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Health-Protective Eating Style Among Students at a Canadian University

Brittany A. Mascioli and Ron Davis
Lakehead University

Many Canadians do not adhere to Canada's Food Guide recommendations, which can increase risk of chronic disease. During the postsecondary education period, young adults gain independence and develop increased responsibility surrounding food choices. Maladaptive dietary choices may increase, putting students at risk for chronic disease. Alternatively, this period may present a unique opportunity for behavioural interventions that promote healthy eating. The purpose of this study was to examine whether health belief model factors predict a health-protective eating style among undergraduate students at a Canadian university. Participants completed a questionnaire that assessed aspects of the health belief model, including perceived susceptibility to negative health outcomes, perceived seriousness of health difficulties, and perceived benefits of healthy eating. Health-protective eating style was quantified by the self-reported frequency with which food choices are informed by the pursuit of improved health. Multinomial logistic regression revealed a trend toward a significant main effect of perceived seriousness, $\chi^2(2, N = 347) = 5.03$, $p = .081$, and a significant main effect of perceived benefits, $\chi^2(2, N = 347) = 37.57$, $p < .001$, in the prediction of a health-protective eating style. No main effect of perceived susceptibility was observed. The overall model was significant, $\chi^2(8, N = 347) = 93.62$, $p < .001$, with strong goodness of fit, $\chi^2(558, N = 347) = 513.98$, $p = .909$, and a small effect size, $R^2_{\text{Cox and Snell}} = .236$. This information is relevant for the creation of targeted interventions to increase a health-protective eating style in this population.

Public Significance Statement
The health belief model posits that people change their behaviour to improve their health based on how susceptible they feel to becoming ill, how serious they believe an illness would be, and how beneficial they believe the behavioural change would be in terms of preventing illness. This study examined these factors among university students and found that perceived seriousness and perceived benefits are each predictive of healthy eating style, whereas perceived susceptibility is not.

Keywords: health belief model, university students, health-protective eating style, perceived seriousness, perceived benefits

Dietary choices can have a significant effect on quality of life and health-related outcomes. Canada's Food Guide (Government of Canada, 2011) provides information and recommendations for dietary behaviour in order to prevent nutritional deficiencies and reduce the incidence of chronic disease. However, results of a recent study (Slater & Mudryj, 2018) show that although most Canadians are aware of the existence of Canada's Food Guide, only 8.7% of respondents indicated using the guide within the past 6 months. Furthermore, 53% of the sample indicated having not consulted any sources of information to inform dietary choices over the past 6 months (Slater & Mudryj, 2018). Whether Canadians are obtaining information from Canada's Food Guide or from other sources, the evidence suggests that dietary patterns in Canada are incongruent with what is recommended by the Canadian guidelines for a healthy diet (Jessri, Nishi, & L'Abbé, 2015).

One outcome of unhealthy dietary behaviour is overweight and obesity, which has emerged as the most prevalent nutritional problem globally (Lau et al., 2007; Seidell & Halberstadt, 2015). According to a report by the World Health Organization (2018), 52% of adults met the criteria for overweight or obesity in 2016. Overweight and obesity are risk factors for the development of numerous chronic diseases, including diabetes, hypertension, coronary artery disease, stroke, and some cancers (Lau et al., 2007). The most recent estimates of overweight and obesity in Canada obtained from Statistics Canada (2019) reveal that 30.3% of individuals aged 18 to 34 years, 36.4% of individuals aged 35 to 49, 38.6% of individuals aged 50 to 64, and 40.3% of individuals aged 65 and over meet the criteria for overweight. Furthermore, 19.7%

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Brittany A. Mascioli and Ron Davis, Department of Psychology, Lakehead University.

Correspondence concerning this article should be addressed to Brittany A. Mascioli, Department of Psychology, Lakehead University, 955 Oliver Road, Thunder Bay, P7B 5E1 ON, Canada. E-mail: bmasciol@lakeheadu.ca

of individuals aged 18 to 34 years, 28.9% of individuals aged 35 to 49, 31.9% of individuals aged 50 to 64, and 28.0% of individuals aged 65 and over meet the criteria for obesity. Health problems related to overweight and obesity contribute substantially to national health care costs each year through direct and indirect expenses (Janssen, 2013). Canadian health care costs attributable to overweight and obesity were estimated to be 2.2 and 3.9 billion dollars, respectively, in 2006 (Anis et al., 2010). Results from an analysis of health care costs in Ontario, Canada, demonstrate the economic burden of obesity to the health care system: The annual cost of hospitalization was demonstrated to be 40% greater for patients with obesity, and total health care costs were shown to be 25% higher among those with obesity (Tarride et al., 2012). Among young adults, annual health care costs per person in Ontario, Canada, were revealed to be approximately $82 greater among individuals with obesity relative to individuals of healthy weight (Tarride et al., 2012).

The beginning of postsecondary education presents a unique opportunity for behavioural intervention concerning the promotion of health-protective eating. Many young adults gain independence from their families as they pursue postsecondary education; some students may be living away from their families for the first time as they attend university and may gain greater responsibility in terms of food selection and preparation (Blichfeldt & Gram, 2013). Unfortunately, this may also be a time period during which maladaptive dietary choices increase, putting students at risk for the development of chronic disease (Grace, 1997). Research suggests that healthy eating, specifically the consumption of fruits and vegetables, declines over the 4-year period during which students attend college (Small, Bailey-Davis, Morgan, & Maggs, 2013). It has been demonstrated among university students that convenience is a stronger motivational factor concerning dietary choice than price, pleasure, taste, health, weight concern, and the influence of family and friends (Driskell, Kim, & Goebel, 2005; Marquis, 2005). Furthermore, greater convenience orientation is predictive of greater difficulties in eating a varied diet and of lower consumption of fresh vegetables, both of which are important components of health-protective eating (Marquis, 2005).

The adoption or exacerbation of maladaptive dietary choices during postsecondary education can have negative health-related consequences. One study found a significant increase in body weight of students over the course of their first year attending university (Vella-Zarb & Elgar, 2010). Obesity between the ages of 14 and 19 is predictive of obesity in adulthood, which is associated with increased mortality (Engeland, Bjørge, Tverdal, & Søgaard, 2004). The eating patterns that are adopted during this transitional period may lay the foundation for dietary behaviours that will characterise the eating patterns of the individual for the course of their adult life.

The health belief model puts forth a set of conditions under which an individual would theoretically be motivated to behave in a way that prevents disease (Rosenstock, 1966). According to the heath belief model, health-related behavioural change is influenced by the combination of perceived threat and perceived benefit of making a change, in the context of salient concern regarding personal health (Rosenstock, Strecher, & Becker, 1988). Health concern does not need to be high in order to create the motivational state proposed to contribute to the undertaking of behavioural change. Cues to trigger health concern can range from large events, such as a serious health scare, to minor ones such as brief exposure to a health advertisement (Rosenstock, 1974). Perceived threat, according to the health belief model, comprises a combination of two factors: perceived susceptibility and perceived seriousness (Rosenstock et al., 1988). The term *perceived susceptibility* refers to the subjective beliefs of an individual regarding their personal risk of developing a health problem; *perceived seriousness* of a disease may involve an individual's interpretation of the degree of impairment that the disease would induce (Rosenstock, 1974). The *perceived benefits* of behavioural change relate to whether the individual believes that the modification of behaviour will be effective in preventing negative health-related outcomes. Additionally, the perceived benefits must outweigh any perceived barriers to behavioural change. These factors are said to influence the likelihood of a health-related behavioural change being undertaken in response to some cue to action (Rosenstock, 1974). The hypothesised purpose of the cue to action is to orient the individual so that health-related issues become salient (Rosenstock et al., 1988).

Previous research has provided support for the health belief model in explaining health-related behaviour, including bicycle helmet use (Ross, Ross, Rahman, & Cataldo, 2010), behaviours associated with cardiac health (Mahalik & Burns, 2011), breast cancer screening (Sunil et al., 2014), and adherence to medical recommendations in diabetes patients (Ayele, Tesfa, Abebe, Tilahun, & Girma, 2012). Educational interventions that are based upon the health belief model can be effective in fostering behavioural change related to health, including the reduction of obesity-related behaviours in children (Abdeyazdan, Moshgdar, & Golshiri, 2017) and increased rates of screening for cervical cancer (Chania et al., 2013).

Informed by the health belief model, we predicted that health-protective eating is influenced by the perception of individual susceptibility to negative health outcomes, the perception of the impairment associated with a given negative health outcome, and by beliefs regarding the benefits of adopting healthy eating style relative to the perceived barriers. In the present study, we explore the role of perceived susceptibility, seriousness, and benefits in the prediction of health-protective eating in a sample of undergraduate students at a Canadian university. Specifically, we hypothesised that perceived susceptibility, perceived seriousness, and perceived benefits each would independently predict the extent to which students report making food choices that are informed by the pursuit of health. Information regarding the factors that are associated with healthy eating in a student population is relevant for the formulation of targeted interventions to increase health-protective eating in this population. Furthermore, we investigated potential correlates of health-protective eating, including gender, body mass index, and degree of responsibility surrounding the selection, purchase, and preparation of food for personal consumption. Students differ in the level of personal responsibility they hold concerning their food choices. Low control regarding the purchase, selection, and preparation of food for personal consumption may attenuate the influence of the factors put forth by the health belief model regarding health-protective eating style. There is evidence to suggest a gender effect such that women exhibit a greater tendency to make food choices that are informed by the pursuit of improved health (Adriaanse, Evers, Verhoeven, & de Ridder, 2016; Wardle et al., 2004). As such, gender differences in

healthy eating were examined in our sample. Finally, the relationship between body mass index and health-protective eating style will be examined because of the possibility that eating styles differ across the spectrum of body mass index.

Method

Participants and Procedure

Undergraduate student volunteers ($N = 374$; 295 women) participated in this study and received bonus points toward their final grades in eligible psychology courses. This study obtained institutional review board approval prior to the commencement of data collection. As part of a separate study, participants were required to be nonsmokers and not taking antidepressant, hypertensive, or cold medications at the time of participation. Participants completed an online questionnaire battery as part of the separate study, which included the measures and questions of interest to the present study (see Measures section). Eligible participants were able to sign up for this study through the SONA research management system. Following sign-up, participants were directed to the questionnaire battery, which was hosted online by SurveyMonkey. Participants completed the questionnaire battery at their convenience from personal devices with Internet access. Participation occurred over a period of 4 months.

Measures

Perceived susceptibility. Perceived susceptibility to negative health outcomes was assessed using the Short Health Anxiety Inventory (SHAI; Salkovskis, Rimes, Warwick, & Clark, 2002). *Health anxiety* is defined as anxiety in response to cues that are perceived as threatening to the health of the individual (Brady & Lohr, 2014). Individuals who are high in health anxiety exhibit a tendency to interpret ambiguous information as indicative of a health problem (Salkovskis et al., 2002). As such, health anxiety can serve as a marker of the extent to which an individual feels personally susceptible to health problems. The SHAI is an 18-item self-report questionnaire with four response options per item. The respondent selects the response that best describes their feelings over the past 6 months. Possible total scores on this measure range from 0 to 54, with higher scores representing greater health anxiety. In the present sample, adequate reliability was demonstrated (Cronbach's $\alpha = .86$). The obtained value of internal consistency was similar to values reported in the literature which range from Cronbach's alphas of .84 to .89 (Abramowitz, Deacon, & Valentiner, 2007; Olatunji, Etzel, Tomarken, Ciesielski, & Deacon, 2011). The mean score for the SHAI obtained in the present sample was 15.10 ($SD = 6.97$).

Perceived seriousness. The Role-Physical subscale of the 36-item Short Form Survey (SF-36; RAND Corporation, 2015) was used as an index of perceived seriousness of a negative health outcome. The construct of perceived seriousness comprises the subjective beliefs regarding the difficulties that would be associated with a given illness. The SF-36 assesses quality of life related to health across eight domains. One of these domains, role-physical, is a measure of the limitations experienced in work or other activities that are attributable to physical health. The present study utilized the Role-Physical subscale of the SF-36 as an index of the perceived difficulties associated with a given health concern. This four-item questionnaire asks, in general terms, about difficulties related to physical health. As such, this measure serves as an index of limitations related to any aspect of physical health, according to their current experience. Possible scores on the Role-Physical subscale range from 4 to 20, with lower scores representing greater physical limitations. In the present sample, strong internal consistency was demonstrated (Cronbach's $\alpha = .94$). The mean score on the Role-Physical subscale of the SF-36 was 17.61 ($SD = 3.46$).

Perceived benefits. Beliefs regarding the relative benefit of adopting a health-protective pattern of eating was quantified using responses to five questions. These questions are presented in Table 1. Two of these questions (Questions 1 and 2) were obtained from an existing measure used to assess a preoccupation with the consumption of healthy food (ORTO15; Donini, Marsili, Graziani, Imbriale, & Cannella, 2004). The remaining three questions were created for the purpose of assessing attitudes regarding the benefits of healthy eating. There were four response options for each item, ranging from 1 (*never*) to 4 (*always*). Scores were summed to produce a continuous variable indicative of individual perception of the benefits of adopting a health-protective eating style. A higher score represents greater perceived benefit. Using the present sample, the internal consistency of this group of questions was demonstrated to be adequate (Cronbach's $\alpha = .71$). The mean score for the present sample was 13.74 ($SD = 2.51$).

Health-protective eating style. In order to assess the degree to which participants engage in a health-protective eating style, they responded to the question "Is your eating style influenced by the pursuit of improved health?" using a 4-point scale with response options 1 (*never*), 2 (*sometimes*), 3 (*often*), and 4 (*always*). Of the respondents, 5.6% endorsed the response option *never*, 35.7% *sometimes*, 43.7% *often*, and 15.0% *always*.

Control regarding food for personal consumption and body mass index. Individual control regarding the selection, purchase, and preparation of food for personal consumption was assessed in two ways. Participants were asked to indicate (a) "who in your household is currently most responsible for selecting/purchasing groceries," and (2) "who in your household is currently most responsible for selecting/preparing meals." Responses to these items were coded as 1, 2, or 3, depending on whether the respondent indicated *sole responsibility*, *partial responsibility*, or *no responsibility*. Individuals who indicated that they relied upon an institutional meal plan ($n = 12$) were excluded from the analysis

Table 1
Items Assessing the Perceived Benefit of Adopting a Health-Protective Eating Style

Items
1. Do you think that the conviction to eat only healthy food increases self-esteem?
2. Do you think that consuming healthy food may improve your appearance?
3. Health-related problems can be prevented by following a particular eating style.
4. Health-related problems can be resolved by following a particular eating style.
5. Modern health problems can be attributed to eating the wrong foods.

that assessed control related to food for personal consumption. An additional six respondents did not provide an answer to the question regarding grocery selection/purchase, and 12 respondents did not provide an answer to the question regarding meal selection/preparation. Concerning the selection/purchase of groceries, 46% of respondents indicated sole responsibility, 5.6% indicated partial responsibility, and 42.6% indicated no responsibility. With respect to the selection/preparation of meals, 49.9% indicated sole responsibility, 6.2% indicated partial responsibility, and 37.5% indicated no responsibility. Participants reported their height and weight at the time of questionnaire completion, which was used to calculate body mass index. In the present sample, body mass index ranged from 16.45 to 40.87. The mean body mass index was 24.30 (SD = 4.75).

Results

Participants ranged from Ages 17 to 53, and the median age was 19 (interquartile range = 18–21). Regarding ethnicity, 79.9% of participants identified as Caucasian/White, 3.8% identified as African Canadian/Black, 3.2% identified as Aboriginal/First Nation, 3.2% identified as East Asian, 2.7% identified as Middle Eastern, 1.9% identified as South Asian, and 5.1% identified as other ethnicities. The majority of respondents identified adhering to a health-protective eating style at least some of the time (94.4%). Preliminary analyses sought to determine the characteristics of the sample that differed according to whether they reported adhering to this eating style *sometimes*, *often*, or *always*. All analyses were conducted using SPSS software (Version 25). The variables perceived benefits and perceived susceptibility were assessed using measures in which a higher score represents a greater endorsement of the construct, whereas perceived seriousness was measured using a scale in which a lower score indicates a greater degree of the construct. In order to facilitate clarity of interpretation, the Role-Physical subscale of the SF-36 questionnaire was transformed such that higher scores represent greater perceived seriousness. This transformation was conducted by recoding the values of responses reciprocally. For example, a score of 1 was recoded as 5, and vice versa.

Multinomial logistic regression was used to explore the roles of perceived susceptibility, seriousness, and benefits in the prediction of a health-protective eating style. Logistic regression is susceptible to bias in the presence of violations of the assumptions of linearity, independence of errors, and the absence of multicollinearity. For logistic regression, the assumption of linearity refers to a linear relationship between the predictors and the logit of the outcome variable (Field, 2013). The assumption of linearity was tested by conducting a multinomial logistic regression analysis including the interaction terms of each predictor with its log in the model. Significance at the $p < .05$ level of any of these interaction terms would be indicative of a violation of linearity (Field, 2013). This diagnostic analysis revealed the Benefits × *ln*Benefits interaction term to be significant ($p = .011$), indicating that the assumption of linearity was violated. Of the 373 valid cases, only 20 participants indicated an eating style that is *never* informed by the pursuit of improved health. This response category of the outcome variable represents only 5.6% of the total sample. In order to remedy the violation of linearity, these cases were dropped from the analysis, resulting in three response categories of the outcome variable, namely, *sometimes*, *often*, and *always*. The diagnostic test of the linearity assumption was repeated. None of the interaction terms consisting of a predictor and their log were significant, indicating that the remedy was successful and the assumption of linearity for logistic regression was not violated.

Violation of the assumption of independence of errors can produce biased significance values through overdispersion. A dispersion parameter greater than 1 is indicative of overdispersion, and greater than 2 suggests issues related to bias (Field, 2013). In the present analysis, the dispersion parameter was calculated by obtaining the ratio of the deviance goodness-of-fit statistic to its degrees of freedom, which revealed no issues with overdispersion ($\varphi = 0.92$). In order to test for violations related to multicollinearity, we evaluated tolerance and variance inflation factor (VIF) statistics obtained through linear regression analysis. When tolerance statistics are less than 0.1 or VIF statistics are greater than 10, an issue with multicollinearity is present (Field, 2013). In the present analysis, tolerance statistics ranged from .89 to .99 and VIF statistics ranged from 1.02 to 1.12, indicating no issues related to multicollinearity in our sample.

Does the Health Belief Model Explain Eating Style?

Multinomial logistic regression was used to test the health belief model using health anxiety (SHAI; Salkovskis, Rimes, Warwick, & Clark, 2002) as an index of perceived susceptibility, using difficulties attributable to a health condition (Role-Physical subscale of SF-36) as a measure of perceived seriousness, and using perceived benefits to the adoption of a healthy eating pattern (see Table 1) to quantify perceived benefits. These three variables were included in the model as predictors, and health-protective eating style was included as the outcome variable. The main effects of susceptibility, seriousness, and benefits were forced into the model; the three possible two-way interactions and the single three-way interaction were entered into the multinomial logistic regression model using the stepwise method. Data from five respondents were excluded because of missing data.

The overall model significantly reduced the amount of unexplained variability in the data relative to the original (intercept only) model, $\chi^2(8, N = 347) = 93.62$, $p < .001$. The model also demonstrated a strong goodness of fit, which was indicated by the absence of a significant difference between the values predicted by the model and the values observed, $\chi^2(558, N = 347) = 513.98$, $p = .909$. A small effect size was observed ($R^2_{\text{Cox and Snell}} = .236$).

The results revealed a trend toward a significant main effect of perceived seriousness, $\chi^2(2, N = 347) = 5.03$, $p = .081$, a significant main effect of perceived benefits, $\chi^2(2, N = 347) = 37.57$, $p < .001$, and a significant interaction effect of Perceived Seriousness × Perceived Benefits, $\chi^2(3, N = 367) = 6.94$, $p = .031$. No main effect of perceived susceptibility was observed.

The response *sometimes* to the question of whether eating style is influenced by the pursuit of improved health was used as the reference category to which responses categories *often* and *always* were compared. Decomposing the results by response category revealed that perceived benefits significantly increased the odds of a response of *often* relative to *sometimes* ($b = 0.47$), Wald $\chi^2(1) = 14.19$, $p < .001$. Furthermore, perceived seriousness was demonstrated to significantly increase the odds of a response of *always* relative to *sometimes* ($b = 0.80$), Wald $\chi^2(1) = 5.06$, $p = .024$, as

was perceived benefits ($b = 1.07$), Wald $\chi^2(1) = 31.88$, $p < .001$. The interaction of Perceived Seriousness × Perceived Benefits predicted a decrease in the odds of response of *always* compared with *sometimes* ($b = -0.06$), Wald $\chi^2(1) = 6.86$, $p = .009$. All regression coefficients and odds ratios included in the model are presented in Table 2.

Supplementary Analyses

Likelihood ratio analyses were used to explore potential predictors of a health-protective eating style, including gender, control over grocery selection/purchase, and control over meal selection/preparation. The association between gender and a health-protective eating style revealed a trend that did not reach statistical significance, $\chi^2(2, N = 351) = 5.08$, $p = .079$. Nonetheless, the main analysis was repeated with the inclusion of gender as a covariate. The results did not appreciable differ from the model without the inclusion of gender, and thus the original model was retained. No significant association was observed between whether the respondent indicated *sole*, *partial*, or *no responsibility* regarding the selection/purchase of groceries and a health-protective eating style, $\chi^2(4, N = 334) = 92.77$, $p = .597$. The association between whether the respondent indicated *sole*, *partial*, *or no responsibility* regarding the selection/preparation of meals and a health-protective eating style was not significant, $\chi^2(4, N = 329) = 2.00$, $p = .735$.

Multinomial logistic regression was used to assess the predictive ability of body mass index in relation to a health-protective eating style. The indication that eating style is *sometimes* influenced by the pursuit of improved health was used as the baseline category with which responses of *often* and *always* were compared. Data from six respondents were excluded from this analysis because of missing data. The model was not significant, $\chi^2(2, N = 352) = 1.60$, $p = .450$, indicating that body mass index is not predictive of a health-protective eating style in the present sample.

Table 2
Results of Multinomial Logistic Regression of Outcome Variable Health-Protective Eating Style on Predictors Benefits, Perceived Susceptibility, and Perceived Seriousness

Predictor variables by response category	*b* (*SE*)	95% CI for odds ratio		
		Lower	Odds ratio	Upper
Often				
Intercept	–5.40 (1.67)*			
Susceptibility	–.03 (.02)	.94	.97	1.01
Seriousness	.28 (.21)	.88	1.32	1.99
Benefits	.47 (.13)**	1.26	1.61	2.05
Seriousness × Benefits	–.02 (.02)	.95	.98	1.01
Always				
Intercept	–15.47 (2.76)**			
Susceptibility	.002 (.03)	.95	1.00	1.06
Seriousness	.80 (.36)*	1.11	2.23	4.49
Benefits	1.07 (.19)**	2.01	2.92	4.24
Seriousness × Benefits	–.06 (.02)*	.89	.94	.98

Note. $R^2 = .24$ (Cox & Snell), .27 (Nagelkerke). Model $\chi^2(8, N = 347) = 93.62$, $p < .001$. *SE* = standard error; CI = confidence interval.
* $p < .01$. ** $p < .001$.

Discussion

The results indicate that the eating style of students at a Canadian university can be predicted by perceived seriousness and perceived benefits of adhering to a health-protective style of eating. Greater endorsement of perceived seriousness of health concerns predicted a greater likelihood of more frequently making food choices that are informed by the pursuit of improved health. This finding is in accordance with the health belief model and is supported by previous research. A meta-analysis by Harrison, Mullen, and Green (1992) that assessed various health behaviours also concluded that the construct of perceived seriousness is a significant predictor of health behaviours, albeit with a small effect size. Similarly, a more recent meta-analysis by Carpenter (2010) also demonstrated a weak association between perceived seriousness and health behaviours. Health-protective eating style was not a health behaviour that was covered in the studies included in these meta-analyses. However, Harrison et al. included one study in which the health behaviour was weight loss, which may overlap to some degree with health-protective eating. Of the studies included in this article, perceived seriousness had the largest effect size for the study in which the outcome health behaviour was weight loss (Harrison et al., 1992). Taken together with the results of the present study, this suggests that perceived severity may be a more important factor for health behaviours related to diet compared with other health behaviours.

In the present analysis, the perceived benefit of health-related dietary choices was a significant predictor of the odds of adhering to a healthy eating pattern. Previous meta-analytic research has supported the predictive ability of this factor of the health belief model concerning a variety of health behaviours (Carpenter, 2010; Harrison et al., 1992; Janz & Becker, 1984). Multiple studies have also supported the role of perceived benefits in predicting health behaviours specifically related to diet and nutrition. Pearson, Ball, and Crawford (2011) demonstrated the significant predictive ability of the perceived value of eating fruit regarding increased fruit consumption among adolescents. Another study showed the relationship between the perceived benefits of healthy eating and actual healthy eating behaviour among high school students ($r = .28$, $p < .001$; Salahshoori, Sharifirad, Hassanzadeh, & Mostafavi, 2014). The relationship between perceived benefits of healthy eating and intentions to consume healthy food was demonstrated among university students in a study by Kim, Ahn, and No (2012). Taken together, these findings support the role of perceived benefits in fostering health behaviours generally and dietary health behaviour specifically.

Perceived susceptibility to negative health outcomes was not associated with the frequency with which dietary choices were informed by health concern in our sample. Although the health belief model implies that perceived susceptibility contributes to whether or not a health-related behaviour will be adopted, this point has not held consistently in the research literature. The meta-analysis conducted by Carpenter (2010) found that perceived susceptibility failed to predict health behaviours across numerous studies, with the exception of studies in which the outcome variable was adherence to a pharmacological regimen in response to a preexisting health problem. Perceived susceptibility has also failed to consistently predict health behaviours related to diet and nutrition. In a study that employed an educational intervention in order

to increase folate consumption among women, perceived susceptibility was significantly higher in the group that received the educational intervention compared with the control group who did not (LaBrosse & Albrecht, 2013). Perceived severity and perceived benefits did not significantly differ between the intervention and control groups. Importantly, the groups did not differ in the amount of folate consumed postintervention, suggesting that the intervention was unsuccessful despite its ability to increase perceived susceptibility to the negative outcomes of not adhering to daily recommendations concerning folate intake (LaBrosse & Albrecht, 2013). Similarly, perceived susceptibility did not influence health behaviour in a study that assessed calcium intake and exercise in the interest of preventing osteoporosis among young women (Schmiege, Aiken, Sander, & Gerend, 2007). Despite the hypothesised role of perceived susceptibility in influencing engagement in health behaviours according to the health belief model, the lack of predictive ability demonstrated in the present study as well as in previous literature suggest that this construct may be less important than perceived benefits and seriousness.

In the present study, the interaction between perceived seriousness and perceived benefits evidenced significant negative predictive ability regarding the frequency of adhering to a health-protective eating style. This finding is counterintuitive, as it seems to suggest that when students perceive both greater seriousness of health concerns and greater benefits of healthy eating, they are less likely to adhere to a health-protective eating style. However, this effect was only significant for the comparison of the response option *always* with *sometimes*, and importantly, the regression coefficient for this effect was near zero. As such, it is reasonable to assume that the finding of significance reflects a statistical artifact and is unlikely to represent a meaningful interaction effect on the outcome variable. Furthermore, the health belief model stipulates that the predictive factors of perceived seriousness, susceptibility, and benefits independently influence health behaviour and does not suggest interaction effects. The present study did not put forth hypotheses related to interaction effects.

In a student population, drawing attention to personal susceptibility to negative health outcomes that can result from the lack of engagement in a health-protective eating style may be even less effective because of the delay between behaviours and potential outcomes. Negative health-related outcomes of unhealthy eating, such as diabetes, coronary artery disease, ischemia, and cancer, typically emerge later in life and, therefore, may be less personally relevant for young adults. Because of the observed lack of predictive ability of perceived susceptibility, it is recommended that nutritional interventions intended for young adults target the benefits of health-protective eating and the seriousness of potential negative health outcomes. Furthermore, the impact of such programs may have greater impact if the seriousness of negative outcomes is framed in a way that fosters personal relevance for students. For example, workshops or other forms of nutritional interventions might benefit from asking participants to think about a negative health outcome that they, or someone whom they are close to, have personally experienced before presenting the benefits of health-protective eating.

No relationship was observed between the degree of responsibility surrounding the selection, purchase, and preparation of food for personal consumption and a health-protective eating style. This finding might be explained by shared values or beliefs about health and diet among individuals who reside together. Of the students who indicated no responsibility for meal selection, purchase, or preparation, the majority reported relying on a parent, other family member, or partner for this purpose. Only five respondents who endorsed no responsibility for meal selection/purchase, and six who endorsed no responsibility for meal preparation indicated that a roommate was responsible. Consequently, similar attitudes toward health-protective dietary behaviour among individuals who participated in the present study and those responsible for the food they eat may explain the absence of an association between control over food and eating style.

In the present study, body mass index did not predict a health-protective eating style. This finding may not be surprising given the widespread disagreement regarding the relationship between body weight and health. For example, high body mass index is not unequivocally related to poor health. Phillips (2013) has proposed a metabolically healthy phenotype of obesity, whereby a proportion of individuals with obesity do not experience the health complaints that are assumed to co-occur with an elevated body weight. One explanation for the lack of predictive ability of body mass index concerning health-protective eating is that some individuals of higher body weight may in fact adhere to a style of eating that is considered healthy. There are many other factors that influence body mass index, including genetics, endocrine functioning, and energy expenditure (Cefalu et al., 2015). In addition, although unhealthy eating patterns are associated with increased body mass index, healthy eating may not be sufficiently protective against an elevated body mass index (Heerman et al., 2017). Findings by Heerman et al. (2017) revealed that adults who adhered to a healthy pattern of eating, defined by fruit and vegetable consumption, yet who still exhibited problem eating behaviours are more likely to exhibit an elevated body mass index.

Limitations

The present study relied upon a convenience sample of undergraduate students. Consequently, the sample is rather homogenous, thereby limiting the generalizability of the findings. Specifically, our sample comprised a large proportion of participants who identified their ethnicity as Caucasian/White. In addition, male participants were underrepresented in the current sample. Despite our interest in a health-protective eating style, we did not assess actual dietary behaviour. We were primarily interested in the factors that influence the intention to consume a health-protective diet rather than differences that could be attributed to individual variability in beliefs regarding what comprises a health-protective diet. Nonetheless, the lack of observed relationship between body mass index and health-protective eating style may reflect the variability in what people believe constitutes a heathy diet, which we did not assess.

According to the health belief model, the perceived benefits of making a health-related behavioural change relative to the perceived barriers of making that change contributes to the likelihood of adopting the new behaviour. This investigation did not assess for perceived barriers. Barriers to adopting a healthy eating style perceived by the students in our sample, such as cost, accessibility, convenience, and taste, might have an influence on food choices. The inclusion of perceived barriers may have strengthened the

predictive ability of perceived benefits in the prediction of a health-protective eating style.

Finally, while providing responses to the questionnaires, participants may have been thinking of a specific negative health outcome. The SHAI (Salkovskis, Rimes, Warwick, & Clark, 2002), the questionnaire that was used in the present study to operationally define the construct of perceived susceptibility to negative health outcomes, references "illness" in many of the items without specificity. For example, the items include indicating one's degree of fear that one has an illness and the extent to which one resists thoughts of illness. We did not control for the type of health concern, some of which may be less amenable to improvement through dietary modification. For example, a participant who completed the questionnaires while thinking about an illness that has a clear association with diet, such as diabetes, may have provided categorially different responses relative to a participant who completed the questionnaires with reference to an illness that has less evidence linking it to diet, such as an autoimmune disease. The lack of specificity regarding the concept of "illness" in the questionnaires, in addition to our failure to control for such potential variability, may have contributed to the lack of an effect observed for personal susceptibility as well as the absence of main effects for perceived benefits. A participant who interprets illness as a specific disease with a less clearly defined connection to dietary behaviour may also have lower expectations in terms of the beneficial aspects of adopting a healthy diet in the interest of disease prevention. Further research is required in order to assess the effectiveness of dietary interventions among students attending postsecondary educational institutions in Canada with references to the assumptions put forth by the health belief model.

Conclusions

Dietary behaviour can have repercussions in terms of increased risk for the development of chronic disease. The period of increased independence and responsibility for decision making related to food that coincides with university attendance can result in a greater incidence of maladaptive eating behaviours. Further, once adopted, maladaptive eating behaviours can persist throughout adulthood, increasing the likelihood of disease. Alternatively, the time period surrounding university attendance may present an opportunity for intervention. The results of the present study suggest that the perceived seriousness of physical limitations related to health concerns and the perceived benefits of a health-protective eating style independently predict the frequency with which students report making food choices that are informed by the pursuit of health. This information can be harnessed for the development of interventions that are designed to increase healthy eating among postsecondary students. We recommend that interventions emphasise the seriousness of potential negative outcomes related to dietary behaviour prior to the presentation of benefits that adopting healthier eating habits can afford.

Résumé

De nombreux Canadiens ne se conforment pas aux recommandations du Guide alimentaire canadien, ce qui peut accroître le risque de développer des maladies chroniques. Au cours de la période d'éducation postsecondaire, les jeunes adultes acquièrent de l'autonomie et développent plus de responsabilités vis-àvis leurs choix alimentaires. Les choix alimentaires déséquilibrés peuvent augmenter, mettant alors les élèves à risque de développer des maladies chroniques. Par ailleurs, cette période peut représenter une occasion unique pour les interventions comportementales qui favorisent une saine alimentation. Le but de cette étude était d'examiner si les facteurs du modèle des croyances relatives à la santé prédisent un mode d'alimentation sain chez les étudiants de premier cycle dans une université canadienne. Les participants ont rempli un questionnaire visant à évaluer les divers aspects du modèle des croyances relatives à la santé, y compris la susceptibilité perçue d'effets négatifs sur la santé, la gravité perçue des troubles de santé et les avantages perçus d'une saine alimentation. Le mode d'alimentation sain a été quantifié par la fréquence de l'auto-évaluation avec laquelle les choix alimentaires sont motivés par la poursuite d'une santé meilleure. Une régression logistique multinomiale a révélé une tendance vers un effet principal significatif de la gravité perçue, $\chi^2(2, N = 347) = 5{,}03$, $p = 0{,}081$, et un effet principal significatif d'avantages perçus, $\chi^2(2, N = 347) = 37{,}57$, $p < 0{,}001$, dans la prévision d'un mode d'alimentation sain. Aucun effet principal de susceptibilité perçue n'a été observé. Le modèle général était significatif, $\chi^2(8, N = 347) = 93{,}62$, $p < 0{,}001$, avec une forte qualité d'ajustement, $\chi^2(558, N = 347) = 513{,}98$, $p = 0{,}909$, et un effet de petite taille, $R_{\text{Cox et Snell}} = 0{,}236$. Cette information est pertinente pour la création d'interventions ciblées visant à augmenter un mode d'alimentation sain dans cette population.

Mots-clés : modèle des croyances relatives à la santé, étudiants universitaires, mode d'alimentation sain, gravité perçue, avantages perçus.

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