse effect: an association between smoking cessation and weight-gain⁵³⁻⁵⁶. However, other studies have found smoking to be related to weight-gain, particularly among heavy smokers, and some have found no relationship between smoking and weight at all^{55,57,58}.

Pills and supplements

Pills and supplements are also popular for weight-loss: one third of US adults who report having tried to lose weight also report the use of supplements⁵⁹. A vast range of pills and supplements for weight-loss are available, some of which are more effective than others⁶⁰. A previous review of common weight-loss supplements groups supplements by intended outcome including increased energy expenditure (ephedra and caffeine), controlled carbohydrate metabolism (chromium and ginseng), appetite suppression (glucomannan, psyllium, and guar gum), fat-loss (hydroxycitric acid, conjugated linoleic acid, pyruvate, and L-carnitine), and blocked fat absorption (chitosan)⁶⁰. Supplements used to increase energy expenditure include ephedra and caffeine, and have previously been found to lead to short-term weight-loss, but evidence for long-term weight loss is lacking⁶¹. Data on L-carnitine have suggested similar findings⁶². Some evidence suggests that supplements containing psyllium, glucomannan, hydroxycitric acid, or pyruvate may assist with weight-loss, however, effects were usually modest, and more recent evidence is conflicting^{60,63-71}. There is very limited evidence to

support the use of chromium, chitosan, ginseng, guar gum, and conjugated linoleic acid for weight-loss in humans ^{60,71–74}.

Summary

Overall, there are many types of fad diets, some more effective at promoting weight-loss than others. There is mixed evidence to suggest that liquid diets, low-carb diets, smoking, and supplements lead to weight-loss, however, further evidence is required. Lastly, there is currently no evidence that cleanses or detox diets lead to weight-loss. While determining the efficacy of fad diets is important, the safety and risks of fad dieting must also be examined.

Fad dieting and risks

Cleanses and detox diets

Cleanses and detoxes have potential side effects. Users of cleanses may experience bothersome side-effects including nausea, vomiting, dehydration, headaches, low energy, and abdominal pain or discomfort ^{35,75}. More worrisome is the potential risk of aplastic anemia, liver toxicity, electrolyte imbalances, changes in blood sugar and blood pressure, and impaired kidney functioning associated with some types of cleanses ^{35,75}. Unfortunately, as cleanses and detoxes have not been thoroughly researched, the risks across specific product types cannot be determined.

Low calorie diets

Diets characterized by an extreme and unsupervised reduction in calorie intake have previously been associated with risks including cardiac arrhythmia, malnutrition, gallstones, and a number

of less serious side effects ^{76,77}. Additionally, there is existing research suggesting that fasting and calorie restriction increases psychological stress and cortisol levels ^{78,79}. The increased stress levels may affect dieters' wellbeing, and researchers have wondered whether the increase in cortisol might actually contribute to weight gain ⁷⁸.

Liquid diets

The commercial liquid diet program OPTIFAST has previously been linked to side effects including cholecystectomy, constipation, and alopecia, however these symptoms were rare ³³. It is possible that liquid diets have similar side effects as VLCDs as they often promote a low caloric intake.

Low-carbohydrate diets

Low-carb diets may induce a metabolic process known as ketosis ⁸⁰. When taken to the extreme, ketosis has the potential to lead to osteoporosis, vision complications, and cognitive changes ⁴⁴. Other low-carb side effects reported are constipation, cramps, headaches, and general weakness ⁴⁹.

Another risk with low-carb diets is that individuals may not be consuming enough produce and grains, and may alternatively be consuming fat or protein in quantities higher than what is generally recommended ⁴⁴. Consuming a diet high in fat is problematic, as it can lead to a decrease in 'good' cholesterol (HDL), and an increase in 'bad' cholesterol (LDL) ⁸¹. This is especially true with the over-consumption of saturated fats or trans-fats. The effect that fat has on cholesterol increases the chance of heart attack, stroke, and heart disease ⁸¹. On the other hand, a diet too high in protein may cause kidney and liver dysfunction ⁸². Thus, it is important

to consume macronutrients in the proportions suggested by health experts. It is recommended that adults receive 45-65% of their calories from carbohydrates, 20-35% from fat, and 10-35% from protein ⁴². Exceeding the upper limits given for macronutrients may put individuals at risk of adverse health effects ⁸³.

Cigarette smoking

Cigarette smoking may be one of the riskiest methods used to regulate weight, as it is a leading cause of premature mortality and morbidity ⁸⁴. Smoking cigarettes reduces life expectancy by at least 10 years ⁸⁵, and presents other serious risks including cancer, heart problems, and lung diseases ⁸⁴.

Pills and supplements

The use of pills and supplements for weight loss may also be dangerous. The use of ephedra, while potentially effective for weight-loss, is related to heart problems, gastrointestinal symptoms, mental illness, seizures, and in some cases, death ^{61,86}. Some supplements lead to less serious side effects, or have no side effects at all. For example, a systematic review found that use of chitosan or guar gum have been linked to diarrhea and other gastrointestinal complications ⁷⁴. The same review found that some weight-loss supplements, including chromium, glucomannan, pyruvate, and psyllium were not related to any adverse effects.

Summary

It is clear through this review of dieting trends that many diets pose significant health risks, however, some diets seem to be riskier than others (i.e. smoking and the use of particular supplements). The serious risks associated with dieting are usually present in extreme cases

^{44,76,77}, and it is possible that less extreme methods may not be harmful. For example, it is unlikely that moderate calorie restriction will result in negative health outcomes, and this behaviour may actually improve health ⁸⁷. It is important that the public be aware of the efficacy and risks of dieting trends in order to promote healthy choices when it comes to weight-loss.

Fad dieting and mental health

Not only can fad dieting affect one's physical health, but it also has the potential to negatively impact one's mental health. Fad diets are often advertised as a quick and easy way to lose weight, with an emphasis on improving physical appearance ^{88,89}. Whether or not such claims are true, appearance-motivated dieting has been associated with higher body dissatisfaction and lower self-esteem than dieting that is health-motivated ⁹⁰. Appearance-motivated dieters are also more likely to be following an unhealthy diet and have a more difficult time restraining from foods outside of their diet plan ⁹⁰. As diets that do not follow traditional nutrition guidelines are generally challenging to maintain ³⁰, dieters may blame themselves for failure to lose weight rather than attributing the failure to the diet itself ⁹¹. Additionally, dieting behaviours that may be perceived as quick and easy ways to achieve thinness including calorie counting, meal plans, supplements, and 'special' foods have all been associated with symptoms of eating disorders ⁹². Unfortunately, for those who diet, appearance is often a priority while health is not, ultimately having an effect on dieters' mental health ⁹².

Important to note is that multiple studies have examined the effect of professionally administered diets on patient mental health, and determined that there is no reason to believe that a healthy diet recommended by a health professional will have a negative impact⁹³. On the contrary, such interventions often improve psychological wellbeing⁹³. Thus, the psychological dangers of dieting lie not in the behaviour itself, but in the cosmetic-driven mentality that often accompanies fad dieting trends.

Factors influencing the decision to diet

Certain factors make some people more likely to follow a diet than others. For example, women are more likely to diet than are men⁹⁴, and people with a higher body mass index (BMI) are more likely to participate in dieting than people with a lower BMI, particularly among females^{95,96}. Factors related to eating disorders including body dissatisfaction, binge eating, and pressure to be thin are also predictive of dieting behaviour⁹⁵. Some characteristics are not only predictive of current dieting behaviour, but of prospective dieting behaviour. For example, one study found that dieting behaviours and disordered eating were more common among those with weight concerns, depressive symptoms, and body dissatisfaction, and among those who felt that weight was important 10 years earlier⁹⁷.

Industry Promotion

Fad diet advertising and advertising sources

Canadians are increasingly turning to commercial products for weight-loss⁹⁸. A major contributor to the popularity of fad dieting is promotion by the commercial diet industry. Advertisements (ads) for weight-loss products are abundant on media platforms including television, magazines, newspapers, and the internet, and include a variety of product types⁹⁹. The types of fad diets that consumers are exposed to likely depends on the ability for the diet to be marketed commercially, as well as advertising regulations around the diet type, and how controversial the diet is for weight-loss.

A recent analysis of US women's health magazines found that out of all weight-loss product ads examined, nearly half were advertising weight-loss pills¹⁰⁰. Also commonly promoted were fat burners, hunger reduction strategies, and fat blockers. Themes among weight-loss ads included gaining a sense of achievement, before and after weight-loss, happiness, natural weight-loss, and sex appeal¹⁰⁰.

Along with diet pills, cleanses and detoxes, and liquid diets are also commonly promoted for weight-loss and are sold commercially^{40,41,101}. Conversely, weight-loss methods such as smoking, fasting, vomiting, or other purging methods do not have commercial ties and are not generally advertised. The advertisement of tobacco in Canada has been banned on media sources including television, radio, print, and outdoor advertising such as billboards¹⁰². While not technically banned from the internet, tobacco advertising is strictly regulated on online sources¹⁰². Fasting and purging methods are not generally advertised as they cannot be sold, and there would likely be backlash in response to advertising such extreme weight-loss methods that have been associated with disordered eating. Thus, consumer's exposure to fad diet ads likely differs drastically across diet type. Despite the formal regulations around the

advertisement of these high-risk weight-loss methods, a new and difficult to monitor platform has emerged for the advertisement of fad diets: social media.

Social media use has become a part of every-day life, and usage is especially high among young people: in 2016, 86% of 18-29 year olds in the US were using social media, which is now easily accessible via mobile devices ¹⁰³. Social media is growing rapidly as a source of health information for young adults ¹⁰⁴. For example, 1 in 3 Americans use social media to find and disseminate health information ¹⁰⁵, and 39% of American students report using Facebook to seek health-related social support ¹⁰⁶. Social media's far reach, engagement, and accessibility make it a good platform for information dissemination ¹⁰⁷.

Health information is available on social media in the form of ads, as well as in the form of posts shared by peers. Advertising on social media may be effective due to the ability to target particular audiences, interact with consumers, and personalise ads to viewers ¹⁰⁸. Accordingly, the types of ads that people are exposed to on social media are often times a reflection of their profile information or browsing history ^{109,110}. For example, one US study found that posting fitness and diet-related content to Facebook resulted in 40% of fitness-related ads, 10% of which were promoting fad diets ¹¹¹. The same study found that 72% of respondents made fitness-related posts, suggesting that the majority of Facebook users are reporting exposure to at least some fad diet advertising.

Social media users are also exposed to information that is posted by people who they 'follow', or in other words, people who they are connected with online. Even if they are not sponsored and have no commercial association, users sometimes share and promote food choices or

particular diets to their followers ¹¹². For example, some people utilise social media to track their diet, educate their followers on nutrition, or to give or receive social support when dieting ¹¹². These users may benefit from the use of social media by connecting with people who share their health goals and by creating a sense of accountability ¹¹², which is a positive outcome if their health goals align with nutrition recommendations. Unfortunately, the nature of social media allows information to be shared by users who may not be qualified to give nutritional advice ¹¹³, including peers or celebrities. If users are viewing and sharing dieting information that is unhealthy or ineffective, they may be influencing others to engage in unhealthy eating behaviours. Such was the case in Sweden, where individuals used social media as a platform to promote a low-carb, high-fat (LCHF) diet, despite contrary recommendations by the National Food Administration ¹¹⁴. A thematic analysis found that the promoters of the LCHF diet used social media for its free dissemination of information and wide reach, as well as for personal testimonies, which may further influence viewer's beliefs ¹¹⁴.

Characteristics of fad diet advertisements

Regardless of where they are found, weight-loss ads often include false or exaggerated claims regarding the product's rapid, long-term, or easy weight-loss ^{88,89}. One study found that less than half of the examined weight-loss articles provided information demonstrating the author's credibility ¹¹⁵. Another study compared weight-loss claims to actual weight lost for 24 dieting programs ¹¹⁶. Less than half of the programs had published randomized control trials (RCTs) to support their claims, and the amount of weight lost in the programs that did have RCTs was less

than what was advertised. This deceptive advertising is problematic as it gives consumers false expectations regarding the effects of diet products, and may persuade consumers to engage in unsafe or ineffective weight-loss methods.

Another common characteristic of diet advertising is celebrity endorsement. The use of celebrity endorsement has been found to effectively increase intent to purchase among young people who are familiar with the celebrity ¹¹⁷, which explains why industries including the weight-loss industry use high-profile celebrities to help promote their products. One successful example is the commercial diet plan Weight Watchers, which reportedly gained 1 million members in the course of a year after recruiting Oprah Winfrey as their brand ambassador ¹¹⁸.

Groups targeted by weight-loss advertising

Particular groups of people are more likely than others to be influenced by manipulative weight-loss advertising. For example, people experiencing weight problems are more likely to receive and open spam emails regarding weight-loss ¹¹⁹. Perhaps people with a higher BMI are more likely to seek out weight-loss methods on the internet, resulting in an increase in emails containing weight-loss content. This could be an indication that advertisers are specifically targeting individuals they know have a higher BMI and are interested in losing weight.

Unsurprisingly, these individuals are more likely to purchase weight-loss products from spam emails than those who do not experience weight problems ¹¹⁹.

Women and adolescents have also been targeted by the weight-loss industry. One study found that popular magazines read by women had 10 times the number of weight-loss promotions

compared to popular magazines read by men ¹²⁰. Additionally, a content analysis found that women's magazine covers displayed more diet, weight-loss, and appearance messages than did men's magazine covers ¹²¹. Despite gender differences, both girls and boys are exposed to weight-loss content at a young age, and it is documented that exposure to dieting in the media is linked to weight-loss behaviours in adolescents ^{122,123}. A study of girls aged 9-17 determined that while girls are aware of the deceptive techniques used in weight-loss advertising, they are not as skilled in recognizing the intended audiences of ads or the potential risks associated with weight-loss products ¹²⁴. Thus, young people may be less equipped to critically analyse a deceptive ad, which may explain why they are more easily influenced by them.

Dieting content in the media and disordered eating

Thus far, our discussion has focused on the physical and behavioral impact of diet advertising and health information exposure. It is also important to discuss the impact that dieting content has on mental health, namely, eating disorders.

Time spent on social media has been strongly associated with disordered eating ¹²⁵. The presence of health-related information on social media may help to explain this relationship. While encouraging good health is not problematic in itself, healthy lifestyles may become distorted when shared online. For example, rather than focusing on the health benefits of proper nutrition and regular exercise, posts may concentrate on physical appearance or particular body shapes ¹²⁶. Some image-based social media websites have accounts dedicated to 'fitspiration' (fitness inspiration) that emphasize thinness and appearance, which is

portrayed as a 'healthy' end-goal ¹²⁷. Images found on these websites may be problematic for girls in particular, as studies have found that girls' exposure to media images is positively associated with dieting attempts and the desire to lose weight ¹²³.

The dieting and weight concerns associated with media images are risk factors for developing an eating disorder ¹²⁸. Common eating disorders include anorexia nervosa and bulimia nervosa. Anorexia is characterised by an extremely low body weight, a distorted body image, and a desire to be thin ¹²⁹. Bulimia is similar to anorexia, but involves recurrent binge-eating followed by an attempt to avoid weight gain through vomiting, laxative use, fasting, or excessive exercise ¹²⁹. Content and images encouraging anorexic and bulimic behaviours, known as 'pro-anorexia' or 'pro-bulimia', can be found and easily accessed on websites and social media ¹³⁰. Viewing this content can lead to negative emotions, poor self-esteem, distorted weight perceptions, and an increase in eating disorder related behaviours such as binge eating and vomiting ¹³¹.

More recently, the trend of 'clean' eating has emerged, characterized by the consumption of nutrient-dense foods and the strict avoidance of foods that are not deemed healthy. This trend has been linked to obsessive eating behaviour, and has led to a new widely accepted (although formally unrecognized) type of eating disorder referred to as orthorexia nervosa ¹³².

Paradoxically, the health obsession observed in those with orthorexia nervosa has resulted in malnutrition ^{133,134}. A recent study found a positive correlation between Instagram use and symptoms of orthorexia ¹³⁵. The authors suggest that because Instagram users choose who to follow, they may perceive the content that they are viewing (e.g. particular diets) as more common than it actually is, increasing the desire to fit in. Additionally, high-profile users with many 'followers' may be increasingly influential when promoting diet products or strategies.

Regulation of diet advertising and reducing misconceptions

Due to the deceptive nature of diet advertising, regulations have been implemented to help consumers make more informed purchasing decisions when it comes to dieting products. For example, all foods intended for special dietary use are required to either meet compositional guidelines, be sold by a weight-reduction clinic, or be a prepackaged meal if they are implying use for weight-loss¹³⁶. The advertisement of particular diet products is also regulated. For example, formulated liquid diet products and other foods intended for a very low energy diet (<900 kilocalories) are prohibited from being advertised to the general public^{137,138}. Products such as meal replacements may be advertised; however, the product must meet nutritional requirements, and additional labelling is necessary if the product is being advertised for the purpose of weight-loss¹³⁹.

Another way to limit the negative impact of advertising to consumers is to enforce policy around deceptive advertising claims. The Federal Trade Commission (FTC) did just this: after an increase of 129% in the presence of weight-loss ads in US magazines in 2001 compared to the beginning of the decade (many of which included false or unsubstantiated weight-loss claims), the FTC began enforcing rules around false advertising. This, in turn, led to a smaller increase in the number of weight-loss ads and associated false claims when analyzed again in 2004^{140 88}.

Specific regulations for social media advertising also exist and are important due to new advertising tactics such as celebrity product-endorsement online¹⁴¹. This type of advertising may be particularly influential as celebrities are idolized and have a large social media

following. It is common practice for celebrities to be paid for a social media post promoting a particular product without the knowledge of consumers ¹⁴¹. Examples include waist trainers and skinny teas endorsed by high-profile celebrities ^{142,143}. In order to buffer the effect of deceptive product advertising, Advertising Standards Canada now requires clear disclosure by bloggers and celebrities being paid to promote a product via social media ¹⁴⁴. Similar guidelines have been put in place by the FTC in the US ¹⁴⁵.

Health organizations and social media users are also able to have a positive impact online. For example, credible health organizations can help to counter health-related misconceptions by engaging on social media and correcting misinformation ¹⁴⁶. In one study, misconceptions regarding the Zika virus were reduced after the Center for Disease Control and Prevention made a correction to misinformation that was posted on Twitter ¹⁴⁶. Other social media users can also have an impact on the spread of misinformation. For example, if two single users make corrections to misinformation and provide credible sources for their corrections, misconceptions are reduced ¹⁴⁷. This effect has been demonstrated on both Twitter and Facebook ¹⁴⁷.

In addition to correcting misinformation, social media can be used to promote a healthy lifestyle and can lead to healthy behaviour change if properly executed. Facebook in particular has been found to be a useful tool for promoting healthy behaviours and for delivering effective weight-loss interventions ^{148,149}. Mobile applications have also been used to assist in tracking and motivating weight-loss. For example, Dietitians of Canada's EaTracker application assists with planning meals, analyzing food choices, and tracking physical activities ¹⁵⁰.

Despite the potential for social media to help communicate credible health information and promote healthy behaviour, the measures necessary to implement these changes are not always taken. Additionally, due to the nature of social media, it is nearly impossible to prevent users from sharing false or deceptive dieting information online. Thus, people remain exposed to distorted health information in the media which may have negative health effects.

STUDY RATIONALE

Currently, many Canadians experience obesity and nutrition-related chronic disease. Despite the desire to be healthy, few Canadians are following dietary guidelines recommended by health authorities; instead, Canadians are looking to fad diets to help them to lose weight. Unfortunately, many fad diets have little or no evidence of effectiveness, and many have potential health risks. Despite these concerns, fad diets persist, likely due their advertising as a 'quick and easy' way to lose weight.

The internet and social media have emerged as a new and pervasive platform for advertisers. As a result, many young people are being exposed to dieting trends and images associated with dieting which promote unhealthy eating behaviours. To date, there is little evidence on the extent to which young Canadians are exposed to fad dieting in the media, and the effect that exposure to fad dieting advertising has on young people's fad diet use, and perceptions of fad diet risk and effectiveness.

Research Questions

Overall, the current study aims to examine the relationship between exposure to fad dieting advertising, fad diet use, and perceptions of risk and effectiveness. The study has four primary research questions:

1. What proportion of young people have been exposed to ads for fad diets?
 - a) Does amount of ad exposure differ across diet types?

b) What sociodemographic factors and dieting behaviours are associated with exposure to fad diet ads? Are particular sociodemographic factors associated with exposure to fad diet ads?

c) What are the most common advertising channels through which young people are exposed to fad diet ads?

d) How are people likely to respond online (or otherwise) to fad diet ads? Are particular factors including sociodemographic factors, celebrity promotion status, and perceptions of risk and effectiveness associated with responses, such as trying to get more information, clicking a link, signing up or purchasing the diet or weight loss method, or beginning to follow the diet or weight loss method?

2. To what extent do youth and young adults perceive fad dieting as risky?

a) Do perceptions of risk differ across diet types?

b) What sociodemographic factors and dieting behaviours are associated with the belief that fad dieting is risky? Are particular factors including sociodemographic factors and exposure to fad diet ads associated with the belief that fad dieting is risky?

3. To what extent do youth and young adults perceive fad diets as effective?

a) Do perceptions of effectiveness differ across diet types?

b) What sociodemographic factors and dieting behaviours are associated with the belief that fad dieting is effective? Are particular factors including sociodemographic factors and exposure to fad diet ads associated with the belief that fad dieting is effective?

4. How many youth and young adults follow a fad diet?

a) Does use of fad diets differ across diet types?

b) What sociodemographic factors and dieting behaviours are associated with following a fad diet? Are particular factors including sociodemographic factors, exposure to fad diet ads, and perceptions of risk and effectiveness associated with following a fad diet?

METHODS

Protocol

Canada Food Study

The Canada Food Study (CFS) is a national cohort study conducted annually to monitor eating patterns and trends among youth and young adults in Canada over time. Wave 1 of the CFS was conducted from October-December 2016 with 3000 respondents. Wave 2 was conducted from October-December 2017 with 932 respondents. The current study examined cross-sectional data from Wave 2 of the CFS only, as the measures of interest were not originally examined in Wave 1.

Data for the current study were collected via online self-report surveys on dietary patterns. Respondents were given the option to complete the surveys in English or French. Respondents were compensated for their participation with a \$20 Interac e-transfer, or a \$20 e-giftcard to either Amazon.ca, Chapters/Indigo, Cineplex, or Starbucks. The study was reviewed by and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE# 21631).

Participants

Recruitment into Wave 2

Respondents for Wave 2 of the Canada Food Study were recruited from the Wave 1 sample. Respondents for Wave 1 were recruited in person at select sites in five Canadian cities,

including Vancouver (BC), Edmonton (AB), Toronto (ON), Montreal (QC), and Halifax (NS).

Systematic sampling and a standard intercept technique were involved in recruitment, where all individuals who passed by a particular landmark were invited to participate by a trained research assistant ¹⁵¹. Respondents were screened during recruitment to determine study eligibility. Eligibility criteria included living in one of the five recruitment cities, being 16-30 years of age during the time of recruitment, having internet access and a laptop, desktop computer or tablet, and not having been previously enrolled in the study panel. Eligible respondents were sent an email with a link to the primary survey on dietary patterns, and were asked to provide their consent to participate prior to accessing the survey. Respondents were presented with a brief follow-up survey to confirm compensation preferences and contact information to be used for Wave 2 invitations. Respondents were discouraged from accessing the surveys via smartphone, as the small size of the screen may affect the way that people interact with the survey, however, they were not restricted from doing so. A full description of Wave 1 research methods can be found in the Canada Food Study Technical Report – Wave 1 (2016) ¹⁵².

A total of 2,992 respondents from Wave 1 were sent an email invitation to participate in Wave 2 of the Canada Food Study, and 1,115 respondents accessed the survey. Respondents were directed to the survey and asked to enter their age. Respondents who were 16-32 years of age were considered eligible for Wave 2. A total of 183 respondents were disqualified for being of an ineligible age, accessing the survey via smartphone, or due to missing data. Eligible respondents were provided with study information and asked to give consent for participation. A total of 932 Wave 2 respondents were retained for analysis, for a retention rate of 83.59%.

Data Integrity

Both Wave 1 and Wave 2 surveys included a data integrity check, involving a mid-survey item asking respondents to select the current month from a list. Responses were compared to the month of submission, and respondents with discrepancies were generally excluded from analysis. However, if respondents reported the month that came before their submission, or if their selected month was within a few days of the actual submission date, they were not excluded from the analysis, as it is possible that they took an extended amount of time to complete and submit their survey.

Measures

Sociodemographic variables

Age. During screening, respondents were asked “How old are you” and could enter an age or refuse to answer.

Sex. Respondents were asked “What sex were you assigned at birth, meaning on your original birth certificate?” with response options “Male” and “Female”.

BMI. Respondents provided self-report height and weight measurements used to calculate Body Mass Index (BMI). Respondents were asked “It is helpful to know the height and weight of survey participants. How tall are you without shoes?” and were then asked “Would you rather answer in:” with response options “Feet and inches”, “Centimetres”, “Don’t know”, and

“Refuse to answer”. Based on this answer, respondents were prompted to enter a number of feet from 3-7 and number of inches from 0-12, or they were prompted to enter a number of centimeters from 100-250. Respondents were then asked “How much do you weigh without clothes or shoes?” and were then asked “Would you rather answer in;” with response options “Pounds (lb)”, “Kilograms (kg)”, “Don’t know”, and “Refuse to answer”. Based on this answer, respondents were prompted to enter a number in kilograms or in pounds. BMI was calculated using the reported height and weight values ($\text{weight}/[\text{height}]^2$) which were then classified and recoded as 1=Underweight (<18.4999), 2=Normal weight (18.50 through 24.991), 3=Overweight (24.992 through 29.991), 4=Obese (29.992 through highest), or 5=Missing. A BMI data quality variable was computed, noting extreme height and weight values, and extreme values were removed from analysis.

Mental Health Status. Respondents were asked “In general, would you say your mental health is...” with response options “Poor”, “Fair”, “Good”, “Very good”, “Excellent”, “Don’t know”, and “Refuse to answer”. This measure was taken from the Canadian Community Health Survey (CCHS) and the Canadian Health Measures Survey (CHMS).

Health Literacy Status. Health literacy was measured during Wave 1 using the Newest Vital Sign (NVS), a commonly used 6-item health literacy assessment focusing on comprehension of nutrition facts labels¹⁵³. Respondents were asked 6 health literacy questions and a health literacy score was calculated based on the number of correct responses to each of the questions. A score was not calculated if respondents selected “Refuse to answer” for any of the literacy questions. A score of: 0-1 suggests high likelihood (50% or more) of limited literacy; 2-3 indicates the possibility of limited literacy; and 4-6 almost always indicates adequate literacy.

Body Image. Respondents were presented with and asked to respond to the prompt “Right now I feel . . .” with response options “Extremely satisfied with my body size and shape”, “Mostly satisfied with my body size and shape”, “Moderately satisfied with my body size and shape”, “Slightly satisfied with my body size and shape”, “Neither dissatisfied nor satisfied with my body size and shape”, “Slightly dissatisfied with my body size and shape”, “Moderately dissatisfied with my body size and shape”, “Mostly dissatisfied with my body size and shape”, “Extremely dissatisfied with my body size and shape”, “Don’t know”, and “Refuse to answer”.

EAT-3. The Eating Attitudes Test 3 (EAT-3) was adapted from the EAT-26¹⁵⁴, a screening measure used to determine whether someone might have an eating disorder. Respondents were asked “In the past 3 months, how often have you:”... “gone on eating binges?” and “made yourself sick (vomited) to control your weight?” with response options “Never”, “Less than 1 time a month”, “1 to 3 times a month”, “Once a week”, “2 to 6 times a week”, “Once a day”, and “More than once a day”. Respondents were coded as 1 for binge eating if they reported binge eating once or more a month, and coded as 1 for vomiting if they reported ever vomiting. Other respondents were coded as 0. Respondents were also asked to respond to the prompt “I am preoccupied with a desire to be thinner” with response options “Always”, “Usually”, “Often”, “Sometimes”, “Rarely”, and “Never”. Female respondents were coded as 1 if they reported “Always” or “Usually”; coding was similar for males, with the inclusion of “Often”. Other respondents were coded as 0. Scores were then summed to create a total EAT-3 score.

Primary measures

Weight behaviour

Respondents were presented with and asked to respond to the prompt “During the past 12 months have you tried to... (Select all that apply)” with response options “Lose weight”, “Gain weight”, “Stay the same weight”, “I have not tried to do anything about my weight”, “Don’t know”, and “Refuse to answer”. This measure was adapted from the National Health and Nutrition Examination Survey (NHANES) 2009-2010.

Fad diet use

If respondents indicated that they tried to gain weight in the past 12 months, they were then asked “How did you try to gain weight in the past 12 months? (Select all that apply)” with response options “Ate more food in general (amount)”, “Ate more fat”, “Ate more carbohydrates”, “Ate more protein”, “Drank sports drinks (e.g., Gatorade, Powerade)”, “Drank energy drinks (e.g., Red Bull, Monster)”, “Used protein or creatine powders”, “Used other types of powders or supplements”, “Took non-prescription pills, injections or steroids”, “Exercised / weight lifting”, “None of the above”, “Don’t know”, and “Refuse to answer”. This measure was adapted from the NHANES diet history questionnaire.

If respondents indicated that they tried to lose weight within the past 12 months but did not indicate that they tried to stay the same weight, they were then asked “How did you try to lose weight in the past 12 months? (Select all that apply)”. If respondents indicated that they tried to stay the same weight within the past 12 months but did not indicate that they tried to lose weight, they were then asked “How did you try to ‘stay the same weight’ in the past 12 months? (Select all that apply)”. If respondents indicated that they tried to lose weight and

tried to stay the same weight within the past 12 months they were then asked “How did you try to lose weight or ‘stay the same weight’ in the past 12 months? (Select all that apply)”.

Response options for all three questions included “Skipped meals or fasted”, “Ate less food (amount)”, “Ate less fat”, “Ate less candy, sugar or sweets”, “Ate fewer carbohydrates”, “Ate more fruits, vegetables or salads”, “Switched to foods with lower calories”, “Followed a special diet or weight loss program (e.g., Atkins, Weight Watchers)”, “Used a liquid diet formula, such as Slimfast or Optifast”, “Did a cleanse or detox diet”, “Exercised”, “Drank a lot of water”, “Got help from a health professional”, “Took diet pills prescribed by a doctor”, “Took other pills, medicines, herbs, or supplements not needing a prescription”, “Took laxatives or vomited”, “Started to smoke or began to smoke again”, “Other”, “None of the above”, “Don’t know”, and “Refuse to answer”. These measures were adapted from the NHANES diet history questionnaire. While the question did not ask specifically about fad diets, and response options were not limited to weight-loss methods that were considered fad diets, a final analytic decision was made in terms of which weight-loss methods were considered to be fad diets.

Accordingly, a *Fad Diet* variable was derived from each measure. Important to note is that because the definition of fad diet is broad and not universally recognized, some diets that are considered in some domains to be fads may not be risky or ineffective. Thus, the current study focuses on only a subset of fad diets that are generally known to be ineffective or unhealthy methods for weight-loss. Respondents were coded as either 0=No fad diet, or 1= One or more of the following: “Skipped meals or fasted”, “Used a liquid diet formula, such as Slimfast or Optifast”, “Did a cleanse or detox diet”, “Took other pills, medicines, herbs, or supplements not

needing a prescription”, “Took laxatives or vomited”, and “Started to smoke or began to smoke again”.

Diet ad exposure and source

“During the past 12 months, have you seen or heard any ads or promotions for the following? (Select all that apply)” with response options “Skipping meals or fasting”, “A liquid diet formula, such as Slimfast or Optifast”, “A cleanse or detox diet”, “Diet or weight loss pills, medicines, herbs, or supplements not needing a prescription”, “Laxatives or vomiting for diet or weight loss”, “Starting to smoke or beginning to smoke again for weight loss”, “Eating more fruits, vegetables or salads”, “None of the above”, “Don’t know”, and “Refuse to answer”. The list of diet and weight-loss programs were presented to respondents in a randomized order.

For each of the diet and weight loss programs that respondents indicated they saw or heard an ad or promotion for within the past 12 months, they were asked “During the past 12 months, did you see or hear ads or promotions in any of the following places? (Select all that apply)”, with response options “TV”, “Radio”, “Online / internet”, “Mobile app / video game”, “Social media (e.g., Twitter, Facebook, Snapchat)”, “In a text message”, “Magazine or newspaper”, “Billboard or outdoor sign (e.g., posters, transit)”, “Signs or displays in stores”, “Giveaways, samples or special offers”, “Other”, “Don’t know”, and “Refuse to answer”.

Response to diet ad

For each of the fad diets that respondents indicated they saw or heard an ad or promotion for within the past 12 months, they were asked “For each of the following, how did you respond to the advertisement or promotion? (Select all that apply)” with response options 1) “I wasn’t interested / ignored the ad”, 2) “I was interested but I didn’t do anything”, 3) “I tried to get more information or clicked an online link”, 4) “I signed up or purchased the diet or weight loss method”, 5) “I started following the diet or weight loss method”, “Don’t know”, and “Refuse to answer”. The variable was treated as a continuous variable with a range of scores from 1-5 for each diet, with higher responses considered more “active”.

Perceived Diet Health Risks

Respondents were asked “Do the following diets and weight loss programs have any health risks?”. Respondents were instructed to respond with “1 – Not at all risky”, “2 – A little risky”, “3 – Somewhat risky”, “4 – Very risky”, “5 – Extremely risky”, “Don’t know”, and “Refuse to answer” for each of the following diet and weight loss programs: “Skipping meals or fasting”, “A liquid diet formula, such as Slimfast or Optifast”, “A cleanse or detox diet”, “Diet or weight loss pills, medicines, herbs, or supplements not needing a prescription”, “Laxatives or vomiting”, “Starting to smoke or beginning to smoke again”, and “Eating more fruits, vegetables or salads”. The list of diets were presented to respondents in a randomized order. Responses were dichotomized for a logistic regression analysis, where “1 – Not at all risky”, “2 – A little risky”, “Don’t know”, and “Refuse to answer” were coded as 0=Not risky, and “3 – Somewhat risky”, “4 – Very risky”, “5 – Extremely risky” were coded as 1=Risky.

Perceived Diet Effectiveness

Respondents were asked “Are the following diets and weight loss programs effective at helping people lose weight?”. Respondents were instructed to respond with “1 – Not at all effective”, “2 – A little effective”, “3 – Somewhat effective”, “4 – Very effective”, “5 – Extremely effective”, “Don’t know”, and “Refuse to answer” for each of the following diet and weight loss programs: “Skipping meals or fasting”, “A liquid diet formula, such as Slimfast or Optifast”, “A cleanse or detox diet”, “Diet or weight loss pills, medicines, herbs, or supplements not needing a prescription”, “Laxatives or vomiting”, “Starting to smoke or beginning to smoke again”, and “Eating more fruits, vegetables or salads”. The list of diets were presented to respondents in a randomized order. Responses were dichotomized for a logistic regression analysis, where “1 – Not at all effective”, “2 – A little effective”, “Don’t know”, and “Refuse to answer” were coded as 0=Not effective, and “3 – Somewhat effective”, “4 – Very effective”, “5 – Extremely effective” were coded as 1=Effective.

Celebrity Promotion of Diet Ad

Respondents were asked “Were the following diet or weight loss methods being advertised or promoted by a celebrity?”. Respondents were instructed to respond with “Yes”, “No”, “Don’t Know”, and “Refuse to answer” to each of the following diet or weight loss methods: “Skipping meals or fasting”, “A liquid diet formula, such as Slimfast or Optifast”, “A cleanse or detox diet”, “Diet or weight loss pills, medicines, herbs, or supplements not needing a prescription”, “Laxatives or vomiting for diet or weight loss”, “Starting to smoke or beginning to smoke again

for weight loss”, “Eating more fruits, vegetables or salads”, “None of the above”, “Don’t know”, and “Refuse to answer”.

Analysis

Results are organized into two separate papers. Descriptive statistics are reported for all sociodemographic variables, including *Age, Sex, BMI, Mental Health Status, Health Literacy Status, Body Image, and EAT-3 Scores*. All point estimates (e.g., means and proportions) are weighted unless otherwise stated. Post-stratification sample weights were constructed based on population estimates for 2017 from the 2011 Census. Sample probabilities were created for 30 demographic groups (age by sex) based on weighted proportions and applied to the data set. Weights were calculated as (1/sample probability) for each group and applied to the full dataset of 932 participants. All statistical analyses are conducted using IBM SPSS Statistics 24.

Paper 1

Frequencies of *Fad Diet Use, Ad Exposure, Ad Source, Celebrity Promotion Status, and Response to Ad* are reported. A total of three models were fitted: 1) a logistic regression model was fitted to examine correlates of *Ad Exposure*; 2) a linear regression model was fitted to model correlates of *Response to Ads*; and 3) a logistic regression model was fitted to examine correlates of *Fad Diet Use*. All models use a ‘repeated-measures’ analysis using the Generalised Estimating Equations framework in SPSS to address correlated responses at the individual level, where responses for each diet type were treated as “observations”¹⁵⁵. All models were

adjusted for *Sex, Age, BMI, Mental Health Status, Health Literacy Status, Body Image, EAT-3, and Diet Type*. The *Fad Diet Use* model was additionally adjusted for *Ad Exposure*, and the *Response to Ad* model was adjusted for *Celebrity Promotion Status*.

Paper 2

Frequencies of *Perceived Risk* and *Perceived Effectiveness* are reported. Baron and Kenny's approach to mediation was used in order to examine whether or not *Perceived Risk* and *Perceived Effectiveness* mediate the relationship between *Ad Exposure* and *Fad Diet Use* ¹⁵⁶.

Baron and Kenny's method includes 3 steps: 1) show that there is a relationship between the predictor variable and the outcome; 2) show that there is a relationship between the predictor variable and the mediator variables; and 3) show that there is a relationship between the mediator variables and the outcome variable, while adjusting for the predictor variable. First, step 1 was satisfied in Paper 1, where analyses were used to determine whether there was a relationship between *Ad Exposure* (predictor variable) and *Fad Diet Use* (outcome variable).

Second, bivariate correlations were conducted to examine the association between *Ad Exposure* and *Perceived Risk*, and *Ad Exposure* and *Perceived Effectiveness* (mediator variables).

The bivariate correlations were then adjusted for *Diet Type* and all sociodemographic variables in two logistic regression models, to determine whether or not the relationships between *Ad Exposure* and *Perceived Risk*, and *Ad Exposure* and *Perceived Effectiveness* remained after adjusting for additional variables. In a separate step, a 2-way interaction was tested in each model: *Ad Exposure* by *Diet Type*.

Third, a logistic regression was fitted to model *Fad Diet Use*, in order to determine whether or not *Fad Diet Use* and *Perceived Risk*, and *Fad Diet Use* and *Perceived Effectiveness* were associated, while adjusting for *Ad Exposure*. 2-way interactions were not addressed in the *Fad Diet Use* model, as the model could not converge due to Hessian Matrix singularity.

Independent from the mediation analysis, a linear regression was used to model *Response to Ad*, adjusted for *Perceived Risk*, *Perceived Effectiveness*, and *Celebrity Promotion Status*. In a separate step, six 2-way interaction terms were tested: *Diet Type* by *Perceived Risk*, *Diet Type* by *Perceived Effectiveness*, *Perceived Risk* by *Perceived Effectiveness*, *Celebrity Promotion Status* by *Diet Type*, *Celebrity Promotion Status* by *Perceived Risk*, and *Celebrity Promotion Status* by *Perceived Effectiveness*.

All models were additionally adjusted for *Sex*, *Age*, *BMI*, *Mental Health Status*, *Health Literacy Status*, *Body Image*, *EAT-3 Scores*, and *Diet Type*. All models used a 'repeated-measures' analysis using the Generalised Estimating Equations framework in SPSS to address correlated responses at the individual level, where responses for each diet type were treated as "observations"¹⁵⁵.

Hypotheses

Hypothesis 1a: Respondents will be more likely to report exposure to fad diet ads for liquid diets, cleanses or detox diets, or non-prescription diet pills compared to skipping meals or fasting, laxatives or vomiting, or smoking.

First, in paper 1, descriptive statistics were used to examine the proportion of respondents who reported *Ad Exposure*. Second, a logistic regression was conducted to examine *Ad Exposure* (0=not exposed, 1=exposed) using an indicator variable for *Diet Type*. The model was adjusted for *Diet Type* and all sociodemographic variables.

Hypothesis 1b: Exposure to any fad diet ad will be higher among respondents who (a) are female, (b) have a higher BMI, and (c) report less satisfaction with their bodies.

To test this hypothesis, the contrasts for each of the covariates entered into the model described in Hypothesis 1a were examined.

Hypothesis 1c: Exposure to any fad diet ad will be most common on social media compared to other sources of fad diet ads.

To test this hypothesis, in paper 1, frequencies of *Ad Exposure* to each type of diet on each *Ad Source* were examined.

Hypothesis 2a: Respondents will be less likely to respond “actively” to an ad for a fad diet if the ad is for laxatives or vomiting or smoking, than if the ad is for skipping meals or fasting, liquid diets, cleanses or detoxes, or non-prescription diet pills.

First, in paper 1, descriptive statistics were used to examine the proportion of respondents who respond to *Response to Ad* for each type of fad diet with “I wasn’t interested / ignored the ad”, “I was interested but I didn’t do anything”, “I tried to get more information or clicked an online link”, “I signed up or purchased the diet or weight loss method”, and “I started following the diet or weight loss method. Second, a linear regression was conducted to examine *Response to Ad* using an indicator variable for *Diet Type*. The model was adjusted for *Celebrity Promotion Status*, *Diet Type*, and all sociodemographic variables. In paper 2, a similar model was conducted, additionally adjusted for *Perceived Risk* and *Perceived Effectiveness*.

Hypothesis 2b: Respondents will be more likely to respond “actively” to an ad for a fad diet if: (a) they are female, (b) they have a higher BMI, (c) they have lower health literacy, (d) they report less satisfaction with their bodies, (e) they have a higher EAT-3 score (f) the ad is being promoted by a celebrity, (f) they perceive fad diets as less risky, and (g) they perceive fad diets as more effective

To test this hypothesis, the contrasts for each of the covariates entered into the models described in Hypothesis 2a were examined.

Hypothesis 3a: Respondents will perceive some fad diets including laxatives or vomiting and smoking as riskier than skipping meals or fasting, liquid diets, cleanses or detoxes, or non-prescription diet pills.

First, in paper 2, descriptive statistics were used to examine the proportion of respondents who respond to *Perceived Risk* for each type of fad diet with “1 – Not at all risky”, “2 – A little risky”, “3 – Somewhat risky”, “4 – Very risky”, and “5 – Extremely risky”. Second, a linear regression was conducted to examine *Perceived Risk* using an indicator variable for *Diet Type*. The model was adjusted for *Ad Exposure*, *Diet Type*, and all sociodemographic variables.

Hypothesis 3b: Respondents will be more likely to perceive fad diets as risky if (a) they are female, (b) they have a higher BMI, (c) they have higher health literacy, (d) they report more satisfaction with their bodies, and (e) they have a lower EAT-3 score (f) they are exposed to a fad diet ad

To test this hypothesis, the contrasts for each of the covariates entered into the model described in Hypothesis 3a were examined.

Hypothesis 4a: Respondents will perceive some fad diets including laxatives or vomiting and smoking as less effective than skipping meals or fasting, liquid diets, cleanses or detoxes, or non-prescription diet pills.

First, in paper 2, descriptive statistics were used to examine the proportion of respondents who respond to *Perceived Effectiveness* for each type of fad diet with “1 – Not at all effective”, “2 – A little effective”, “3 – Somewhat effective”, “4 – Very effective”, and “5 – Extremely effective”.

Second, a linear regression was conducted to examine *Perceived Effectiveness* using an indicator variable for *Diet Type*. The model was adjusted for *Ad Exposure*, *Diet Type*, and all sociodemographic variables.

Hypothesis 4b: Respondents will be more likely to perceive fad diets as effective if (a) they are female, (b) they have a lower BMI, (c) they have lower health literacy, (d) they report less satisfaction with their bodies, and (e) they have a higher EAT-3 score (f) they are exposed to a fad diet ad

To test this hypothesis, the contrasts for each of the covariates entered into the model described in Hypothesis 4a were examined.

Hypothesis 5a: Respondents will be less likely to report using laxatives or vomiting or smoking than skipping meals or fasting, liquid diets, cleanses or detoxes, or non-prescription diet pills.

While hypotheses 2a and 2b examine responses to fad diet ad exposure (including a measure of fad diet use in response to ad exposure), hypotheses 5a and 5b examine the use of fad diets over the past 12-months, irrespective of exposure to fad diet ads. First, in paper 1, descriptive statistics were used to examine the proportion of respondents who report following each type

of *Weight Loss Method* and *Weight Maintenance Method*. Second, a logistic regression was conducted to examine *Fad Diet Use* (0=no fad diet use, 1=fad diet use) using an indicator variable for *Diet Type*. The model was adjusted for *Ad Exposure*, *Diet Type*, and all sociodemographic variables. In paper 2, a similar model was conducted, additionally adjusted for *Perceived Risk* and *Perceived Effectiveness*.

Hypothesis 5b: Respondents will be more likely to follow a fad diet if (a) they are female, (b) they have a higher BMI, (c) they are exposed to a fad diet ad, (d) they have lower health literacy, (e) they report less satisfaction with their bodies, (f) they have a higher EAT-3 score (g) they perceive fad diets as less risky, and (h) they perceive fad diets as effective.

To test this hypothesis, the contrasts for each of the covariates entered into the model described in Hypothesis 5a were examined.

Hypothesis 5c: The relationship between fad diet ad exposure and fad diet use will be mediated by perceptions of risk and perceptions of effectiveness.

To test this hypothesis, Baron and Kenny's approach to mediation was used¹⁵⁶. First, the Paper 1 model described in hypothesis 5a was examined to determine whether there was a relationship between *Ad Exposure* and *Fad Diet Use*. Second, two bivariate correlations were conducted, examining the effect of *Perceived Risk* and *Perceived Effectiveness* on *Ad Exposure*. The bivariate correlations were then adjusted for additional variables, as described in the

models in Hypothesis 3a and Hypothesis 4a. Third, the Paper 2 model described in Hypothesis 5a was fitted to determine whether or not *Fad Diet Use* was associated with *Perceived Risk* and *Perceived Effectiveness*.

RESULTS

Paper 1 – EXPOSURE AND RESPONSE TO DIET ADS AMONG YOUTH AND YOUNG ADULTS IN CANADA

ADVERTISEMENT EXPOSURE ASSOCIATED WITH FAD DIET USE AMONG YOUTH AND YOUNG ADULTS IN CANADA

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ADVERTISEMENT EXPOSURE ASSOCIATED WITH FAD DIET USE AMONG YOUTH AND YOUNG ADULTS IN CANADA

RESEARCH SNAPSHOT

Research Question: Is there an association between fad diet advertisement exposure and fad diet use?

Key Findings: In this survey based, cross-sectional prospective cohort study of 932 Canadians between the ages of 16-32, reported fad diet advertisement exposure was associated with reported fad diet use ($P < 0.05$).

OVERVIEW

Background. Many Canadians report trying to manage their weight, however few follow recommended dietary guidelines. In contrast, many consumers use “fad” diets, despite little evidence of efficacy and potential adverse health effects. There is little evidence on the extent to which young Canadians are exposed to fad diet advertising, and how this is associated with dieting behaviour.

Objective. The current study seeks to determine whether or not there is an association between fad diet advertisement exposure and fad diet use.

Design. Cross-sectional survey data were drawn from Wave 2 of the Canada Food Study.

Participants/setting. Respondents were recruited via email from Wave 1 of the Canada Food Study into Wave 2 (n=1115). Respondents were between the ages of 16-32 with internet access; 183 were disqualified for a final sample of n=932.

Main outcome measures. Main measures included *Fad Diet Use* of fasting and skipping meals, liquid diets, cleanses and detoxes, non-prescription diet pills, laxatives or vomiting, and smoking; *Ad Exposure, Ad Source, and Response to Ad*; and *Celebrity Promotion Status*.

Statistical analyses performed. Three repeated measures regression models were fitted examining correlates of *Ad Exposure, Response to Ads, and Fad Diet Use*. Models were adjusted for sex, age, BMI, EAT-3, body image, health literacy, and mental health.

Results. Almost two-thirds of respondents (61.2%) reported exposure to a fad diet advertisement, most commonly on the internet, and one in five reported fad diet use. Exposure to advertisements was most likely for cleanses and detoxes. Respondents were most likely to report use of fasting. Fad diet use was greater among respondents who were exposed to fad diet advertisements ($p<0.05$ for all).

Conclusions. Many Canadians reported fad diet advertisement exposure and use, which were associated. However, the direction of the relationship is unclear. The study may warrant new advertising regulations for dieting products.

ADVERTISEMENT EXPOSURE ASSOCIATED WITH FAD DIET USE AMONG YOUTH AND YOUNG ADULTS IN CANADA

INTRODUCTION

Many Canadians experience obesity and nutrition-related chronic disease¹⁻³. In 2014, the prevalence of overweight and obesity was 62% for men and 46% for women⁴. Excess weight has been associated with health risks such as type two diabetes, cancer, and cardiovascular disease,^{5,6} and has placed a considerable economic burden on the Canadian healthcare system⁷.

A healthy diet is critically important to avoiding excess weight gain. Current dietary recommendations include eating the suggested amount of calories for one's sex, age, and energy expenditure,^{8,9} and limiting fat, sugar, sodium, and processed foods¹⁰. For weight-loss in particular, Dietitians of Canada recommends a flexible and easily maintained plan, with a weight-loss goal of no more than two pounds every week¹¹. While more than one third of Canadians report trying to lose weight¹², few are following the dietary guidelines recommended by health authorities¹³. Many people, however, are looking to "fad" diets to help with weight loss^{14,15}.

"Fad" dieting broadly refers to the use of trendy dieting methods that promise easy and rapid weight-loss, which are often times restrictive and difficult to maintain,^{11,16} however, there is no official criteria or definition for the term. Fad diets usually focus on short-term rather than long-term weight-loss^{11,16}. Popular fad diets include cleanses, detoxes, and liquid diets. Unfortunately, many fad diets have little to no evidence of effectiveness, and may have adverse health effects¹⁶. For these reasons, Dietitians of Canada discourages the use of fad diets¹¹.

Despite these concerns, fad diets remain popular. A major contributor to the popularity of fad dieting is promotion by commercial diet industry. Advertisements (ads) for weight-loss products are abundant and increasing on media platforms including television, magazines, newspapers, and the internet¹⁷. Weight-loss ads often include false or exaggerated claims regarding the product's rapid, long-term, or easy weight-loss,^{18,19} and often times target women and adolescents²⁰⁻²⁴. This deceptive advertising is problematic as it may promote false expectations regarding the effects of diet products, and persuade consumers to engage in unsafe or ineffective weight-loss methods.

More recently, social media has emerged as a pervasive platform for advertising, which may be particularly influential due to the ability to target specific audiences, interact with consumers, and personalise ads to viewers²⁵. Another influential aspect of social media advertising is the use of celebrity promotion, as celebrities are often times used in online advertising for their high status and influence. The types of ads that people are exposed to on social media are often times a reflection of their profile information or browsing history^{26,27} and one study found that 72% of respondents made fitness-related posts, resulting in 10% of all ads promoting fad diets²⁸. This suggests that the majority of Facebook users are being exposed to at least some fad diet advertising, which is of particular concern as social media platforms are generally dominated by young people, who are more easily influenced by deceptive advertising²²⁻²⁴. Thus, it is critical to examine the effect that fad diet ad exposure has on young people's dieting behaviours.

There is little recent evidence on the extent to which young Canadians are exposed to fad dieting in the media, and the impact that exposure to fad diet advertising has on fad diet use. The current study had three primary objectives: 1) to examine the frequency of self-reported exposure to fad diet advertising on various media platforms including social media; 2) to examine the ways in

which young people respond to fad diet ads; and 3) to examine the association between fad diet ad exposure and fad diet use.

MATERIALS AND METHODS

Protocol

The Canada Food Study (CFS) is a national cohort study conducted annually to monitor eating patterns and trends among youth and young adults in Canada over time. Wave 1 of the CFS was conducted from October-December 2016 with 3000 respondents. Wave 2 was conducted from October-December 2017 with 932 respondents. The current study examined cross-sectional data from Wave 2 of the CFS only, as the measures of interest were not originally examined in Wave 1.

Data for the current study were collected via online self-report surveys on dietary patterns. Respondents were given the option to complete the surveys in English or French. Respondents were compensated for their participation with a \$20 Interac e-transfer or e-giftcard. The study was reviewed by and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE# 21631), and all respondents provided informed consent prior to participation.

Participants and Recruitment into Wave 2

Respondents for Wave 2 of the CFS were recruited from the Wave 1 sample. Respondents for Wave 1 were recruited in person at select sites in five Canadian cities, including Vancouver, Edmonton, Toronto, Montreal, and Halifax. Systematic sampling and a standard intercept

technique were involved in recruitment, where all individuals who passed by a particular landmark were invited to participate by a trained research assistant²⁹. Respondents were screened during recruitment to determine study eligibility. Eligibility criteria included living in one of the five recruitment cities, being 16-30 years of age during the time of recruitment, having internet access and a laptop, desktop computer or tablet, and not having been previously enrolled in the study panel. Eligible respondents were sent an email with a link to the primary survey on dietary patterns, and were later presented with a brief follow-up survey to confirm compensation preferences and contact information to be used for Wave 2 invitations. Respondents were discouraged from accessing the surveys via smartphone, but were not restricted from doing so. A full description of Wave 1 research methods can be found in the Canada Food Study Technical Report – Wave 1 (2016)³⁰.

A total of 2,992 respondents from Wave 1 were sent an email invitation to participate in Wave 2 of the CFS, and 1,115 respondents accessed the survey. Respondents who were 16-32 years of age were considered eligible for Wave 2. A total of 183 respondents were disqualified for being of an ineligible age, due to missing data, or for accessing the survey via smartphone.

Respondents who accessed the survey via smartphone were disqualified, as the small size of the screen may have affected the way that people interacted with the survey. Eligible respondents were provided with study information and asked to give consent for participation. A total of 932 Wave 2 respondents were retained for analysis, for a retention rate of 83.59%.

Measures

Sociodemographic information was collected from all respondents, including *Age, Sex, BMI* (calculated using reported height and weight values) and self-report *Mental Health Status*. *Health Literacy Status* was also determined using the Newest Vital Sign³¹, where respondents were asked six health literacy questions and a score was calculated based on the number of correct responses. A score of: 0-1 suggests high likelihood (50% or more) of limited literacy; 2-3 indicates the possibility of limited literacy; and 4-6 almost always indicates adequate literacy.

A measure for *Body Image* prompted respondents with “Right now I feel . . .” with nine response options from “Extremely satisfied with my body size and shape” to “Extremely dissatisfied with my body size and shape”. Disordered eating was measured using *EAT-3*, three survey items asking respondents to report the frequency of the following: “Went on eating binges”, “Vomited to control weight”, and “Preoccupied with desire to be thinner”. Responses were scored, with higher scores indicating more symptoms of eating disorders.

For all measures, participants were given the option to respond with “Don’t know” or “Refuse to answer”. Measures with lists were presented to participants in a randomized order. A detailed description of all measures can be found in the Canada Food Study: User Guide and Codebook – Wave 2 (2017)³².

Weight behaviour and fad diet use

Respondents were asked to respond to the prompt “During the past 12 months have you tried to....” with response options “Lose weight”, “Gain weight”, “Stay the same weight”, and “I have not tried to do anything about my weight”³³. Respondents who reported trying to lose weight and/or stay the same weight were then asked “How did you try to lose weight or ‘stay the same

weight' in the past 12 months?” with the response options: “Skipped meals or fasted”, “Ate less food”, “Ate less fat”, “Ate less candy, sugar or sweets”, “Ate fewer carbohydrates”, “Ate more fruits, vegetables or salads”, “Switched to foods with lower calories”, “Followed a special diet or weight loss program (e.g., Atkins, Weight Watchers)”, “Used a liquid diet formula, such as Slimfast or Optifast”, “Did a cleanse or detox diet”, “Exercised”, “Drank a lot of water”, “Got help from a health professional”, “Took diet pills prescribed by a doctor”, “Took other pills, medicines, herbs, or supplements not needing a prescription”, “Took laxatives or vomited”, “Started to smoke or began to smoke again”, and “Other”, “None of the above”³³. While the question did not ask specifically about fad diets, and response options were not limited to weight-loss methods that were considered fad diets, a final analytic decision was made in terms of which weight-loss methods were considered to be fad diets.

Accordingly, a *Fad Diet* variable was derived from each measure. Important to note is that because the definition of fad diet is broad and not universally recognized, some diets that are considered in some domains to be fads may not be risky or ineffective. Thus, the current study focuses on only a subset of fad diets that are generally known to be ineffective or unhealthy methods for weight-loss. Respondents were coded as either 0=No fad diet, or 1=One or more of the following: “Skipped meals or fasted”, “Used a liquid diet formula, such as Slimfast or Optifast”, “Did a cleanse or detox diet”, “Took other pills, medicines, herbs, or supplements not needing a prescription”, “Took laxatives or vomited”, and “Started to smoke or began to smoke again”.

Diet ad exposure and source

Respondents were asked “During the past 12 months, have you seen or heard any ads or promotions for the following?” with response options including the six fad diets previously mentioned, and an option for “None of the above”. For each of the diets that respondents reported exposure to, they were asked “During the past 12 months, did you see or hear ads or promotions in any of the following places?”, with response options “TV”, “Radio”, “Online / internet”, “Mobile app / video game”, “Social media (e.g., Twitter, Facebook, Snapchat)”, “In a text message”, “Magazine or newspaper”, “Billboard or outdoor sign (e.g., posters, transit)”, “Signs or displays in stores”, “Giveaways, samples or special offers”, and “Other”. Respondents were also asked “Were the following diet or weight loss methods being advertised or promoted by a celebrity?” for each six diet types.

Response to diet ad

For each of the fad diets that respondents reported exposure to, they were asked “For each of the following, how did you respond to the advertisement or promotion?” with response options “I wasn’t interested / ignored the ad”, “I was interested but I didn’t do anything”, “I tried to get more information or clicked an online link”, “I signed up or purchased the diet or weight loss method”, and “I started following the diet or weight loss method”. The variable was treated as a continuous variable from “*least active*” to “*most active*”.

Analysis

Descriptive statistics are reported for all sociodemographic variables. Frequencies of *Fad Diet Use*, *Ad Exposure*, *Ad Source*, *Celebrity Promotion Status*, and *Response to Ad* are also reported. A total of three models were fitted: 1) a logistic regression model was fitted to examine

correlates of *Ad Exposure*; 2) a linear regression model was fitted to model correlates of *Response to Ads*; and 3) a logistic regression model was fitted to examine correlates of *Fad Diet Use*. All models use a ‘repeated-measures’ analysis using the Generalised Estimating Equations framework in SPSS to address correlated responses at the individual level, where responses for each diet type were treated as “observations”³⁴. All models were adjusted for *Sex, Age, BMI, Mental Health Status, Health Literacy Status, Body Image, EAT-3 scores, and Diet Type*. The *Fad Diet Use* model was additionally adjusted for *Ad Exposure*, and the *Response to Ad* model was adjusted for *Celebrity Promotion Status*.

All estimates are weighted unless otherwise stated. Post-stratification sample weights were constructed based on population estimates for 2017 from the 2011 Census. All statistical analyses were conducted using IBM SPSS Statistics 24³⁵.

RESULTS

Sample Characteristics

Demographic characteristics of the 932 respondents retained for analysis are presented in Table 1. Respondents were between the ages of 16-32 (M=24.27, SD=4.24), and the majority were female, of normal weight, and had adequate health literacy.

Diet Ad Exposure and Source

A total of 61.2% (n=568) of respondents reported exposure to at least one fad diet ad, while 38.8% (n=361) reported no exposure to fad diet ads. The proportion of respondents who reported exposure to each fad diet ad from each media source are presented in Table 2.

A logistic regression model was fitted to examine correlates of fad diet *Ad Exposure*. *Ad Exposure* differed by *Diet Type* ($\chi^2=411.8$; $p<0.001$): respondents were more likely to report exposure to cleanses and detoxes compared to the other diet types, and less exposure to smoking and laxatives or vomiting than to the other diets. Females were more likely than males to report exposure to fad diet ads (28.6% vs 17.2%, AOR=2.1, 95% CI=1.6, 2.7, $p<0.001$). The odds of reporting exposure to a fad diet ad also differed by *BMI* ($\chi^2=15.0$; $p=0.005$): compared to respondents who had “missing” BMI data (15.6%), respondents classified as underweight (28.1%, AOR=2.7, 95% CI=1.3, 5.5, $p=0.007$), normal weight (22.9%, AOR=1.9, 95% CI=1.2, 2.8, $p=0.003$), or obese (29.8%, AOR=2.5, 95% CI=1.4, 4.4, $p=0.003$) were significantly more likely to report exposure to a fad diet ad. There were no significant differences in *Ad Exposure* between respondents classified as underweight, normal weight, overweight, or obese. The odds of exposure also differed by *Health Literacy Status* ($\chi^2= 18.4$; $p<0.001$): respondents with a likelihood of adequate literacy (25.1%) were more likely to report exposure to a fad diet ad than respondents with a likelihood of limited literacy (13.3%, AOR=2.1, 95% CI=1.4, 3.2, $p<0.001$) and respondents with possibility of limited literacy (18.9%, AOR=1.5, 95% CI=1.1, 2.0, $p=0.007$).

Age ($\chi^2=2.1$; $p=0.5$), *Mental Health Status* ($\chi^2=1.3$; $p=0.3$), *Body Image* ($\chi^2=2.1$; $p=0.1$), and *EAT-3 Scores* ($\chi^2=1.4$; $p=0.7$) were not significantly associated with *Ad Exposure*.

Response to Diet Ad

Table 3 shows how participants responded to fad diet ads, among those exposed to ads in the past 12 months. The majority of respondents reported that “I wasn’t interested / Ignored the ad” for

each type of diet. However, approximately one quarter of respondents reported that they “tried to get more information or clicked an online link”, “signed up or purchased the diet”, or “started following the diet” for skipping meals and fasting and smoking. Only about 10% or fewer respondents gave the same “active” responses for liquid diet, cleanse or detox, non-prescription diet pills, and laxatives or vomiting.

A linear regression model was conducted to examine correlates of *Response to Ad* exposure (N=622). The odds of giving an “active” response differed by *Diet Type* ($\chi^2=50.7$; $p<0.001$): respondents gave responses that were more “active” for fasting more than for liquid diets ($\beta=0.6$, 95% CI=0.4, 0.8, $p<0.001$), cleanses or detoxes ($\beta=0.3$, 95% CI=0.09, 0.5, $p=0.005$), non-prescription diet pills ($\beta=0.5$, 95% CI=0.3, 0.7, $p<0.001$), and laxatives or vomiting ($\beta=0.3$, 95% CI=0.02, 0.6, $p=0.04$), and for detoxes and cleanses more than liquid diets ($\beta=0.3$, 95% CI=0.2, 0.4, $p<0.001$) and non-prescription diet pills ($\beta=0.2$, 95% CI=0.08, 0.3, $p<0.001$). *Body Image* ($\chi^2=7.0$; $p=0.008$) and *EAT-3 Score* ($\chi^2=12.5$; $p=0.006$) were also significantly associated with *Response to Ad*. Specifically, respondents who reported lower satisfaction with their bodies “actively” responded to ads more than respondents who reported higher body satisfaction ($\beta=0.05$, 95% CI=0.01, 0.09, $p=0.008$). Respondents who scored higher on EAT-3 responded to ads more “actively” than those with lower scores: respondents who scored 3 gave more “active” responses than respondents who scored 0 ($\beta=0.97$, 95% CI=0.2, 1.7, $p=0.01$) or 1 ($\beta=0.8$, 95% CI=0.09, 1.6, $p=0.03$); respondents who scored 2 also gave more “active” responses than respondents who scored 0 ($\beta=0.4$, 95% CI=0.1, 0.6, $p=0.006$).

Sex ($\chi^2=1.9$; $p=0.2$), *Age* ($\chi^2=1.6$; $p=0.7$), *BMI* ($\chi^2=0.2$; $p=0.99$), *Health Literacy Status* ($\chi^2=4.1$; $p=0.1$), *Mental Health Status* ($\chi^2=0.01$; $p=0.9$), and *Celebrity Promotion Status* ($\chi^2=2.0$; $p=0.2$) were not significantly associated with *Response to Ad*.

Weight Behaviour and Diet Use

Overall, 14% (n=130) respondents reported trying to gain weight, 44.2% (n=410) reported trying to lose weight, and 15.3% (n=142) reported trying to stay the same weight. A total of 34.6% (n=321) reported no weight control behaviour.

Of respondents who reported trying to lose and/or maintain weight, 20.9% (n=194) used at least one fad diet. Figure 1 displays total number of fad diets used among respondents reporting each weight behaviour. Table 4 displays the prevalence of diet methods for respondents who reported trying to lose and/or maintain weight. The odds of *Fad Diet Use* differed by *Diet Type* ($\chi^2=233.5$; $p<0.001$): respondents were significantly more likely to report using skipping meals or fasting compared to using liquid diets (AOR=29.8, 95% CI=15.0, 59.3, $p<0.001$), cleanses or detoxes (AOR=9.4, 95% CI=5.5, 16.0, $p<0.001$), non-prescription diet pills (AOR=7.5, 95% CI=4.6, 12.2, $p<0.001$), laxatives or vomiting (AOR=12.5, 95% CI=7.7, 20.2, $p<0.001$), and smoking (AOR=13.7, 95% CI=7.8, 24.1, $p<0.001$). Liquid diets were less likely to be used than cleanses or detoxes (AOR=0.3, 95% CI=0.2, 0.6, $p=0.002$) and non-prescription diet pills (AOR=0.3, 95% CI=0.1, 0.5, $p<0.001$).

Those who reported exposure to a fad diet ad were more likely to use a fad diet than those who did not report exposure (5.7% vs 4.1%, AOR=1.6, 95% CI=1.1, 2.4, $p=0.008$). Females were more likely than males to use a fad diet (5.5% vs 3.4%, AOR=1.6, 95% CI=1.1, 2.3, $p=0.021$). The odds of using a fad diet also differed by *BMI* ($\chi^2=22.1$; $p<0.001$): respondents who were classified as overweight (7.9%) and obese (8.9%) were more likely to report using a fad diet than those who were classified as underweight (2.8%, AOR=2.7, 95% CI=1.2, 5.9, $p=0.02$; AOR=2.6,

95% CI=1.1, 6.5, $p=0.03$, respectively) or normal weight (3.1%, AOR=2.3, 95% CI=1.5, 3.6, $p<0.001$; AOR=2.3, 95% CI=1.3, 4.2, $p=0.005$, respectively). The odds of fad diet use also differed by *EAT-3 scores* ($\chi^2=48.3$; $p<0.001$): respondents with an EAT-3 score of 3 (29%) were more likely than respondents with a score of 2 (10.6%, AOR=5.0, 95% CI=2.3, 11.1, $p<0.001$), 1 (5.5%, AOR=9.2, 95% CI=4.1, 20.4, $p<0.001$), and 0 (2.3%, AOR=19.3, 95% CI=7.9, 46.7, $p<0.001$) to report *Fad Diet Use*. Additionally, respondents with a score of 2 were more likely to report *Fad Diet Use* than respondents with a score of 1 (AOR=1.8, 95% CI=1.2, 2.8, $p=0.008$) or 0 (AOR=3.8, 95% CI=2.3, 6.4, $p<0.001$), and respondents with a score of 1 were more likely than respondents with a score of 0 (AOR=2.1, 95% CI=1.3, 3.3, $p=0.001$). *Age* ($\chi^2=6.7$; $p=0.083$), *Mental Health Status* ($\chi^2=0.2$; $p=0.687$), *Health Literacy Status* ($\chi^2=1.5$; $p=0.479$), and *Body Image* ($\chi^2=2.6$; $p=0.107$) were not significantly associated with *Fad Diet Use*.

DISCUSSION

The current study has five primary findings. First, more than half of respondents reported exposure to an ad for a fad diet in the past 12 months. The two most common sources were the internet and social media. Given the amount of diet advertising in the media, and the growing use of social media platforms among young people, this finding is unsurprising. The internet has recently overtaken television as the largest platform for advertising³⁶, and a recent report released by GroupM predicts that 2018 will be the first year in which time spent online will be greater than television exposure³⁷. Thus, the current finding that fad diet ads are most common on online sources mirrors recent industry trends.

Respondents reported the greatest exposure to ads for cleanses or detoxes, and the least exposure to ads for smoking or for laxatives. This finding is in line with the recent interest in using

cleanses and detoxes for weight-loss, which has re-emerged as a dieting trend³⁸. Additionally, as many cleanses and detoxes, liquid diets, and diet pills are sold commercially³⁹⁻⁴¹, it is expected that consumers would report exposure to promotions for these diets more so than for non-commercial diets such as fasting, smoking, and laxatives or vomiting. The advertisement of tobacco in Canada has been banned on media sources including television, radio, print, and outdoor advertising such as billboards⁴². While not technically banned from the internet, tobacco advertising is strictly regulated on online sources. Thus, exposure to weight-loss ads for smoking is unlikely. It is also unlikely that people would be exposed to ads for weight-loss products that cannot be sold, such as fasting or vomiting. If these behaviours were promoted, there would likely be backlash due to the extreme nature of such behaviours for weight-loss and their associations with disordered eating. While extreme and non-commercial weight-loss methods are not formally advertised, young Canadians still report small levels of exposure to these types of weight-loss methods. Young people may be viewing these weight-loss methods online as promotions or paid endorsements from high profile bloggers or celebrities, where it is challenging to monitor the information that people are choosing to share.

Secondly, nearly one quarter of respondents reported trying to get more information, signing up or purchasing a diet, or starting to follow a diet for smoking and skipping meals or fasting, approximately 10% for cleanses and detoxes and laxatives, and under 10% for liquid diets and non-prescriptions diet pills. These findings indicate that a subset of people report conscious engagement with fad diet ads, which is of concern given their associated health risks.

Those who were most likely to “*actively*” respond to a diet ad were respondents who reported lower body satisfaction and more eating disorder symptoms, and previous research has noted a relationship between dieting and disordered eating behaviour⁴³. Respondents were more likely to

respond “*Actively*” to ads for skipping meals or fasting than to the other diet types, excluding smoking. This may be because fasting involves little preparation and is easy to start immediately. Surprisingly, neither sex nor BMI were associated with response to diet ad, despite both being associated with ad exposure and fad diet use. It is possible that these variables were associated with other variables in the model, such as body image or disordered eating, and that if they were examined in an unadjusted model, they would be significantly associated with people’s response to ads.

Third, the current study examined whether response to a diet ad was associated with celebrity promotion status. Celebrities are often used for their high status and influence, which is becoming increasingly popular on media sources such as social media. However, no relationship was found between celebrity promotion status and response to ad. Perhaps the type of celebrity and their level of status is an important factor in whether or not they will influence consumers to engage with an ad. Alternatively, respondents may be hesitant to admit that a celebrity influenced their dieting behaviour, or unaware that a celebrity’s weight-loss recommendation was actually a paid promotion. Maybe the most likely explanation is that celebrities associate themselves with more conventional diet types and less extreme ones (for example, Oprah Winfrey’s association with Weight Watchers⁴⁴), and thus celebrity promotion only influences how people respond to ads for particular diet types, which is an area for future research.

Fourth, one fifth of respondents reported using one of the fad diets, the most common of which was skipping meals or fasting. While respondents reported higher levels of healthy weight-loss behaviours, such as exercising or drinking more water, this finding does not negate the fact that many respondents also report using unhealthy weight-loss methods. Respondents with a higher BMI and who reported more symptoms of an eating disorder were more likely to use a fad diet

than their counterparts, which could be explained by the perception of needing to lose weight. These findings are consistent with previous research suggesting that both disordered eating symptoms and higher BMI are related to dieting behaviour^{43,45}. One explanation is that people with a higher BMI are less satisfied with their bodies and thus more likely to engage in a weight-loss behaviour to try and change their bodies. However, it is possible that the relationship also goes in the other direction. In fact, dieting behaviours may increase unhealthy body dissatisfaction among young people⁴⁶. Additionally, unhealthy weight-control behaviours such as fasting or use of diet pills have been shown to lead to an increase in BMI over time⁴⁵. The same study found that the use of dieting and unhealthy weight-loss behaviours were most common among females, which is in line with the findings of the current study.

Lastly, fad diet ad exposure was related to fad diet use: respondents who reported exposure to ads were more likely to use a fad diet, even after adjusting for body image, BMI, and other factors. This finding may be an indication of the strength of the weight-loss industry in successfully promoting risky and ineffective diet products to young people. This finding is consistent with existing research on the persuasiveness of advertising. For example, in the food and beverage industry, it has been repeatedly demonstrated that exposure to food advertising on television and online media is associated with changes in dietary intake among young people⁴⁷. Thus, it is unsurprising that ads for dieting products would also be persuasive and influence behaviour. However, due to the cross-sectional nature of the data, causality or the direction of the association between exposure and use cannot be determined in the current study; it is possible that respondents who use fad diets are more likely to recall exposure to diet ads. Future research is necessary in order to further understand the relationship between exposure and use.

Limitations and future research

The number of fad diets considered in this study is limited to a select few that are generally shown to be ineffective and risky: fasting or skipping meals, liquid diets, cleanses or detoxes, non-prescription diet pills, laxatives or vomiting, and smoking. This represents a limitation to the study as it may impact overall levels of fad diet ad exposure reported. If a broader range of diets were considered, the number of people exposed to fad dieting in the media might be greater than what is currently reported. Another limitation is that some of the fad diets, while generally viewed as unfit for effective and healthy weight-loss, may not be risky in every scenario. For example, while fasting and skipping meals is not recommended for weight-loss, occasionally skipping a meal may not be particularly harmful.

The current study examined data from a self-reported online survey. Due to the nature of self-report surveys, and the personal nature of some survey items, the results of the study may be subject to response bias. Potential areas of bias include misreporting of weight measurements or dieting behaviours due to embarrassment or shame that is sometimes associated with excess weight. Generally, those who fail to report weight measurements have a higher BMI⁴⁸. Other possible biases are the misreporting of dieting behaviours and ad exposure due to memory recall biases. This may be the case for some diet types more so than others. For example, respondents might have had a more difficult time remembering whether or not they have fasted or skipped a meal versus taken laxatives or smoked, as the latter two involve more effort including a purchase, and are more extreme weight-loss methods. Respondent fatigue is another possible area of bias, as multiple consecutive questions were asked regarding dieting behaviour and advertising.

In addition, the respondents were not recruited using probability-based sampling methods and were recruited from five select Canadian cities. Therefore, estimates reported in the current paper are not representative of the entire Canadian population. Compared to national estimates, the current sample is more likely to be comprised of students and people reporting food insecurity²⁹. Levels of overweight and obesity, and use of tobacco and cannabis are similar to national estimates. Results may have differed if non-urban areas were sampled. For example, respondents may have reported less overall exposure to fad diet ads, and, if so, may also have reported less fad diet use.

Further research is needed in order to fully understand the relationship between diet ad exposure and diet use. The current study design was cross-sectional and therefore the direction of the relationship between fad diet ad exposure and fad diet use cannot be determined. Thus, future research could examine these variables using a longitudinal study design to better understand whether the relationship is casual, and if so, in which direction. Additionally, it would be useful to examine the specific characteristics of fad diet ads that make them influential to young people. For example, it may be the case that particular advertising qualities such as celebrity promotion, ad source, or presence of deceptive claims make them more attractive options for weight-loss among young people. As fad diets are often times risky and ineffective weight-loss methods¹⁶, future research could also examine the impact of consumer perceptions of risk and effectiveness on diet use, and whether or not those perceptions are influenced by exposure to diet ads. More specifically, if perceptions of fad diet risk and effectiveness are in fact related to fad diet use and fad diet ad exposure, it would be interesting to determine whether the relationships differ across diet types, and whether or not particular diet types deemed as risky or effective are likely to be used in combination with one another.

CONCLUSION

Overall, the current study suggests that fad diet ads may be effective in persuading young people to use a particular diet. Implementing regulations around the advertisement of fad diets, such as prohibiting the advertisement of risky diets and the use of false claims may help to reduce the impact of advertising exposure on young people. Specifically, given the growing popularity of the internet and social media for the advertisement of fad diets, and the unrestricted nature of sharing information on these platforms, it will be increasingly important to find methods for regulating the content and misleading health information that is being circulated.

TABLES AND FIGURES

Table 1. Sample characteristics

Characteristic	Unweighted % (n)	Weighted % (n)
Total	932	929
Sex		
Female	70.3 (655)	49.6 (461)
Male	29.7 (277)	50.4 (468)
Age		
16-18	12.4 (116)	10.9 (102)
19-21	32.7 (305)	18.9 (175)
22-25	30.7 (286)	28.3 (263)
26-32	24.1 (225)	41.9 (389)
BMI		
Underweight	6.2 (58)	6.1 (57)
Normal weight	62.4 (582)	62.1 (576)
Overweight	16.2 (151)	17.6 (164)
Obese	7.5 (70)	7.3 (68)
Missing	7.6 (71)	6.9 (65)
Literacy		
High likelihood of limited literacy (score 0-1)	9.1 (85)	8.7 (81)
Possibility of limited literacy (2-3)	20.3 (189)	18.0 (167)
High likelihood of adequate literacy (4-6)	70.6 (658)	73.3 (681)

Self-rated mental health status

Mean	2.95	3.08
Standard Deviation	1.07	1.07

Body Image

Mean	4.08	3.92
Standard Deviation	2.27	2.21

EAT-3 score

0	57.3 (534)	60.6 (562)
1	29.3 (273)	27.6 (256)
2	11.2 (104)	10.1 (93)
3	2.3 (21)	1.8 (17)

Table 2. Percentage of young Canadians participating in Wave 2 of the Canada Food Study who reported exposure to fad diet ads on each media source, n=929

Media source	Cleanse or detox % (n)	Diet pills % (n)	Liquid diet % (n)	Skip meals or fasting % (n)	Laxatives or vomiting % (n)	Smoking % (n)	Any diet % (n)
Online	27.6 (257)	26.9 (250)	16.2 (151)	9.2 (85)	2.7 (25)	0.6 (6)	45.6 (424)
Social media	27.1 (252)	23.3 (217)	10.3 (96)	9.2 (86)	1.9 (18)	0.7 (6)	40.5 (377)
Television	10.1 (93)	15.1 (141)	15.6 (145)	3.8 (36)	2.4 (22)	0.6 (6)	27.3 (253)
Magazine	8.0 (75)	9.6 (90)	6.8 (63)	2.8 (26)	0.1 (1)	0.0 (0)	17.0 (158)
In-store sign	5.9 (54)	10.0 (93)	7.2 (67)	1.2 (11)	0.3 (3)	0.1 (1)	15.9 (147)
Radio	4.1 (38)	5.5 (51)	3.5 (32)	1.9 (18)	0.6 (6)	0.5 (5)	11.3 (105)
Mobile app	4.2 (39)	4.0 (37)	2.0 (19)	2.0 (18)	0.6 (6)	0.0 (0)	8.6 (80)
Billboard	3.0 (28)	4.0 (37)	3.4 (31)	1.2 (11)	0.1 (1)	0.1 (1)	8.5 (79)
Giveaways	3.8 (36)	4.5 (41)	3.3 (31)	0.9 (9)	0.1 (1)	0.0 (0)	8.5 (79)
Other	1.2 (11)	0.4 (4)	0.5 (4)	1.5 (14)	0.6 (5)	0.5 (5)	4.1 (38)
Text message	0.4 (4)	0.3 (3)	0.4 (4)	1.0 (9)	0.1 (1)	0.4 (4)	2.4 (23)
Any source	43.0 (399)	40.4 (375)	29.4 (273)	14.9 (139)	6.9 (64)	3.1 (29)	61.2 (568)
Celebrity	19.2 (178)	10.7 (99)	8.8 (82)	3.5 (33)	1.8 (17)	0.5 (5)	26.5 (246)

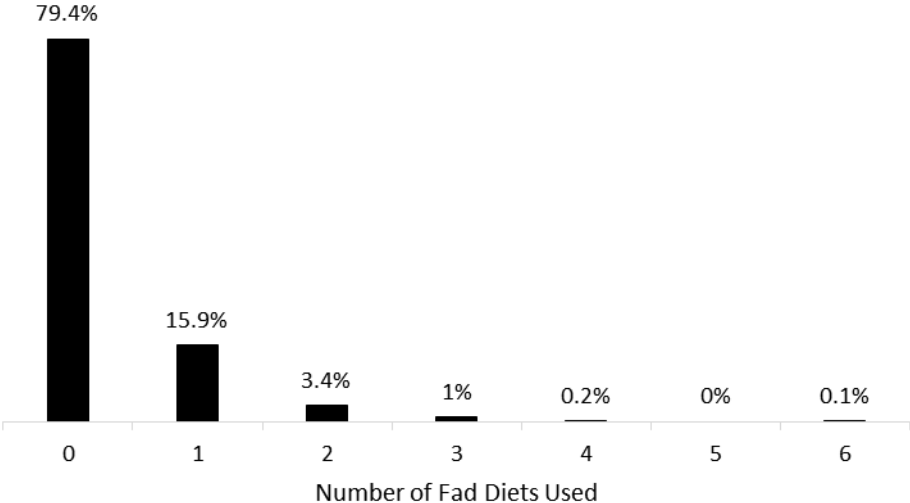
Table 3. Percentage of young Canadians participating in Wave 2 of the Canada Food Study who reported a response to an ad among those who were exposed to an ad

Diet type	I wasn't interested / Ignored the ad		I was interested but I didn't do anything		I tried to get more info or clicked an online link		I signed up or purchased the diet		I started following the diet	
	%	n	%	n	%	n	%	n	%	n
Skipping meals or fasting N=139	60.0	83	19.7	27	14.0	19	1.9	3	6.5	9
Liquid diet N=273	88.0	240	8.9	24	1.9	5	1.3	4	0.9	2
Cleanse or detox N=399	73.7	294	16.9	67	7.0	28	1.0	4	3.2	13
Diet pills N=375	85.5	321	9.7	37	4.6	17	2.2	8	1.0	4
Laxatives or vomiting N=64	79.7	51	11.7	7	2.9	2	2.1	1	5.7	4
Smoking N=29	69.3	20	2.8	1	12.0	3	1.3	0	12.1	3

Table 4. Percentage of young Canadians participating in Wave 2 of the Canada Food Study who reported trying to lose or maintain weight using each diet type, n=929

Diet type	Lose and maintain weight	
	%	n
Fad diet		
Skipped meals or fasted	16.1	149
Non-prescription diet pills	3.6	32
Did a cleanse or detox	2.9	27
Took laxatives or vomited	1.9	17
Started to smoke or began to smoke again	1.7	15
Used a liquid diet formula, such as Slimfast or Optifast	0.9	9
Other weight control method		
Exercised	44.4	413
Drank a lot of water	39.1	363
Ate less candy, sugar or sweets	34.7	322
Ate less food (amount)	34.1	317
Ate more fruits, vegetables or salads	32.2	300
Ate fewer carbohydrates	22.1	205
Ate less fat	21.8	203
Switched to foods with lower calories	15.5	144
Followed a special diet or weight loss program	2.9	27
Got help from a health professional	1.8	16
Other	0.9	9
Took diet pills prescribed by a doctor	0.2	1
None of the above	1.3	12

Figure 1. Number of fad diets used among respondents who reported trying to lose or maintain weight, n=929



Paper 2 – THE IMPACT OF PERCEIVED RISK AND EFFECTIVENESS OF FAD DIETS ON THE RELATIONSHIP BETWEEN ADVERTISEMENT EXPOSURE AND FAD DIET USE AMONG YOUTH AND YOUNG ADULTS IN CANADA

THE IMPACT OF PERCEIVED RISK AND EFFECTIVENESS OF FAD DIETS ON THE RELATIONSHIP BETWEEN ADVERTISEMENT EXPOSURE AND FAD DIET USE AMONG YOUTH AND YOUNG ADULTS IN CANADA

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OVERVIEW

Objective: To examine the relationship between fad diet advertisement exposure and fad diet use, with regard to perceived risk and effectiveness.

Design: The study draws cross-sectional survey data from Wave 2 of the Canada Food Study. Main measures included *Fad Diet Use*, for fasting or skipping meals, liquid diets, cleanses or detoxes, non-prescription diet pills, laxatives or vomiting, and smoking; *Ad Exposure*, *Ad Source*, and *Response to Ad*; *Perceived Risks*; *Perceived Effectiveness*; and *Celebrity Promotion Status*. Data were analysed using repeated measures linear and logistic regression models.

Setting: Respondents were recruited from five major Canadian cities: Vancouver, Edmonton, Toronto, Montreal, and Halifax, and completed the study online.

Subjects: Respondents were Canadians aged 16-32 years (n=932). The majority were female and of normal weight.

Results: Respondents were most likely to perceive smoking and laxatives or vomiting as risky, and fasting and cleanses or detoxes as effective. Respondents exposed to fad diet advertisements were less likely to perceive fad diets as risky (AOR=0.7, 95% CI=0.6, 0.8) and more likely to perceive them as effective (AOR=1.3, 95% CI=1.0, 1.6). Respondents who perceived fad diets as riskier were less likely to use fad diets (AOR=0.4, 95% CI=0.3, 0.6), and respondents who perceived fad diets as effective were more likely to use them (AOR=4.4, 95% CI=3.1, 6.2) (p<0.05 for all).

Conclusions: The relationship between fad diet advertisement exposure and fad diet use may be mediated by perceived risk and effectiveness, thus it may be important to reinforce policies around deceptive and persuasive dieting advertisements.

KEY WORDS: diet, perceived risk, perceived effectiveness, advertisements, youth

INTRODUCTION

Proper nutrition is necessary to promote good health and wellbeing. Maintaining a healthy diet can aid in the prevention and treatment of diet-related diseases, including cancer, cardiovascular disease, diabetes, and obesity⁽¹⁾. Current dietary recommendations include eating a wide variety of whole foods and limiting foods high in fat, sugar, sodium, and processed foods^(2,3). For weight loss, it is recommended that people follow a plan that is flexible and sustainable, that encourages no more than 2 pounds of weight-loss per week⁽⁴⁾. Unfortunately, most Canadians are not consuming the types or quantities of foods recommended by Health Canada⁽⁵⁾, but many are looking to fad diets to help them lose weight^(6,7).

The term “fad” diet is a broad term, generally used to describe a dieting trend that promises quick and easy weight-loss^(4,8), however, the term has not been officially defined. Fad diets can be restrictive and are not generally sustainable, as they tend to focus on weight-loss in the short-term rather than the long-term^(4,8). Examples of fad diets may include cleanses, detoxes, liquid diets, or weight-loss pills. Fad diets are not recommended by Dietitians of Canada, as there is little evidence that they are effective methods for weight-loss, and they may be associated with health risks^(4,8).

For example, diets such as cleanses, detoxes, and liquid diets have little quality evidence supporting their use for long-term weight loss⁽⁹⁻¹¹⁾. Due to the low caloric intake typically associated with these diets, they may be challenging to maintain and unrealistic for long-term adherence⁽¹²⁾. Additionally, there are concerns of malnutrition, as well as other side effects such as gastrointestinal problems, increased stress, and reduced energy levels⁽¹⁰⁻¹³⁾. Other unhealthy and extreme methods for weight-loss have been reported among young people, including the use of diet pills, laxatives, and vomiting⁽¹⁴⁾.

Due to the advertisement of fad diets as quick and easy ways to lose weight, with an emphasis on improving physical appearance^(15,16), fad dieting may also have a negative impact on mental health. Appearance-motivated dieting has been associated with higher body dissatisfaction and lower self-esteem than dieting that is health-motivated dieting⁽¹⁷⁾. As diets that do not follow traditional nutrition guidelines are generally challenging to maintain, dieters may blame

themselves for failure to lose weight rather than attributing it to the diet itself^(18,19). Additionally, extreme weight-loss behaviours and appearance-motivated dieting are closely linked to symptoms of disordered eating^(17,19,20).

Despite these concerns, fad diets continue to be popular methods for weight-loss. This, in part, may be due to influence by the commercial diet industry. Advertisements (ads) for weight-loss products are abundant on platforms such as television and magazines, and their presence has become more common with the availability of the internet and social media⁽²¹⁾. Ads for weight-loss products are often times deceptive, making false or exaggerated claims about a product's rapid, long-term, or easy weight-loss^(22,23), and often times target women and adolescents⁽²⁴⁻²⁸⁾. This deceptive advertising may give consumers false expectations regarding the safety and effectiveness of diet products.

There is some existing literature on perceptions of fad diet safety and effectiveness. One study found that most people had concerns regarding the safety and effectiveness of weight-loss drugs⁽²⁹⁾. Opinions were based on personal experience, information from media sources, or information from other influential people. Two additional studies examined men and women's perceptions of safety and effectiveness, focusing on a maladaptive weight-control methods including fasting, skipping meals, eliminating carbohydrates or fats, supplements, laxatives, and vomiting. The studies suggest that those who use unhealthy weight-loss methods or have eating disorders are more likely than their counterparts to believe that unhealthy weight-loss methods as both safe and effective^(30,31). Interestingly, while one of the studies found that many women recognized that the examined weight-loss methods were unsafe, many still made the decision to use them⁽³⁰⁾.

Another study specifically examining dietary supplements found similar results, in that users of the supplements perceived them as more safe and effective for weight-loss than did non-users⁽³²⁾. Younger people were also more likely than older people to believe in the safety and effectiveness of these products. In contrast, a more recent study reported no difference in efficacy beliefs regarding dietary supplements among users and non-users⁽³³⁾. However, this study focused mainly on student athletes, who may have different beliefs than the general population. Still, the study found that nearly half of the sample felt that dietary supplements were effective for fat loss.

Despite the research on perceptions of fad diet risk and effectiveness, there is little evidence on how exposure to fad diet advertising is related to these perceptions. Additionally, while previous research suggests that there is a relationship between exposure to fad diet ads and fad diet use⁽³⁴⁾, the reason for this relationship remains unclear. For these reasons, the current study seeks to determine the role that perceptions of risk and effectiveness play in the relationship between fad diet ad exposure and diet use. Further, the current study examines how young Canadian's perceive different types of fad diets in terms of risk and effectiveness.

METHODS

Protocol

The Canada Food Study (CFS) is a national cohort study conducted annually to monitor eating patterns and trends among youth and young adults in Canada over time. Wave 1 of the CFS was conducted from October-December 2016 with 3000 respondents. Wave 2 was conducted from October-December 2017 with 932 respondents. The current study examined cross-sectional data from Wave 2 of the CFS only, as the measures of interest were not originally examined in Wave 1.

Data for the current study were collected via online self-report surveys on dietary patterns. Respondents were given the option to complete the surveys in English or French. Respondents were compensated for their participation with a \$20 Interac e-transfer or e-giftcard.

Participants and Recruitment into Wave 2

Respondents for Wave 2 of the CFS were recruited from the Wave 1 sample. Respondents for Wave 1 were recruited in person at select sites in five Canadian cities, including Vancouver, Edmonton, Toronto, Montreal, and Halifax. Systematic sampling and a standard intercept technique were involved in recruitment, where all individuals who passed by a particular landmark were invited to participate by a trained research assistant⁽³⁵⁾. Respondents were screened during recruitment to determine study eligibility. Eligibility criteria included living in

one of the five recruitment cities, being 16-30 years of age during the time of recruitment, having internet access and a laptop, desktop computer or tablet, and not having been previously enrolled in the study panel. Eligible respondents were sent an email with a link to the primary survey on dietary patterns, and were later presented with a brief follow-up survey to confirm compensation preferences and contact information to be used for Wave 2 invitations. Respondents were discouraged from accessing the surveys via smartphone, but were not restricted from doing so. A full description of Wave 1 research methods can be found in the Canada Food Study Technical Report – Wave 1 (2016)⁽³⁶⁾.

A total of 2,992 respondents from Wave 1 were sent an email invitation to participate in Wave 2 of the CFS, and 1,115 respondents accessed the survey. Respondents who were 16-32 years of age were considered eligible for Wave 2. A total of 183 respondents were disqualified for being of an ineligible age, due to missing data, or for accessing the survey via smartphone.

Respondents who accessed the survey via smartphone were disqualified, as the small size of the screen may have affected the way that people interacted with the survey. Eligible respondents were provided with study information and asked to give consent for participation. A total of 932 Wave 2 respondents were retained for analysis, for a retention rate of 83.59%.

Measures

Sociodemographic information was collected from all respondents, including age, sex, BMI (calculated using reported height and weight values) and self-report mental health status. Health literacy status was also determined using the Newest Vital Sign⁽³⁷⁾, where respondents were asked 6 health literacy questions and a score was calculated based on the number of correct responses. A score of: 0-1 suggests high likelihood (50% or more) of limited literacy; 2-3 indicates the possibility of limited literacy; and 4-6 almost always indicates adequate literacy.

A measure for body image prompted respondents with “Right now I feel . . .” with 9 response options from “Extremely satisfied with my body size and shape” to “Extremely dissatisfied with my body size and shape”. Disordered eating was measured using three survey items asking respondents to report the frequency of the following: “Went on eating binges”, “Vomited to

control weight”, and “Preoccupied with desire to be thinner”. Responses were scored, with higher scores indicating more symptoms of eating disorders.

For all measures, participants were given the option to respond with “Don’t know” or “Refuse to answer”. Measures with lists were presented to participants in a randomized order. A detailed description of all measures can be found in the Canada Food Study: User Guide and Codebook – Wave 2 (2017)⁽³⁸⁾.

Weight behaviour

Respondents were asked to respond to the prompt “During the past 12 months have you tried to... (Select all that apply)” with response options “Lose weight”, “Gain weight”, “Stay the same weight”, and “I have not tried to do anything about my weight”⁽³⁹⁾. Respondents who indicated trying to lose weight and/or stay the same weight were then asked “How did you try to lose weight or ‘stay the same weight’ in the past 12 months? (Select all that apply)” with the response options: “Skipped meals or fasted”, “Ate less food (amount)”, “Ate less fat”, “Ate less candy, sugar or sweets”, “Ate fewer carbohydrates”, “Ate more fruits, vegetables or salads”, “Switched to foods with lower calories”, “Followed a special diet or weight loss program (e.g., Atkins, Weight Watchers)”, “Used a liquid diet formula, such as Slimfast or Optifast”, “Did a cleanse or detox diet”, “Exercised”, “Drank a lot of water”, “Got help from a health professional”, “Took diet pills prescribed by a doctor”, “Took other pills, medicines, herbs, or supplements not needing a prescription”, “Took laxatives or vomited”, “Started to smoke or began to smoke again”, and “Other”, “None of the above”⁽³⁹⁾. While the question did not ask specifically about fad diets, and response options were not limited to weight-loss methods that were considered fad diets, a final analytic decision was made in terms of which weight-loss methods were considered to be fad diets.

Accordingly, a *Fad Diet* variable was derived from each measure. Important to note is that because the definition of fad diet is broad and not universally recognized, some diets that are considered in some domains to be fads may not be risky or ineffective. Thus, the current study focuses on only a subset of fad diets that are generally known to be ineffective or unhealthy methods for weight-loss. Respondents were coded as either 0=No fad diet, or 1=One or more of

the following: “Skipped meals or fasted”, “Used a liquid diet formula, such as Slimfast or Optifast”, “Did a cleanse or detox diet”, “Took other pills, medicines, herbs, or supplements not needing a prescription”, “Took laxatives or vomited”, and “Started to smoke or began to smoke again”.

Response to diet ad

For each of the fad diets that respondents reported exposure to, they were asked “For each of the following, how did you respond to the advertisement or promotion?” with response options “I wasn’t interested / ignored the ad”, “I was interested but I didn’t do anything”, “I tried to get more information or clicked an online link”, “I signed up or purchased the diet or weight loss method”, and “I started following the diet or weight loss method”. The variable was treated as a continuous variable from “*least active*” to “*most active*”.

Perceived Diet Health Risks

All respondents were asked “Do the following diets and weight loss programs have any health risks?” and were instructed to respond with “1 – Not at all risky”, “2 – A little risky”, “3 – Somewhat risky”, “4 – Very risky”, and “5 – Extremely risky” for each of the six fad diets. Responses were dichotomized for analysis: responses of 1, 2, “Don’t know”, and “Refuse to answer” were coded as 0=Not risky, and responses of 3-5 were coded as 1=Risky.

Perceived Diet Effectiveness

All respondents were asked “Are the following diets and weight loss programs effective at helping people lose weight?” and were instructed to respond with “1 – Not at all effective”, “2 – A little effective”, “3 – Somewhat effective”, “4 – Very effective”, and “5 – Extremely effective” for each of the six fad diets. Responses were dichotomized for analysis: responses of 1, 2, “Don’t know”, and “Refuse to answer” were coded as 0=Not effective, and responses of 3-5 were coded as 1=Effective.

Analysis

Descriptive statistics are reported for all sociodemographic variables. Frequencies of *Perceived Risk* and *Perceived Effectiveness* are also reported.

Baron and Kenny's approach to mediation⁽⁴⁰⁾ was used in order to examine whether or not *Perceived Risk* and *Perceived Effectiveness* mediate the previously established relationship between *Ad Exposure* and *Fad Diet use*⁽³⁴⁾. Baron and Kenny's method includes 3 steps: 1) show that there is a relationship between the predictor variable and the outcome (Path A); 2) show that there is a relationship between the predictor variable and the mediator variables (Path B); and 3) show that there is a relationship between the mediator variables and the outcome variable, while adjusting for the predictor variable (Path C). First, step 1 was satisfied in Paper 1, where analyses were used to determine whether there was a relationship between *Ad Exposure* (predictor variable) and *Fad Diet Use* (outcome variable), which is path A (see Figure 1 for a conceptual model).

Second, two bivariate correlations were conducted to examine the association between *Ad Exposure* and *Perceived Risk* (Path 1B), and the association between *Ad Exposure* and *Perceived Effectiveness* (Path 2B).

Third, the bivariate correlations were adjusted for *Diet Type* and all sociodemographic variables in two logistic regression models, to determine whether or not the relationships between *Ad Exposure* and *Perceived Risk* (Path 1B), and *Ad Exposure* and *Perceived Effectiveness* (Path 2B) remained after adjusting for additional variables. In a separate step, a 2-way interaction was tested in each model: *Ad Exposure* by *Diet Type*.

Fourth, a logistic regression was fitted to model *Fad Diet Use*, in order to determine whether or not *Perceived Risk* and *Fad Diet Use* (Path 1C), and *Perceived Effectiveness* and *Fad Diet Use* (Path 2C) were associated, while adjusting for *Ad Exposure*. 2-way interactions were not addressed in the *Fad Diet Use* model, as the model could not converge due to Hessian Matrix singularity.

Independent from the mediation analysis, a linear regression was used to model *Response to Ad*, adjusted for *Perceived Risk*, *Perceived Effectiveness*, and *Celebrity Promotion Status*. In a separate step, three 2-way interaction terms were tested: *Diet Type* by *Perceived Risk*, *Diet Type* by *Perceived Effectiveness*, *Perceived Risk* by *Perceived Effectiveness*, *Celebrity Promotion*

Status by Diet Type, Celebrity Promotion Status by Perceived Risk, and Celebrity Promotion Status by Perceived Effectiveness.

All models were adjusted for *Sex, Age, BMI, Mental Health Status, Health Literacy Status, Body Image, EAT-3, and Diet Type*. All models used a ‘repeated-measures’ analysis using the Generalised Estimating Equations framework in SPSS to address correlated responses at the individual level, where responses for each diet type were treated as “observations”⁽⁴¹⁾. All estimates were weighted unless otherwise stated. Post-stratification sample weights were constructed based on population estimates for 2017 from the 2011 Census. All statistical analyses were conducted using IBM SPSS Statistics 24.

RESULTS

Sample Characteristics

Demographic characteristics of the 932 respondents retained for analysis are presented in Table 1. Respondents were between the ages of 16-32 (M=24.27, SD=4.24), and the majority were female, full time students, were of normal weight, and had adequate health literacy.

Path 1B: Perceived Diet Health Risks

The proportion of respondents who reported their perception of health risk for each fad diet type are presented in Table 2. Over half of respondents reported that all of the diets were at least “Somewhat risky”, and over 90% reported that smoking and laxatives or vomiting were at least “Somewhat risky”. Still, over one third of respondents reported that cleanses and detoxes were “Not at all risky” or “A little risky”, and one quarter reported the same for liquid diets.

Perceptions of risk differed by *Diet Type* ($\chi^2=308.2$; $p<0.001$), with significant differences present among all pairwise comparisons. Smoking and laxatives or vomiting were perceived as riskier than the other diet types, while cleanses or detoxes were perceived as less risky than the other diets.

Ad Exposure and *Perceived Risk* (Path 1B) were significantly associated in an unadjusted bivariate test ($\chi^2=12.5$; $p<0.001$) suggesting that those who are exposed to fad diet ads are less likely to perceive them as risky (AOR=0.7, 95% CI=0.6, 0.8). Although the main effect of *Ad Exposure* was not significantly associated with *Perceived Risk* in the adjusted model, a 2-way interaction between *Diet Type* and *Ad Exposure* was significant ($\chi^2=16.7$, $p=0.005$): respondents were significantly less likely to perceive fad diets as risky if they were exposed to an ad for fasting or skipping meals, liquid diets, or cleanses or detoxes, compared to laxatives or vomiting, or smoking. Respondents were more likely to perceive fad diets as risky if they were exposed to an ad for fasting or skipping meals, or non-prescription pills, compared to liquid diets and cleanses or detoxes (see Appendix Figure 1).

Females were more likely than males to perceive fad diets as risky (81.2% vs 70.5%, AOR=2.0, 95% CI=1.6, 2.5, $p<0.001$). The odds of perceiving fad diets as risky also differed by *Health Literacy Status* ($\chi^2=20.3$; $p<0.001$): respondents with “adequate literacy” (78.8%) were more likely to perceive fad diets as risky than respondents with a “possibility of limited literacy” (71.6%, AOR=1.5, 95% CI=1.1, 2.1, $p=0.07$) and respondents with a “likelihood of limited literacy” (60.4%, AOR=2.5, 95% CI=1.6, 3.8, $p<0.001$). Additionally, respondents with a “possibility of limited literacy” were more likely than those with a “likelihood of limited literacy” to perceive fad diets as risky (AOR=1.6, 95% CI=1.0, 2.6, $p=0.04$). The odds of perceiving a fad diet as risky also differed by *Body Image* ($\chi^2=4.2$; $p=0.04$): respondents who reported lower satisfaction with their bodies were less likely to perceive fad diets as risky compared to respondents who reported higher body satisfaction (AOR=0.9, 95% CI=0.9, 1.0, $p=0.04$).

Age ($\chi^2=1.0$; $p=0.8$), *BMI* ($\chi^2=4.7$; $p=0.3$), *Mental Health Status* ($\chi^2=2.4$; $p=0.1$), *EAT-3 Score* ($\chi^2=4.9$; $p=0.2$), and *Ad Exposure* ($\chi^2=0.1$; $p=0.7$) were not significantly associated with *Perceived Risk*.

Path 2B: Perceived Diet Effectiveness

The proportion of respondents who reported their perception of effectiveness for each fad diet type are presented in Table 3. Respondents most commonly reported that each type of diet was

“Not at all effective”, with over half of respondents reporting that smoking and laxatives or vomiting were “Not at all effective”. However, at least 15% of respondents reported each diet as “Somewhat effective”, “Very effective”, or “Extremely effective”, and approximately 30% gave these responses for cleanses or detoxes.

Ad Exposure and *Perceived Effectiveness* (Path 2B) were significantly associated in an unadjusted bivariate test ($\chi^2=5.7$; $p=0.02$), suggesting that those who are exposed to fad diet ads are more likely to perceive them as effective (AOR=1.3, 95% CI=1.0, 1.6); however, *Ad Exposure* was not significant in the adjusted logistic regression model.

The odds of perceiving fad diets as effective differed by *Diet Type* ($\chi^2=91.4$; $p<0.001$): respondents were more likely to perceive skipping meals or fasting and cleanses or detoxes as effective compared to liquid diets (AOR=1.6, 95% CI=1.3, 2.1, $p<0.001$; AOR=2.0, 95% CI=1.6, 2.4, $p<0.001$), non-prescription diet pills (AOR=2.0, 95% CI=1.5, 2.6, $p<0.001$; AOR=2.4, 95% CI=1.9, 3.0, $p<0.001$), laxatives or vomiting (AOR=1.8, 95% CI=1.4, 2.1, $p<0.001$; AOR=2.1, 95% CI=1.6, 2.8, $p<0.001$), and smoking (AOR=2.0, 95% CI=1.6, 2.7, $p<0.001$; AOR=2.5, 95% CI=1.8, 3.3, $p<0.001$).

The odds also differed by *BMI* ($\chi^2=10.1$; $p=0.04$): respondents who were underweight (32.1%) were significantly more likely to perceive fad diets as effective compared to respondents who were normal weight (18.8%, AOR=2.1, 95% CI=1.3, 3.5, $p=0.003$) or overweight (21.4%, AOR=1.9, 95% CI=1.1, 3.4, $p=0.02$). The odds also differed by *EAT-3 Score* ($\chi^2=14.4$; $p=0.002$): respondents with an EAT-3 score of 0 (18.4%) were less likely than respondents with a score of 1 (21.9%, AOR=0.7, 95% CI=0.6, 1.0, $p=0.03$) or 2 (28.6%, AOR=0.5, 95% CI=0.4, 0.8, $p=0.001$) to perceive fad diets as effective.

Sex ($\chi^2=1.5$; $p=0.2$), *Age* ($\chi^2=4.9$; $p=0.2$), *Mental Health Status* ($\chi^2=0.02$; $p=0.9$), *Health Literacy Status* ($\chi^2=2.0$; $p=0.4$), *Body Image* ($\chi^2=0.2$; $p=0.6$), and *Ad Exposure* ($\chi^2=2.1$; $p=0.2$) were not significantly associated with *Perceived Effectiveness*. No tested 2-way interactions were statistically significant.

Path 1C and Path 2C: Fad Diet Use

A logistic regression model was conducted to examine whether the relationship between *Ad Exposure* and *Fad Diet Use*⁽³²⁾ is mediated by *Perceived Risk* and *Perceived Effectiveness*. *Perceived Risk* (Path 1C; $\chi^2=18.0$; $p<0.001$) and *Perceived Effectiveness* (Path 2C; $\chi^2=70.2$; $p<0.001$) were both significant in the model. Respondents who perceived fad diets as riskier were less likely to use fad diets than respondents who perceived fad diets as less risky (AOR=0.4, 95% CI=0.3, 0.6). Respondents who perceived fad diets as effective were more likely to use fad diets than those who did not perceive fad diets as effective (AOR=4.4, 95% CI=3.1, 6.2). *Ad Exposure* was not significantly associated with *Fad Diet Use* ($\chi^2=2.6$; $p=0.1$).

Response to Diet Ad

A linear regression model was conducted to examine correlates of *Response to Ad* exposure. *Perceived Risk* ($\chi^2=29.3$; $p<0.001$) and *Perceived Effectiveness* ($\chi^2=31.3$; $p<0.001$) were significantly associated with *Response to Ad* exposure. Respondents who perceived fad diets as risky were less likely to report “*active*” responses ($\beta=-0.1$, 95% CI=-0.3, -0.03, $p=0.02$). Respondents who perceived fad diets as effective were more likely to respond “*actively*” to fad diet ads ($\beta=1.0$, 95% CI=0.6, 1.5, $p<0.001$). A 2-way interaction between *Perceived Effectiveness* and *Diet Type* was significant ($\chi^2=11.8$, $p=0.04$): respondents who perceived fad diets as effective were significantly more likely to respond “*actively*” to ads for fasting and skipping meals compared to liquid diets ($\beta=0.9$, 95% CI=0.5, 1.3, $p<0.001$), cleanses or detoxes ($\beta=0.4$, 95% CI=0.03, 0.8, $p=0.04$), and non-prescription diet pills ($\beta=0.6$, 95% CI=0.2, 1.0, $p=0.004$). Respondents were significantly less likely to respond “*actively*” to an ad they perceive as effective for liquid diets compared to cleanses or detoxes ($\beta=-0.5$, 95% CI=-0.7, -0.3, $p<0.001$), non-prescription diet pills ($\beta=-0.4$, 95% CI=-0.7, -0.1, $p=0.02$), laxatives or vomiting ($\beta=-1.0$, 95% CI=-1.9, -0.2, $p=0.02$), and smoking ($\beta=-1.0$, 95% CI=-1.9, -0.1, $p=0.03$) (see Appendix Figure 2). Lastly, a 2-way interaction between *Perceived Risk* and *Perceived Effectiveness* was significant ($\chi^2=11.4$, $p=0.001$): respondents who perceived diets as both effective and not risky were significantly more likely to respond “*actively*” to ads (see Appendix Figure 3). No other tested 2-way interactions were statistically significant.

DISCUSSION

The current study has three primary findings. First, over half of respondents perceived fad diets as at least somewhat risky. Respondents were most likely to perceive smoking as the riskiest diet type, with the vast majority of respondents agreeing that it is “Very” risky or “Extremely” risky. Given public health efforts to prevent smoking behaviour and the widely understood harms of smoking, it is unsurprising that respondents viewed smoking as the riskiest weight-loss method. Three fourths of respondents reported that the use of non-prescription diet pills was at least “Somewhat” risky. This finding is consistent with previous research suggesting that most people have concerns regarding the safety of weight-loss drugs⁽²⁹⁾. Of concern is that approximately 12% of respondents perceived non-prescription diet pills as “Not at all risky” or indicated that they did not know if they were risky. This is problematic given that the unsupervised use of dieting pills has been associated with cardiovascular conditions and other serious risks⁽⁴²⁾, and demonstrates a need for awareness around risky dieting methods. Cleanses and detoxes were viewed as the least risky, which may have to do with their current popularity. Additionally, there are a wide range of cleanses and detoxes available, and while they may not be necessary or effective in promoting good health and long-term weight loss⁽⁹⁻¹¹⁾, they may not be particularly harmful.

Interestingly, respondents perceptions of risk for each diet type differed by ad exposure. That is, respondents who reported exposure to an ad for liquid diets, cleanses, and pills were more likely than those who did not report exposure to perceive diets as risky, while the inverse was true for fasting or skipping meals, laxatives or vomiting, and smoking. Fasting or skipping meals, laxatives or vomiting, and smoking appear overall to be perceived as riskier than the other diet types, which may be because they are generally considered taboo and are not commonly advertised. Perhaps the advertisement of these kinds of extreme weight-loss methods helps to normalise the diet, thus making them seem less risky. As liquid diets, cleanses or detoxes, and non-prescription diet pills are already normalised as weight-loss methods and are considered less risky than the other diet types, increased ad exposure may lead respondents to become more informed about the effects of the diet and thus realise the potential risks.

Females were more likely than males to view the diets as risky, which is in line with previous research that females have a tendency to be more risk averse⁽⁴³⁾. Those with higher health literacy and body satisfaction were also more likely than their counterparts to perceive the diets as risky. Those with higher health literacy are likely more educated about dieting methods and their risks. People with low body satisfaction may be more desperate for a fad diet to work, and thus more likely to consider using harmful diets despite the risks associated with them. One unexpected finding is that symptoms of disordered eating were not related to perceptions of fad diet risk, as has been found in previous research^(30,31).

Secondly, while most people perceived fad diets as ineffective, a considerable number of people reported that each fad diet was at least “Somewhat” effective. For example, approximately 15% of respondents reported that non-prescription diet pills, smoking, and laxatives or vomiting were at least “Somewhat effective”. Skipping meals or fasting and cleanses or detoxes were viewed as the most effective diets, with approximately 25% and 30% of respondents reporting them at least “Somewhat effective”, respectively. Given the lack of evidence for these types of diets, these findings are surprising. It is possible that these findings are due to misinformation that is circulating regarding diet trends, leading them to be perceived as more effective than they actually are. Respondents who did perceive fad diets as effective were more likely to be underweight and report more eating disorder symptoms. Previous research has also found that those who have eating disorders or symptoms of disordered eating are more likely than those who do not to believe that maladaptive weight-loss techniques are effective^(30,31).

Respondents who perceived fad diets as effective were always more likely than those who perceived fad diets as not effective to take action (e.g. sign up or purchase the diet) in response to an ad, but the effect was more likely for fasting or skipping meals and less likely for liquid diets compared to other diets. This finding may relate to the ease of preparation in beginning to fast or skip meals compared that of liquid diets, cleanses or detoxes, or non-prescription diet pills, which all have to be purchased. It appears that respondents perceive liquid diets as the least effective diet for weight-loss overall, which explains why they would be less interested in responding to an ad for a liquid diet compared to the other diet types.

The third primary finding is that the relationship between fad diet ad exposure and fad diet use⁽³⁴⁾ may be partially mediated by perceptions of risk and effectiveness. Mediation was determined

using Baron and Kenny's approach⁽⁴⁰⁾. First, bivariate correlations found that fad diet ad exposure was associated with both perceptions of risk and effectiveness. Second, a relationship was found between fad diet use and perceptions of risk and effectiveness. Lastly, a previous analysis demonstrated a relationship between fad diet ad exposure and fad diet use⁽³⁴⁾. The same data were used in the current analysis, however, after adjusting for perceived risk and perceived effectiveness, the relationship between fad diet ad exposure and fad diet use was no longer significant. Together, these three preliminary findings may suggest a mediation effect of perceptions of risk and effectiveness in the relationship between fad diet ad exposure and fad diet use. This analysis is consistent with the finding that lower perceived risk and higher perceived effectiveness increased the likelihood that a respondent would use a fad diet, and take action in response to a fad diet ad.

However, the current study was correlational in nature and therefore does not provide insight into the causality or directionality of the relationship between fad diet use and perceptions of risk and effectiveness. Therefore, as an alternative explanation, fad diet use may lead people to report fad diets as more effective and less risky, perhaps to help justify their behaviour. Regardless of the interpretation, the findings are consistent with previous research suggesting that people who use dietary supplements and other maladaptive weight-loss techniques perceive the behaviours as safer and more effective^(30,31,32).

Limitations and Future Research

The current study has several limitations common to survey methodology. First, the data are subject to recall bias. For example, respondents may misreport information due to the personal nature of the survey items, or alternatively, due to memory effects. To reduce the chance of misreporting or memory bias, respondents had the option of selecting "Don't know" or "Refuse to answer" for each survey item, and were asked to report dieting behaviour and exposure within a set time frame of 12 months. Another limitation is respondent fatigue, as respondents were asked to answer many similar questions consecutively.

Additionally, respondents were recruited from 5 major Canadian cities and probability-based sampling methods were not used; therefore, the current sample is not nationally representative.

In comparison to national estimates, the current respondents in the current study are more likely to report food insecurity and to be students, while weight status is likely to be similar to national estimates⁽³⁵⁾.

Lastly, the relationship between fad diet ad exposure and perceptions of effectiveness (step 2 of Kenny's mediation process) was only significant in the unadjusted bivariate test. Future research could extend the preliminary tests of mediation reported in the current paper using more explicit mediational tests, such as structural equation modelling or the application of bootstrap methods⁽⁴⁴⁾.

CONCLUSION

Overall, the study suggests that the relationship between fad diet ad exposure and fad diet use may be partially mediated by perception of risk and effectiveness. However, not all fad diets are equal, and thus the pattern may differ across diet types, which should be explored in future research. If perceptions of risk and effectiveness do in fact promote use of fad diets, it may be important to address the deceptive and persuasive nature of dieting ads and whether the current regulations surrounding advertising are sufficient to allow young people to make informed dieting decisions. Currently, Advertising Standards Canada prohibits the use of false or misleading advertising claims⁽⁴⁵⁾. Despite this regulation, deceptive weight-loss advertising persists^(22,23). Thus, advertisers should be held more strictly accountable for misrepresenting their products. Additionally, as television and internet users are often times exposed to ads from outside of Canada, it may be equally important for other countries to amend their regulations surrounding fad diet and weight-loss advertising.

TABLES AND FIGURES

Table 1. Sample characteristics

Characteristic	Unweighted % (n)	Weighted % (n)
Total	932	929
Sex		
Female	70.3 (655)	49.6 (461)
Male	29.7 (277)	50.4 (468)
Age		
16-18	12.4 (116)	10.9 (102)
19-21	32.7 (305)	18.9 (175)
22-25	30.7 (286)	28.3 (263)
26-32	24.1 (225)	41.9 (389)
BMI		
Underweight	6.2 (58)	6.1 (57)
Normal weight	62.4 (582)	62.1 (576)
Overweight	16.2 (151)	17.6 (164)
Obese	7.5 (70)	7.3 (68)
Missing	7.6 (71)	6.9 (65)
Literacy		
High likelihood of limited literacy (score 0-1)	9.1 (85)	8.7 (81)
Possibility of limited literacy (2-3)	20.3 (189)	18.0 (167)
High likelihood of adequate literacy (4-6)	70.6 (658)	73.3 (681)

Self-rated mental health status

Mean	2.95	3.08
Standard Deviation	1.07	1.07

Body Image

Mean	4.08	3.92
Standard Deviation	2.27	2.21

EAT-3 Score

0	57.3 (534)	60.6 (562)
1	29.3 (273)	27.6 (256)
2	11.2 (104)	10.1 (93)
3	2.3 (21)	1.8 (17)

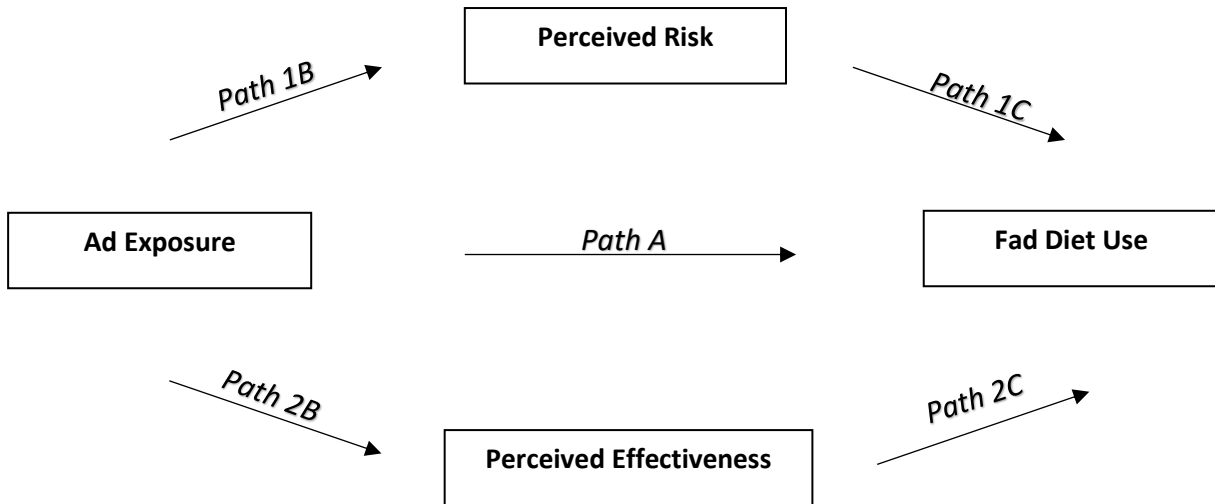
Table 2. Proportion of respondents who reported each level of perceived diet health risks, n=929

Diet type % (n)	Not at all risky	A little risky	Somewhat risky	Very Risky	Extremely risky	Don't know
Skip meals/fast	4.4 (40)	10.8 (100)	27.4 (254)	25.9 (241)	27.9 (259)	3.6 (34)
Liquid diet	5.5 (51)	20.8 (193)	32.0 (297)	16.8 (156)	11.5 (107)	13.5 (125)
Cleanse or detox	12.5 (116)	24.2 (225)	33.1 (307)	11.4 (106)	8.6 (80)	10.3 (95)
Diet pills	2.7 (25)	13.4 (125)	29.7 (276)	23.8 (221)	21.2 (197)	9.1 (85)
Laxatives/vomiting	1.4 (13)	2.1 (19)	8.8 (82)	23.1 (215)	59.6 (553)	5.1 (47)
Smoking	1.2 (11)	0.9 (9)	7.0 (65)	16.2 (150)	71.3 (662)	3.3 (31)

Table 3. Proportion of respondents who reported each level of perceived diet effectiveness, n=929

Diet type % (n)	Not at all effective	A little effective	Somewhat effective	Very effective	Extremely effective	Don't know
Skip meals/fast	45.3 (421)	19.9 (185)	16.7 (155)	6.2 (58)	3.6 (34)	8.3 (77)
Liquid diet	36.2 (336)	22.4 (208)	16.1 (149)	1.7 (16)	1.0 (9)	22.7 (210)
Cleanse or detox	28.7 (267)	22.9 (213)	21.3 (197)	7.4 (69)	2.5 (23)	17.2 (160)
Diet pills	42.3 (393)	21.7 (201)	13.0 (121)	2.8 (26)	0.4 (3)	19.9 (185)
Laxatives/vomiting	56.2 (522)	10.7 (99)	10.6 (99)	2.8 (26)	3.6 (34)	16.1 (149)
Smoking	56.3 (523)	10.5 (98)	10.0 (93)	4.0 (37)	1.0 (9)	18.2 (169)

Figure 1. Conceptual model of the hypothesised relationship between *Ad Exposure* and *Fad Diet Use* with *Perceived Risk* and *Perceived Effectiveness* as mediators



DISCUSSION

Exposure to Fad Diet Ads

Overall, more than half of respondents reported being exposed to an ad for a fad diet. The two most common sources were the internet and social media. Given the amount of diet advertising in the media, and the growing use of social media platforms by young people, this finding is unsurprising. The internet has recently overtaken television as the largest platform for advertising¹⁵⁷, and a recent report released by GroupM predicts that 2018 will be the first year where time spent online will be greater than television exposure¹⁵⁸. Thus, the current finding that fad diet ads are most common on online sources mirrors recent industry trends.

The current research found strong support for hypothesis 1a, in that respondents were more likely to report exposure to liquid diets, cleanses and detoxes, and pills or supplements compared fasting, laxatives or vomiting and smoking. Cleanses and detoxes were the most commonly reported, while smoking and laxatives or vomiting were least commonly reported. This finding is in line with the recent interest in using cleanses and detoxes for weight-loss, which has re-emerged as a dieting trend¹⁵⁹. Additionally, as many cleanses and detoxes, liquid diets, and diet pills are sold commercially^{40,41,100,101}, it is expected that consumers would report exposure to promotions for these diets more so than for non-commercial diets such as fasting, smoking, and laxatives or vomiting. The advertisement of tobacco in Canada has been banned on media sources including television, radio, print, and outdoor advertising such as billboards¹⁰². While not technically banned from the internet, tobacco advertising is strictly regulated on online sources. Thus, exposure to weight-loss ads for smoking is unlikely. It is also unlikely that

people would be exposed to ads for weight-loss products that cannot be sold, such as fasting or vomiting. If these behaviours were promoted, there would likely be backlash due to the extreme nature of such behaviours for weight-loss and their associations with disordered eating. While respondents are reporting exposure to fewer non-commercial compared to commercial weight-loss methods, there are still some respondents who reported exposure to fasting or skipping meals, smoking, and laxatives or vomiting. This unexpected exposure to extreme and non-commercial weight-loss methods may be due to the increase in social media use, which is challenging to monitor, as any users can share or promote information to the people whom they are connected to online.

Females were more likely than males to report exposure to fad diet advertisements, providing partial support for hypothesis 1b. This is expected due to the tendency for the weight-loss industry to target females^{121,123,124}, as well as a greater preoccupation with dieting among females compared to males⁹⁴. Exposure was not associated with body image. While it may be speculated that those who are unsatisfied with their bodies may seek out weight-loss methods and thus increase their exposure, this finding suggests that body satisfaction does not affect exposure to dieting ads.

Responses to Diet Ads

Among all diet types, the most common response to an ad was to ignore the ad. Among the least common responses were signing up or purchasing the diet, or following the diet. This suggests that while most respondents are exposed to fad diet ads, the majority report not being

influenced by advertising to change their purchasing or dieting behaviours, or if they are, they are not consciously aware of it. Still, nearly one quarter of respondents reported trying to get more information, signing up or purchasing a diet, or starting to follow a diet for smoking and skipping meals or fasting, and a smaller proportion of people reported the same for the other diet types, indicating that a subset of people do report conscious engagement with fad diet ads.

Only partial support was found for Hypothesis 2a; respondents were more likely to report more “*active*” responses for fasting and skipping meals compared to some of the other diets, including liquid diets, cleanses or detoxes, non-prescription diet pill, and laxatives or vomiting, but not for smoking. Respondents may respond “*actively*” to ads for skipping meals or fasting compared to ads for other types of diets because fasting generally involves little preparation and is easy to start immediately. Despite the fact that fasting and skipping meals does not usually involve purchases, almost 2% reported that they “signed up or purchased the diet”. It may be the case that respondents were exposed to an ad for a commercial diet plan that included fasting or skipping meals as a part of the program, explaining why respondents would report signing up or purchasing the diet.

Those who were most likely to respond “*actively*” to a diet ad were respondents who were less satisfied with their bodies, reported more symptoms of eating disorders, and those who perceived fad diets as less risky and more effective. These results were expected, as those who are preoccupied with their weight with a more positive view and fewer inhibitions about dieting may be more likely to try a range of dieting behaviours. Respondents who perceived fad diets as effective were always more likely than those who perceived fad diets as not effective to take action in response to an ad, but the effect was more likely for fasting or skipping meals and less

likely for liquid diets compared to other diets. This finding may relate to the ease of preparation in beginning to fast or skip meals compared that of liquid diets, cleanses or detoxes, or non-prescription diet pills, which all have to be purchased. It appears that respondents perceive liquid diets as the least effective diet for weight-loss overall, which explains why they would be less interested in responding to an ad for a liquid diet compared to the other diet types.

Surprisingly, neither sex nor BMI were associated with response to diet ad, despite both being associated with ad exposure (and, as we will address later, diet use). It is plausible that these variables were associated with other variables in the model, such as body image or disordered eating, and that if they were examined in an unadjusted model, they would be significantly associated with people's response to ads.

Similarly, neither health literacy nor celebrity promotion were associated with response. It is possible that the health literacy measure used in the current study is not relevant to perceptions of diet advertising, as it was derived from questions regarding nutrition facts labels. This would explain why health literacy was not significant in the majority of the models, and is recognized as a limitation to the study. More surprising is that celebrity promotion did not impact people's response to ads: It was expected that respondents would respond more "*actively*" to an ad if it was promoted by a celebrity, as celebrities are often times used for their high status and influence, which is becoming increasingly popular in places such as social media^{142,143}. Perhaps the type of celebrity or their level of status is an important factor as to whether or not they will influence consumers to engage with an ad. Alternatively, respondents may be hesitant to admit that a celebrity influenced their dieting behaviour, or unaware that a celebrity's weight-loss recommendation was actually a paid promotion. Maybe the most likely

explanation is that celebrities associate themselves with more conventional diet types and less extreme ones (for example, Oprah Winfrey's association with Weight Watchers ¹¹⁸), and thus celebrity promotion only influences how people respond to ads for particular diet types, which is an area for future research.

Perceptions of Risk

Over half of respondents perceived fad diets as at least somewhat risky. Respondents were most likely to perceive smoking as the riskiest diet type, with the vast majority of respondents agreeing that it is "Very risky" or "Extremely risky", supporting hypothesis 3a. Given public health efforts to prevent smoking behaviour and the widely understood harms of smoking, it is unsurprising that respondents viewed smoking as the riskiest weight-loss method. Additionally, as expected, laxatives and vomiting were viewed as the second riskiest next to smoking. Three fourths of respondents reported that the use of non-prescription diet pills was at least "Somewhat risky". This finding is consistent with previous research suggesting that most people have concerns regarding the safety of weight-loss drugs ¹⁶⁰. Of concern is that approximately 12% of respondents perceived non-prescription diet pills as "Not at all risky" or indicated that they did not know if they were risky. This is problematic given that the unsupervised use of dieting pills has been associated with cardiovascular conditions and other serious risks ⁹⁸, and demonstrates a need for awareness around risky dieting methods. Cleanses and detoxes were viewed as the least risky, which may have to do with their current popularity. Additionally, there are a wide range of cleanses and detoxes available, and while they may not be necessary

or effective in promoting good health and long-term weight loss, some may not be particularly harmful, either ^{34,35,161}.

Females were more likely than males to view the diets as risky, which is in line with previous research that females have a tendency to be more risk-averse¹⁶², and lends partial support to hypothesis 3b. Those with lower health literacy were also less likely than their counterparts to perceive the diets as risky: those with higher health literacy are likely more educated about dieting methods and their risks.

People with high body satisfaction were also more likely to perceive fad diets as risky; people with low body satisfaction may be more desperate for a fad diet to work, and thus more likely to consider using harmful diets despite the risks associated with them. One unexpected finding is that symptoms of disordered eating were not related to perceptions of fad diet risk, as has been found in previous research ^{163,164}.

Ad exposure was associated with perceived risk in a bivariate correlation: those who were exposed to fad diet ads were less likely to perceive fad diets as risky. Although the main effect of ad exposure was not significantly associated with perceived risk in the adjusted model, a 2-way interaction between diet type and ad exposure was significant. Interestingly, the association between ad exposure and lower perceived risk only holds for three diet types: skipping meals or fasting, laxatives or vomiting, and smoking. The inverse relationship was found for the other diet types, including liquid diets, cleanses or detoxes, and non-prescription diet pills. Fasting or skipping meals, laxatives or vomiting, and smoking appear overall to be perceived as riskier than the other diet types, which may be because they are generally

considered taboo and are not commonly advertised. Perhaps the advertisement of these kinds of extreme weight-loss methods helps to normalise the diet, thus making them seem less risky. As liquid diets, cleanses or detoxes, and non-prescription diet pills are already normalised as weight-loss methods and are considered less risky than the other diet types, increased ad exposure may lead respondents to become more informed about the effects of the diet and realise potential risks. Further research is necessary in order to fully understand the relationship between exposure, diet type, and perceptions of risk.

Perceptions of Effectiveness

While most people perceived fad diets as generally ineffective, a considerable number of people reported that each fad diet was at least “Somewhat effective”. Given the lack of evidence for these types of diets, it is surprising that there were still many respondents who perceived the fad diets as effective for weight-loss. For example, approximately 15% of respondents reported that non-prescription diet pills, smoking, and laxatives or vomiting were at least “Somewhat effective”. Skipping meals or fasting and cleanses or detoxes were viewed as the most effective diets, with approximately 25% and 30% of respondents reporting them at least “Somewhat effective”, respectively. It is possible that these findings are due to misinformation that is circulating regarding diet trends, leading them to be perceived as more effective than they actually are. Partial support for hypothesis 4a was found in that laxatives or vomiting and smoking were viewed as less effective weight-loss methods than skipping meals or fasting and cleanses or detoxes. Respondents who do perceive fad diets as effective are

more likely to be underweight and report more eating disorder symptoms. Previous research has also found that those who have eating disorders or symptoms of disordered eating are more likely than those who do not to believe that maladaptive weight-loss techniques are effective ^{163,164}.

Diet Use

One fifth of respondents reported using one of the fad diets, the most common of which was skipping meals or fasting. Hypothesis 5a was generally not supported, as laxatives or vomiting and smoking were not less likely to be used than the other diet types (with exception of skipping meals or fasting). This is surprising, given that laxatives or vomiting and smoking were reportedly perceived as some of the riskiest and least effective diet types. The lack of consideration regarding risk and effectiveness found among those choosing to use an unconventional diet may indicate a desperate attempt to lose weight, thus resulting in disregard for rational thoughts of danger or success.

Respondents with a higher BMI and who reported more symptoms of an eating disorder were more likely to use a fad diet than their counterparts, which could be explained by the perception of needing to lose weight. These findings are consistent with previous research suggesting that both disordered eating symptoms and higher BMI are related to dieting behaviour ^{94,165}. One explanation is that people with a higher BMI are less satisfied with their bodies and thus more likely to engage in a weight-loss behaviour to try and change their bodies. However, it is possible that the relationship also goes in the other direction. In fact, dieting

behaviours may increase body dissatisfaction among young people ¹⁶⁶. Additionally, unhealthy weight-control behaviours such as fasting or use of diet pills have been shown to lead to an increase in BMI over time ¹⁶⁵. The same study found that the use of dieting and unhealthy weight-loss behaviours were most common among females, which is in line with the findings of the current study.

Surprisingly, despite the fact that females were more likely than males to report exposure to fad diet ads, they were no more likely to use a fad diet or perceive them as effective. This finding differs from previous research suggesting that females are more likely to diet than are men ⁹⁴. The current finding may be explained by the extreme or risky nature of the diet types considered; females were more likely to perceive the weight-loss methods as risky, which may prevent them from using them for weight-loss.

Perhaps the most interesting finding is that fad diet ad exposure was related to fad diet use: respondents who reported exposure to ads were more likely to use a fad diet, even after adjusting for body image, BMI, and other factors. This finding may be an indication of the strength of the weight-loss industry in successfully promoting risky and ineffective diet products to young people. This finding is consistent with existing research on the persuasiveness of advertising. For example, in the food and beverage industry, it has been repeatedly demonstrated that exposure to food advertising on television and online media is associated with changes in dietary intake among young people ¹⁶⁷. Thus, it is unsurprising that ads for dieting products would also be persuasive and influence behaviour. However, due to the cross-sectional nature of the data, causality or the direction of the association between exposure and use cannot be determined in the current study; it is possible that respondents

who use fad diets are more likely to recall exposure to diet ads, and future research is necessary in order to further understand the relationship between exposure and use.

The study also suggests that the relationship between fad diet ad exposure and fad diet use may be partially mediated by perceptions of risk and effectiveness. Mediation was determined using Baron and Kenny's approach ¹⁵⁶. First, bivariate correlations found that fad diet ad exposure was associated with both perceptions of risk and effectiveness. Second, a relationship was found between fad diet use and perceptions of risk and effectiveness. Lastly, a relationship between fad diet ad exposure and fad diet use was demonstrated, however, after adjusting for perceived risk and perceived effectiveness, the relationship was no longer significant. Together, these three preliminary findings may suggest a mediation effect of perceptions of risk and effectiveness in the relationship between fad diet ad exposure and fad diet use. This analysis is consistent with the finding that lower perceived risk and higher perceived effectiveness increased the likelihood that a respondent would use a fad diet, and take action in response to a fad diet ad.

However, the current study was correlational in nature and therefore does not provide insight into the causality or directionality of the relationship between fad diet use and perceptions of risk and effectiveness. Therefore, there may be an alternative interpretation of the results: rather than perceptions of effectiveness and minimal risk leading to the use of fad diets, it is equally plausible that fad diet use may lead people to report fad diets as more effective and less risky, perhaps to help justify their behaviour. Regardless of the interpretation, the findings are consistent with previous research suggesting that people who use dietary supplements and

other maladaptive weight-loss techniques perceive the behaviours as safer and more effective
163,164,168 .

Important to note is that exposure to fad diet ads was only significantly associated with fad diet use in the analyses from paper 1, and not paper 2. Given that the only difference between the two models was the presence of risk and effectiveness perceptions as predictors in paper 2, it is likely that the difference is due to the effect of risk and effectiveness perceptions as mediating variables.

Limitations and Future Research

The current study found a relationship between fad diet ad exposure and fad diet use, and preliminary evidence that perceptions of risk and effectiveness may mediate the relationship between the two. However, the relationship between fad diet ad exposure and perceived effectiveness (step 2 of Kenny's mediation process) was only significant in the unadjusted bivariate tests. Future research could extend the preliminary tests of mediation reported in the current paper using more explicit mediational tests, such as structural equation modelling or the application of bootstrap methods ¹⁶⁹.

The current study has also has several limitations common to survey methodology. Due to the nature of self-report surveys, and the personal nature of some of the survey items, the results of the study may be subject to response bias. Potential areas of bias include the misreporting of height or weight measurements or dieting behaviours due to embarrassment or shame that is sometimes associated with excess weight. Generally, those who fail to report height and weight

measurements have a more extreme BMI ^{170,171}. Other possible biases are the misreporting of dieting behaviours and ad exposure due to memory recall biases. This may be the case for some diet types more so than others. For example, respondents might have had a more difficult time remembering whether or not they have fasted or skipped a meal versus taken laxatives or smoked, as the latter two involve more effort including a purchase, and are more extreme weight-loss methods. Respondent fatigue is another possible area of bias, as multiple consecutive questions were asked regarding dieting behaviour and advertising. In order to reduce the chance of bias, respondents were only asked follow-up questions for six fad diets, as opposed to answering follow-up questions for each weight-loss method.

In addition, the respondents were not recruited using probability-based sampling methods and were recruited from 5 select Canadian cities. Therefore, estimates reported in the current paper are not representative of the entire Canadian population. Compared to national estimates, the current sample is more likely to be comprised of students and people reporting food insecurity ¹⁵¹. Levels of overweight and obesity, and use of tobacco and cannabis are similar to national estimates. Results may have differed if non-urban areas were sampled. For example, respondents may have reported less overall exposure to fad diet ads, and, if so, may also have reported less fad diet use.

Lastly, the number of fad diets considered in this study is limited to a select few that are generally shown to be ineffective and risky: fasting or skipping meals, liquid diets, cleanses or detoxes, non-prescription diet pills, laxatives or vomiting, and smoking. This represents a limitation to the study as it may impact overall levels of fad diet ad exposure reported. If a broader range of diets were considered, it is likely that the number of people exposed to fad

dieting in the media would be greater than what is currently reported. Another issue is that some of the chosen fad diets may be considered broad categories, encompassing different types of diets ranging from extremely to moderately unhealthy, or not risky at all. Cleanses and detoxes, for instance, are usually defined as weight-loss products that aim to remove bodily toxins³⁵. In this case, a cleanse or detox may be an unhealthy powder, supplement, or laxative, but it could also refer to a whole foods diet, provided that the diet is claiming to “cleanse” the body. This leads to an additional limitation with the chosen diet types, which is that some of the diet types overlap, including cleanses and laxatives.

Further research is needed in order to fully understand the relationship between diet ad exposure and diet use. The current study design was cross-sectional and therefore the direction of the relationship between fad diet ad exposure and fad diet use cannot be determined. Thus, it would be valuable for future research to examine these variables using a longitudinal study design to better understand whether the relationship is casual, and if so, in which direction. Additionally, it would be useful to examine the specific characteristics of fad diet ads that make them influential to young people. For example, it may be the case that particular advertising qualities such as celebrity promotion, ad source, or presence of deceptive claims make them more attractive options for weight-loss among young people.

The current study examined the use of individual fad diets, as well as the whether or not respondents reported using multiple types of fad diets. However, the study did not examine which particular fad diets are generally used in combination with one another. Thus, a direction for future research is to examine which types of fad diets are most likely to be used together,

and whether or not fad diet ad exposure has an impact on the number of fad diets that people are using.

Finally, as fad diets are often times risky and ineffective weight-loss methods³⁰, future research could also examine the impact of consumer perceptions of risk and effectiveness on diet use, and whether or not those perceptions are influenced by exposure to diet ads. More specifically, if perceptions of fad diet risk and effectiveness are in fact related to fad diet use and fad diet ad exposure, it would be interesting to determine whether the relationships differ across diet types.

CONCLUSION

Overall, the study suggests that there is a relationship between fad diet ad exposure and fad diet use, and that this relationship may be mediated by perception of risk and effectiveness. However, not all fad diets are equal, and thus the pattern may differ across diet types, which should be explored in future research. If perceptions of risk and effectiveness do in fact promote use of fad diets, it may be important to address the deceptive and persuasive nature of dieting ads and whether the current regulations surrounding advertising are sufficient to allow young people to make informed dieting decisions. Currently, Advertising Standards Canada prohibits the use of false or misleading advertising claims¹⁷². Despite this regulation, deceptive weight-loss advertising persists^{89,173}. Thus, advertisers should be held more strictly accountable for misrepresenting their products. Additionally, as television and internet users are often times exposed to ads from outside of Canada, it may be equally important for other countries to amend their regulations surrounding fad diet and weight-loss advertising. However, the study also suggests that perceptions and behaviours related to diets differ by diet type, and that some weight-loss approaches, such as laxatives or vomiting or smoking may be fundamentally different than others. Future research could examine the specific characteristics of fad diet ads for different diet types that make them influential to young people in order to reduce the negative impact of diet advertising.

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APPENDIX

Figure 1. 2-way interaction between Ad Exposure and Diet Type for Perceived Risk logistic regression model, n=929

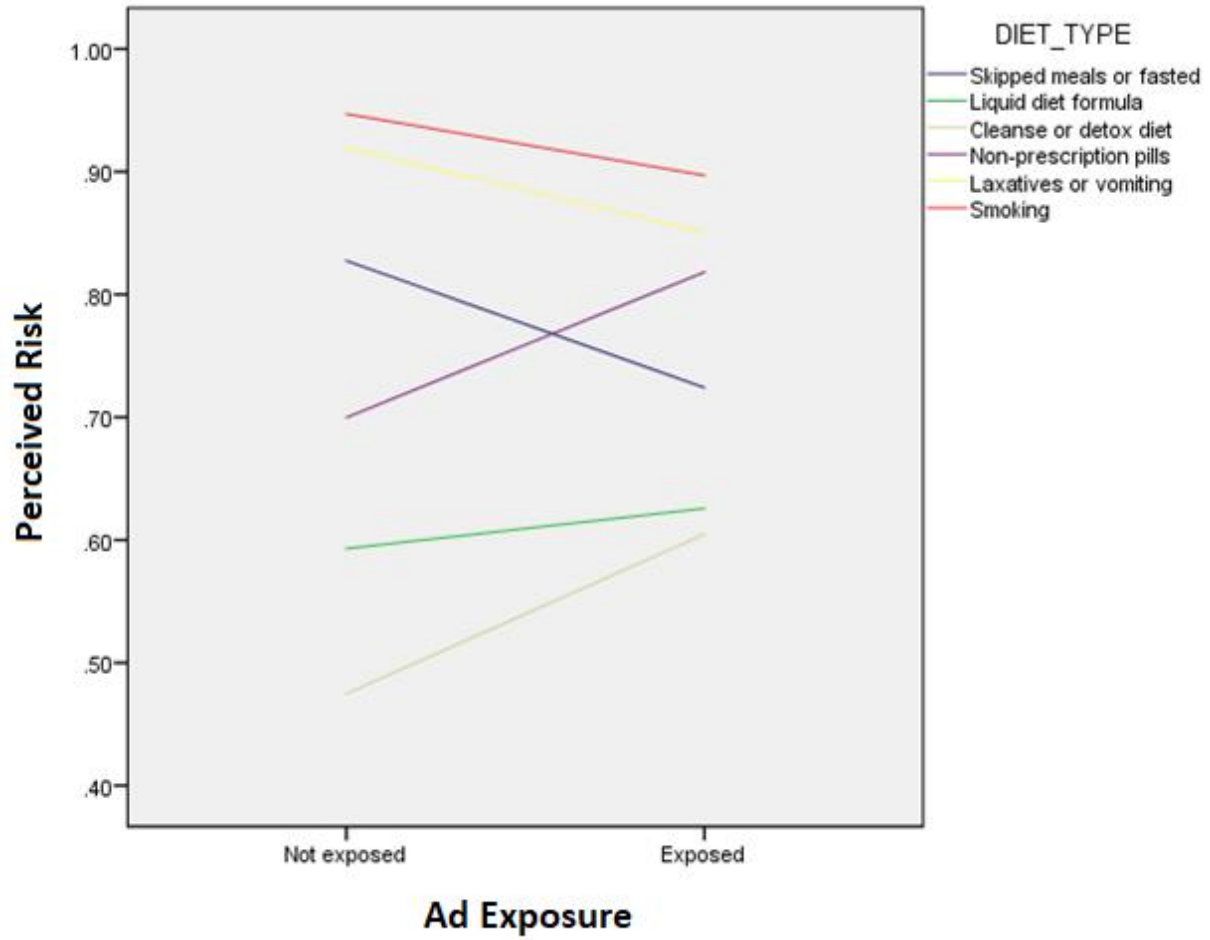


Figure 2. 2-way interaction between Perceived Effectiveness and Diet Type for Response to Ad linear regression model, n=622

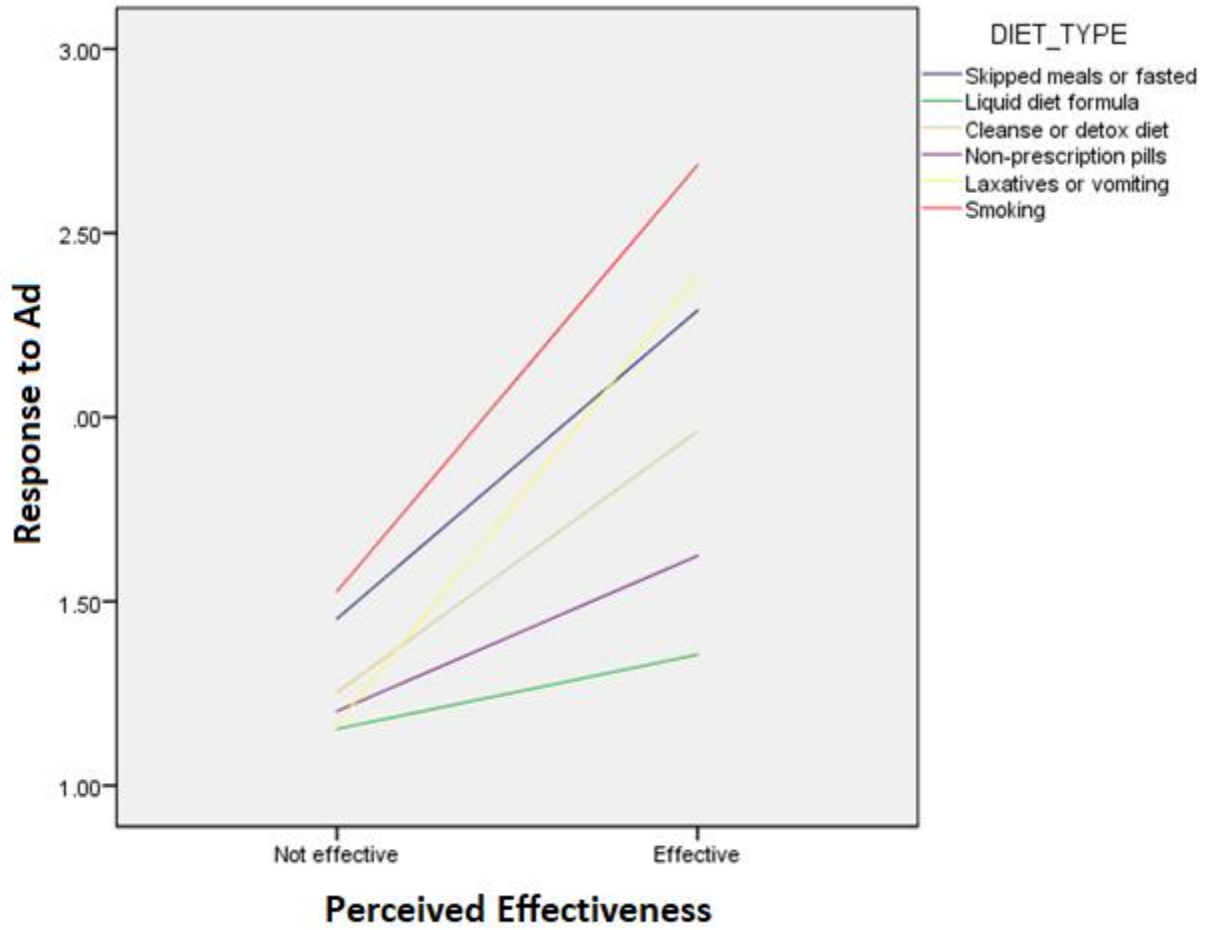


Figure 3. 2-way interaction between Perceived Risk and Perceived Effectiveness for Response to Ad linear regression model, n=622

