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Modifying Students' Intentions to Eat Sustainably

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Modifying students' intentions to eat sustainably

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Note

The manuscript has been created according to Author Guidelines for the International Journal of Environmental, Cultural, Economic and Social Sustainability, found in Appendix J.

Abstract

The Sustainable Eating Project is a social marketing campaign promoting sustainable eating through animated kiosks, an informational webpage, and cooking workshops. Eating sustainably is defined in this study as: eating locally, eating meatless meals and cooking at home. Kiosks were animated by McGill Dietetics stagiaires and trained peer educators at three events on-campus, who engaged in persuasive verbal communication with students, and distributed paper resources. There were five cooking workshops total each consisting of a 20 minute discussion led by a Dietetics stagiaire, followed by preparation of a vegetarian meal. The webpage was created within the pre-existing "Fit@McGill" website, and included information on the "why's" and "how's" of each behavior. This study uses the Theory of Planned Behavior (TPB) model to evaluate changes in university students' intentions to eat sustainably, following exposure to the Sustainable Eating Project.

Our hypothesis was that exposure to the various behavior change techniques employed by the three components of the project will result in an increase in students' intentions to eat locally produced food, prepare meals at home more often, and eat meatless meals more often. In accordance with the TPB, students' intentions to perform these desired behaviors will be predicted by their attitudes, perceived behavioral control, and subjective norms regarding the behaviors. An increase in fruit and vegetable intake was expected to occur secondarily to an increase in intention to eat sustainably. A survey of pre-validated measures was administered prior to, and following exposure to the campaign to assess change in: fruit and vegetable intake, intentions, attitudes, perceived behavioral control, and subjective norms. Data collection ran from Nov 2010 to Apr 2011.

Ninety-two university students completed Survey 1 (78.3% female; 20.7% male). Fifty-four of the original sample completed Survey 2. Statistically significant changes in mean scores between Survey 1 and Survey 2 were observed for: attitudes and perceived behavioral control for local eating; perceived behavioral control for cooking at home; and subjective norm for meatless meals. Change in intention and fruit and vegetable intake did not reach statistical significance. Subjective norm, perceived behavioral control, and attitude account for 28.3% of variance in intention to eat locally ($F = 9.204$, $p = 0.000$), 22.2% of variance in intention to cook at home ($F = 6.995$, $p = 0.000$), and 12.2% of variance in intention to eat meatless meals ($F = 3.926$, $p = 0.013$).

This study provides dietitians and university health promotion programs with evidence supporting the use of various behavior change techniques to modify predictors of behavior with respect to sustainable eating. Further research is required to confirm the relationship between specific behavior change techniques and subsequent changes in sustainable eating practices.

Introduction

On any given day, 25% of Canadians will eat food prepared at a fast-food outlet, with the highest frequency of eating fast food seen in the 19 to 30 years age group (Garriguet, 2004). Young adults are reported to view cooking as "warming, picking-up, or assembling of prepared components", resulting in higher reliance of processed foods and snack-type foods (Serecon Management Consulting Inc prepared for Agriculture and Agri-Food Canada, 2005). University students are particularly at risk of relying on pre-prepared and processed foods, as they are presented with the new responsibilities of grocery shopping, meal planning and meal preparation (Garcia *et al.*, 2010). Inadequate cooking skills and lack of nutrition knowledge are reported by young adults to be barriers to cooking at home (Larson *et al.*, 2006; Garcia *et al.*, 2010). The current food preparation habits of young adults are contributing to high intakes of sodium and saturated fat, and low intakes of fiber and fruits and vegetables, placing young adults at a high risk for developing chronic diseases earlier in life (Bazzano *et al.*, 2001; Health Canada, 2002; Weatherall *et al.*, 2003; Newby *et al*, 2005; Larson *et al.*, 2006; Genkinger & Koushik, 2007; Aune *et al.*, 2009; Larson *et al*, 2009; Sinha *et al.*, 2009; Mozaffarian *et al.*, 2010; United States Department of Agriculture [USDA], 2010).

Diets consisting largely of heavily processed or pre-prepared foods has resulted in increased energy inputs into the food system, increased waste from non-recycled packaging, and an overall reduction in dietary quality (Heller & Keoleian, 2003; Story *et al.*, 2008; Wang *et al.*, 2008; Williams & Wikström, 2011). Dietary habits which optimize human health while conserving natural and non-renewable resources, and reducing contamination of the natural environment, are referred to as sustainable eating practices (Tagtow & Harmon, 2008). Individuals who value and/or practice sustainable eating habits have higher fruit and vegetable

intakes, and lower saturated fat intakes, leading to lower chronic disease risk and lower chronic-disease-related healthcare costs (Bazzano *et al.*, 2001; Health Canada, 2002; Weatherall *et al.*, 2003; Newby *et al*, 2005; Larson *et al.*, 2006; Genkinger & Koushik, 2007; Aune *et al.*, 2009; Larson *et al.*, 2009; Sinha *et al.*, 2009; Mozaffarian *et al.*, 2010; United States Department of Agriculture [USDA], 2010; Williams & Wikström, 2011).

Eating locally-produced foods, eating meatless meals more often, and preparing a greater proportion of meals at home, are sustainable eating behaviors gaining considerably greater consumer attention (Byker *et al.*, 2010; Johns Hopkins Bloomberg School of Public Health, 2011). Locally-produced foods can be purchased at farmer's markets and supermarkets, or can be obtained through participating in community gardens, community-supported agriculture, or growing produce at home (Ball, 2009). Obtaining locally-produced foods, to replace foods from national or international sources, reduces GHG emissions from transportation, and reduces reliance on non-renewable resources such as fossil fuels (Pirog *et al.*, 2001; Xuereb, 2005). Individuals who obtain food from mainly local sources have been shown to have higher intakes of fiber, fruits and vegetables, and lower intakes of saturated fat (Rose 2008). Similarly, choosing non-animal sources of protein, instead of industrially sourced animal protein, promotes conservation of natural resources and reduces greenhouse-gas emissions (Bennett & Blaney, 2002; Pimentel & Pimentel, 2003; Serecon Management Consulting Inc prepared for Agriculture and Agri-Food Canada, 2005; Garnett, 2009; Garnett 2011). Replacing animal-based protein with non-animal protein is also demonstrated to reduce risk of cancer, heart disease, type 2 diabetes mellitus and prevent long-term weight gain, through a reduction in saturated fat intake, and an increase in dietary fibre intake (Bazzano *et al.*, 2001; Weatherell *et al.,* 2003; Newby, Tucker & Wolk, 2005; Genkinger & Koushik, 2007; Aune, Ursin & Veierød, 2009; Mitchell,

Lawrence, Hartman & Curran, 2009; Sinha, Cross, Graubard, Leitzmann & Schatzkin, 2009; Mozaffarian, Micha & Wallace, 2010).

Despite becoming increasingly aware of the environmental and health issues associated with their food choices, young adults report several barriers as preventing them from making sustainable food choices (Escott-Stump *et al.,* 2002; Weatherall *et al*., 2003). There is limited research on effective health promotion strategies that encourage the adoption of these sustainable eating behaviors by students during the formative years of university. The purpose of this study is to assess the effectiveness of a multi-component campaign to promote sustainable eating on a university campus, in modifying students' intentions to eat sustainably. The benefits of eating locally, eating meatless meals, and cooking at home, were promoted through a webpage, cooking workshops and animated kiosks, to positively affect student attitudes, norms and perceived barriers toward sustainable eating. Specific research questions include:

1. Does the intervention increase students' intentions toward: consuming locally-produced foods, preparing more meals at home, and eating meatless meals?

2. Does the intervention increase students' self-reported fruit and vegetable intake?

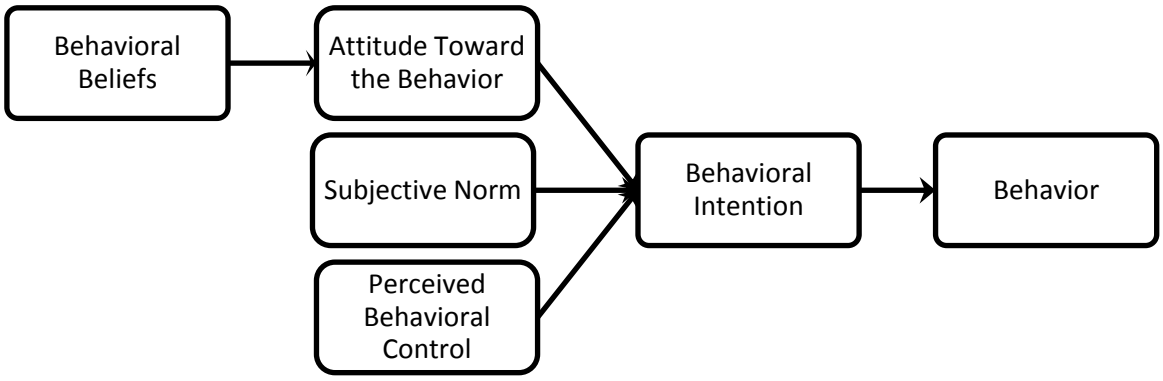
It was hypothesized that the intervention would produce a significant increase in students' intentions to eat locally produced food, prepare meals at home more often, and eat meatless meals more often. An increase in fruit and vegetable intake was expected to occur secondary to an increase in intention to eat sustainably (Larson *et al*., 2006, Rose *et al*., 2007; Arvola *et al.,* 2008; American Dietetic Association [ADA], 2009).

Methods

Behavior Modification

This study used the Theory of Planned Behavior (TPB) model (Figure 1) to examine and evaluate changes in university students' intentions to eat sustainably, as defined by three behaviors: using local foods, cooking at home and eating meatless meals. The TPB proposes that an individual's decision to perform a specific behavior can be predicted by the individuals'; attitude toward the behavior, perceived expectations from others to perform the behavior (subjective norms, SN), and perceived ability to perform the behavior (perceived behavioral control, PBC) (Ajzen, 1985). Intention of carrying out a behavior is commonly measured as a proxy to actual behavior due to convenience and practicality (Ajzen, 1991). In accordance with TPB, an individual will engage in sustainable eating if: his/her attitudes toward sustainable eating, and the perceived outcomes of sustainable eating, are positive; there is perceived social pressure to engage in sustainable eating; and, the individual feels capable and in control of engaging in sustainable eating practices. Students' intentions to sustainable eating practices will be predicted by their attitudes, perceived behavioral control, and subjective norms regarding the behaviors (Ajzen, 1985). The TPB has been investigated with respect to various health behaviors in the past and more recently, with sustainable eating behaviors (Robinson & Smith, 2002; Shaharudin *et al.,* 2010; Vermeir & Verbeke, 2006; Wyker & Davison, 2010; Arvola *et al.,* 2008). The TPB was used to develop the survey tool used in the assessment of this intervention.

Figure 1. Theory of Planned Behavior (Ajzen, 1991)



Interventions

Interventions aimed at changing behavior as predicted through the TPB are designed to modify attitudes, subjective norm and perceived behavioral control for that behavior, also known as predictors of behavior. The intervention developed for the present study consisted of three components, and employed multiple techniques of behavior change. The three components of the intervention were: cooking workshops, animated kiosks, and a webpage. Behavior modification techniques included in the intervention were: supplying information on the personal and environmental benefits of eating sustainably; persuasive verbal communication; behavioral rehearsal; and experiential learning (Michie *et al.*, 2008, Kolb *et al.*, 2001). These behavioral change techniques have been previously demonstrated to: modify intention and determinants of intention, improve dietary intake, and increase self-reported sustainable eating behaviors (Brown & Hermann, 2005; Levy & Auld, 2004; Michelman *et al.,* 2005).

A webpage titled “Sustainable Eating” was created within a pre-existing health-promotional website called Fit@McGill, and contained information on each of the three

sustainable eating behaviors. Information regarding the benefits of eating sustainably, and information on how to carry out each of the behaviors, was provided through this webpage. Informational kiosks were animated by McGill Dietetics stagiaires and trained peer educators, who disseminated sustainable eating information through persuasive verbal communication and in the form of print materials, at three campus events.

Cooking workshops involved an educational component, which included a discussion on sustainable eating led by a Dietetics stagiaire, as well as behavioral rehearsal and an experiential learning component, through participant involvement in preparing a meal. Students interested in participating in cooking workshops could sign up at various health promotion events throughout the academic year. Participants prepared a balanced vegetarian meal containing locally sourced foods at each workshop. Sustainably-grown food materials were provided by McGill Food and Dining Services for the cooking workshop. An attendance limit for each workshop was set at 15 participants. Other sustainable behaviors, such as recycling and composting, were modeled at the events.

Data Collection

The study received approval from the Ethics Review Board within the Faculty of Agricultural and Environmental Sciences at McGill University, and informed consent was obtained prior to survey completion. Data were collected between November 2010 and April 2011. Surveys were collected at the time of exposure to the intervention (Survey 1; n = 92), and two weeks following the intervention (Survey 2; n = 54). Survey 1 was completed by individuals: clicking on a link to the survey placed on the Fit@McGill webpage; filling out paper surveys at

kiosks; and completing paper surveys at cooking workshops. Survey 2 was accessed to participants through a hyperlink sent in an email two weeks following completion of Survey 1.

Measures

The same instrument was used at Survey 1 and Survey 2. Demographic questions and other related measures (age, weight, height, year and faculty of study) comprised the start of the survey. Subsequently, respondents were asked to estimate their daily fruit and vegetable intake by selecting one of eight categories, ranging from "1 serving", to "≥ 8 servings". Examples of serving sizes were provided.

Questions pertaining to attitude, subjective norm, perceived behavioral control, and intention, were constructed for each behavior separately, from questionnaires validated in previous studies (Saba, 2003; Robinson & Smith, 2002; Brug,, 2006; Armitage, 1999; Chen, 2007; Arvola, 2008; Rodgers, 2008; Shaharudin, 2010; Bogers, 2004). The order of questions in the survey was: eating locally, cooking meals at home, and eating meatless meals. Attitude, subjective norm and perceived behavioral control were measured using Likert scale questions, where 1=strongly disagree, 2=disagree, 3=neutral/undecided, 4=agree, and 5=strongly agree. Selected questions were negatively worded to prevent respondents from selecting the same response regardless of the context. Reliability coefficients (Cronbach's alpha) for subjective norm and perceived behavioral control for each behavior ranged from 0.27 to 0.7.

Attitude was measured indirectly through two sets of Likert scales: one for behavioral beliefs and one for outcome evaluations. Attitude score is calculated as the belief composite score ($A = \sum a_i b_i$, where 'A' is the attitude score, 'a' is the score for each behavioral belief, and 'b' is the score for each outcome evaluation) (Francis *et al.,* 2004). Subjective norm and perceived

behavioral control were measured with two and four Likert-scale items, respectively, for each behavior. Scores for subjective norm and perceived behavioral control were calculated as the mean of the respective individual item scores. Intention to perform each behavior over the next week was assessed using a single item.

After the sections on eating locally and cooking at home, participants were asked if they eat meat, fish or poultry. Response was in a 'yes/no' format. Participants selecting 'no' were instructed to submit the survey without completing the meatless meals section. The survey was pilot-tested on 10 students and staff, and was modified slightly from the original version to improve reader comprehension. The final version of the survey can be found in the Appendix E.

Data analysis

Survey data was collected and entered into LimeSurvey®. Data was analyzed using IBM® SPSS® Statistics 18.0.0. Descriptive statistics were used to show the demographic profile of respondents (gender, age, body mass index, year of study, faculty). Differences in mean self-reported fruit and vegetable intake between Survey 1 and Survey 2 were subject to the two-tailed Wilcoxon signed ranks test, on matched pairs.

Each behavior was analyzed individually. Mean scores for attitude, subjective norm, perceived behavioral control and intention are calculated for Survey 1 and Survey 2. Two-tailed Wilcoxon signed rank test was performed on the mean scores of each construct for Survey 1 and Survey 2.

Pearson's correlation coefficients were produced to explore the relationships between attitudes, subjective norm, perceived behavioral control and intention for each behavior. Pearson's correlation coefficients were also produced to investigate inter-behavior relationships.

Principal component analysis using varimax rotation was conducted on attitude, subjective norm and perceived behavioral control for each behavior. Components were extracted if their Eigenvalue was greater than 1.0. Regression values for principal components were saved and entered in regression models if the following criteria were satisfied: Bartlett's test was passed ($p < 0.05$) and KMO was greater than 0.60.

The overall validity of the theoretical model was assessed using multiple linear regressions. Intention was defined as the dependent variable and attitude, subjective norm, perceived behavioral control were included simultaneously as independent variables.

Results

Survey response frequencies are presented in Appendix A. Body mass index, year of study, faculty of study and age statistics can be seen in Table 1. Differences in construct scores between Survey 1 and Survey 2 did not reach significance between groups according to age, gender, level of study and faculty. Seven (7.5%), 42 (45.2%) and 44 (47.3%) participants completed Survey 1 at an informational kiosk, at a cooking workshop and through the website, respectively. Survey 1 respondents indicated they had previously: seen an informational kiosk (17%), viewed the Sustainable Eating webpage (44%), and attended a cooking workshop (17%).

Mean fruit and vegetable intake was 4.67 servings per day for Survey 1, and 4.37 servings per day for Survey 2 ($p = 0.39$). Distributions of intakes are presented in Appendix A.

Eating Locally

See Table 2 for mean scores for behavioral constructs at Survey 1 and Survey 2. Significant differences in mean scores were observed for attitude and perceived behavioral

control for local eating, between Survey 1 and Survey 2. Mean attitude score decreased, while mean score for perceived behavioral control increased. Intention to eat local foods did not change between Survey 1 and Survey 2.Variances in subjective norm and attitude account for 28.3% of variance in intentions to eat locally ($F = 9.2$, $p = 0.00$).

Cooking at Home

A significant increase in mean score for perceived behavioral control was observed for cooking at home, between Survey 1 and Survey 2. Intention to cook meals at home did not change between Survey 1 and Survey 2. Post-hoc analysis of those who attended a cooking workshop showed an increase in intention between Survey 1 and 2 for this subgroup only. Variance in perceived behavioral control accounted for 22.2% of variance in intention to cook at home ($F = 6.9$, $p = 0.00$).

Eating Meatless Meals

A significant increase in mean score for subjective norm was observed for eating meatless meals, between Survey 1 and Survey 2. Intention to eat meatless meals did not change between Survey 1 and Survey 2. Variances in attitude account for 12.2% of variance in intention to eat meatless meals ($F = 3.9$, $p = 0.01$).

Discussion

Body Mass Index

The current sample has an average body mass index (BMI) of 22 kg/m^2, within the normal range of 18.5 to 24.9 kg/m^2. The BMI range of the present sample at Survey 1 is

expected for a sample identifying themselves as being health- or environmentally-conscious (Gow *et al.*, 2010; Brunt & Rhee, 2008; Larson *et al.,* 2009; Chock, 2011; Greene *et al.,* 2011). This is lower than the average BMI of Canadians aged 20 to 39 years, however, of 26.2 kg/m^2, which classifies the majority of Canadians within the same age group as being overweight (Statistics Canada, 2010).

Fruit and Vegetable Intake

The majority of female and male participants have self-reported to be consuming less than the minimum number of servings of fruits and vegetables as recommended by Canada's Food Guide to Healthy Eating, at Survey 1 and 2. These findings are consistent with those from similar studies assessing fruit and vegetable intakes of college students (Nelson & Story, 2009; Ha & Caine-Bish, 2009).

There are several explanations for the lack of change in fruit and vegetable (FV) intake. Firstly, the interventions involved educational, experiential and motivational strategies to encourage three sustainable eating behaviors, and did not specifically promote increasing FV consumption. Interventions aimed at increasing FV intake are most effective at bringing about an increase in FV intake if the study participants are at high risk of disease (Pomerleau *et al.,* 2005). As college students are reported to inaccurately perceive their risk of disease to be lower than their actual risk of disease, it is expected that their motivation to change their FV intake would be low (Francis *et al.,* 2004; Green *et al.,* 2003). Second, there was no increase in intentions for each of the three behaviors that were expected to lead to an increase in FV intake (Farmer *et al.,* 2011; Engler-Stringer, 2010; Rose *et al.,* 2007). Lastly, this outcome measure relied on self-

reported information. Although examples were given to inform participants on what constitutes a serving size based on Canada's Food Guide to Healthy Eating, this questionnaire item may not have been sensitive enough to capture the small change in FV intake typical of such interventions (Francis *et al.*, 2004).

Eating Locally

Attitude score decreased from a mean score of 17.65 down to 16.88, however both of these scores indicate that this sample has a strong, positive attitude toward eating locally before and after the intervention. The unexpected decrease in attitude score could be due to the fact that the indirect measure of attitude that was used in this survey did not include behavioral beliefs which are valued highly by respondents (Ajzen, 2001). Alternatively, there may factors influencing intentions to eat locally that were not measured, such as internal satisfaction, sense of responsibility, or prioritization of beliefs (Arvola *et al.*, 2008; Kollmuss & Agyeman, 2002). Post-hoc analyses show that there are no differences between scores for behavioral beliefs between Survey 1 and 2, however there is a significant drop in scores for the outcome evaluation of eating healthy food. That is, students are reporting that eating healthy food is less important to them at Survey 2 than at Survey 1. It has been recorded that young adults value the taste of food more highly than the perceived healthfulness of food (Roininen *et al.*, 1999). There are no items for outcome evaluations relating to taste in the questionnaire for the current study. Therefore, it remains unknown as to whether the intervention modified students' perceptions of taste for local food, at the expense of lowering the rated self-importance of eating healthfully.

Subjective norm, for eating locally, did not change following the intervention. Subjective norm is a measure of the social pressure that an individual feels to comply with a behavior, and also includes the degree to which that individual feels motivated to "give in" to that pressure. Modifying subjective norm, therefore, requires the identification of important others, and the beliefs and attitudes of these important others regarding eating sustainably. It was expected that the use of peer educators, reliable sources (Dietetics stagiaires) and peer involvement at cooking workshops would increase subjective norm for all behaviors, on the pretense that peers and reliable sources are perceived as being "important others". It is possible that individuals or groups (i.e. partners, family members, professors, specific friend groups) perceived as "important others" by the study population were not involved in the intervention. Future interventions should consider a series of group cooking classes as they may provide an additive effect on the change in subjective norm through the development of interpersonal ties and a sense of social support in one's attempts to eat sustainably.

The increase in perceived behavioral control and perceived accessibility was expected following an intervention providing information on accessibility of local foods either on the webpage, at informational kiosks or at cooking workshops (Ajzen, 1985). Although some authors report that there are seasonal variations in local produce availability and price which would decrease perceived behavioral control to eat locally, the present intervention was effective at overcoming these perceptions (Riediger *et al.*, 2007; Hall *et al.*, 2009).

Perceived behavioral control was found to be an independent predictor of intention in this study, as predicted by the TPB. Variances in perceived behavioral control accounted for 28.3% of variance in intention to eat local foods in the present study. Bissonnette and Contento (2001) used an "extended Theory of Planned Behavior" to predict intention, which accounted for 31%

of variance in intention to consume or purchase foods grown locally, similar to the results presented here.

Cooking at Home

Perceived behavioral control scores for cooking at home increased between Surveys 1 and 2. These results are consistent with findings of other researchers using interventions involving provision of information, persuasion, and skill rehearsal for cooking meals at home. Collins (2010) found that following completion of the food lab series, students reported having increasing levels of perceived skill and knowledge of meal preparation, and decreased perceived difficulties in preparing meals. Similarly, Wrieden *et al* (2007) reported that a greater proportion of participants cooked from basic ingredients following a series of educational and foods skills workshops, and significantly increased confidence in following a recipe.

There was no increase in intention to cook at home despite the increase in mean perceived behavioral control score. It has been hypothesized that the strength of the PBC-intention relationship can vary depending on the complexity of the behavior in question (Rodgers *et al*., 2008). Cooking meals at home, for instance, requires necessary skill and ability to carry out a subset of behaviors including food purchasing, meal preparation and clean-up. The statement "I feel confident I can cook meals at home more often over the next two weeks" is asking about the behavior of cooking at home only, and is not explicitly involving the extraneous tasks and skills that are required (Jaeger & Meiselmann, 2004). If participants felt capable of cooking meals, but felt unable to find the time to purchase foods and/or spend time cleaning up

after cooking, this perceived difficulty would not be captured in the current questionnaire nor could they be included in one single cooking workshop.

The interventions were advertised as promoting "Sustainable Eating", resulting in a possibility for a respondent bias toward students who already value and intend to practice sustainable eating, hence the high level of intention at Survey 1 (Sarkin *et al.*, 2008). Specifically, the inability of the interventions to modify intentions to cook meals at home more often could also be a result of the high level of intention to cook meals at home at Survey 1 (mean = 4.10; range = 1-5). It is possible that there is a selection bias for students who are generally interested in cooking, given the high level of intention to cook at home at Survey 1.

Eating Meatless Meals

Attitude was the only significant predictor of intention, opposing the TPB that each construct is an independent predictor of intention. Similar to the present study, Wyker and Davison (2010) found attitudes to be a predictor of intention to follow a plant-based diet for one year (Wyker & Davison; 2010). The only change in construct score in the present study, however, was seen in subjective norm. The incorporation of peer educators and Dietetic stagiaires, as reliable sources, into the interventions could explain the increase in subjective norm for eating meatless meals. In contrast, this was not sufficient to increase score for subjective norm for either eating locally or cooking at home. This difference may be a result of peers modeling the behavior of preparing and eating meatless meals; participants at the cooking workshops prepared meatless meals from foods already acquired, so the behavior of purchasing local foods was not modeled specifically (Delacollette *et al.*, 2011).

The present study found that attitude, subjective norm and perceived behavioral control only account for 12.2% of variance in intentions to eat meatless meals as much as possible over the next week. Wyker and Davison (2010) found that attitude, subjective norm and perceived behavioral control accounted for 61% of variance in intention to follow a plant-based diet over the next year. The difference in prediction of intention between the present study and that of Wyker and Davison could be due to the differences between the specificities of the behaviors in question, or due to the differences in sample size (Glanz *et al.*, 2008; Ajzen, 2011). The smaller sample size for this particular section of the survey (n = 66), compared to the other two behaviors investigated here is the consequence of one survey item ("Do you eat meat, fish or poultry?"). Participants who report to not eat meat, fish or poultry were instructed to not complete the "meatless meals" section of the survey. The resulting lower response rate to this section of the survey compared to the sample size of Wyker and Davison (n = 204), could have resulted in a weaker linear relationship between the independent and dependent variable(s), and a theoretical model with apparently poor predictive quality (Wyker & Davison, 2010).

Prevalence of vegetarianism in university student populations varies widely between studies. For example, 23.9% of university students in Jordan were self-reported to be vegetarians, mostly for "weight control and economic reasons", compared to just 6.7% of students at Lakehead University in Thunder Bay, Ontario (Suleiman, Alboqai, Kofahi, Aughsteen & El Masri, 2009; Kooshesh, 2010). The proportion of respondents who report to not be consuming meat, poultry or fish is higher than rates of vegetarianism reported in other universities, suggesting that the current sample is likely a health-conscious group of individuals. Moreover, lack of knowledge and inconvenience of plant-based diets are reported as impediments to students choosing to not follow a plant-based diet (Suleiman *et al.*, 2009). The high prevalence

of participants reporting to not be consuming meat or fish suggests that this sample may represent a group of students who possess greater nutrition knowledge and food preparation skills compared to other university students.

Change in Intentions

The inability of the interventions to modify intentions for all of the behaviors could be related to the high level of intention to perform each behavior at Survey 1, which is possibly due to a respondent bias as previously discussed. Behavior changes are also notoriously difficult to promote, and slow to develop, so it is possible that this study is not capturing changes in behavior that occurred or will be occurring following the two week time frame between Survey 1 and Survey 2 (Kollmuss & Agyeman, 2002).

Limitations

Attitude was assessed using an indirect measure only for each behavior in order to reduce the length of the survey and increase response rate. Perceived behavioral control and subjective norm were assessed using direct measures only, as these are more strongly associated with intentions (Ajzen, 1985). Several limitations are associated with this survey design. First, this design does not allow for scale items to be validated (Francis *et al.*, 2004). Second, this design limits the ability to identify which normative and control beliefs are motivating students' intentions, and therefore which beliefs should be targeted for modification through the intervention (Ajzen, 1985).

Furthermore, behavioral beliefs were gathered through a literature search on relevant studies. Consequently, motivations to change behavior such as sense of responsibility are not

represented in the attitude measure (Kollmuss & Agyeman, 2002). Therefore, it is possible that additional behavioral beliefs would have been identified through conducting a focus group with this study population.

There is evidence that "multiple-channel delivery" of behavior change messages is more effective at modifying self-reported behavior to make healthy food choices than single-channel delivery methods (Lefebvre *et al.*, 1999). Furthermore, cooking workshops involved more hands-on, experiential learning for participants, compared to those who read the webpage or approached a kiosk. The differential impact of various behavior change techniques employed in each component of the intervention cannot be assessed given the small sample size. The study sample was assessed as one large group with heterogeneous exposures to the interventions. Thus, it is not possible to determine if individual components of the intervention (webpage, cooking workshop, or kiosk), or if specific behavior change techniques, were effective at modifying intentions.

As previously discussed, there is likely a selection bias inherent in this sample. Future studies can include surveying a random sample of students to be used as a comparison group, to determine if the sample being investigated is indeed more likely to be intending to eat sustainably than a random sample of students. This will also allow researchers to draw conclusions on how this present sample relates to the general student population.

The low reliability coefficients for several constructs (i.e. Cronbach's alpha less than 0.60) may be due to a small sample size, presence of skewness, and/or a potential "underestimating of relationships" between behavioral constructs (Schmitt, 1996). In order to compare the results of this study with similar studies investigating TPB, normality of data was an assumption to allow

for multiple linear regressions to be carried out. There are additional concerns regarding the norm of analyzing Likert-type scale questions as continuous data, particularly given the small sample size of the present study.

Relevance to Practice

Health promotion interventions involving a combination of behavior change techniques, such as experiential-learning, provision of information, and peer involvement, can be implemented to increase students' attitudes and perceived behavioral control toward sustainable eating. Group cooking workshops, informational webpages and interactive kiosks are examples of interventions which could be implemented. Cooking workshop participants as a subgroup were found to have increased intentions to cook at home, comparable to results of other educational, hands-on cooking and nutrition programs (Davis *et al.*, 2011; Hermann *et al.*, 2006, Garden-Robinson, 2011). This information is sufficient to warrant further investigation of experiential learning programs, such as those involving cooking classes, to modify students' intentions to eat sustainably. Requesting that participants pay a small fee to cover the costs of the workshop materials may enable health promotion departments with small budgets and unlimited demands for their resources, to carry out regular cooking workshops as a series. Cooking workshops, and other interventions, should be designed according to the participants' skillset and knowledge-level, in order to build upon previously-held beliefs, attitudes and perceived barriers to sustainable eating. Informal follow-up with participants can inform health promotion departments about participant satisfaction with the cooking classes. Longer-term follow-up with participants can provide an indicator of utilization of skills learned through cooking workshops, for example, by asking participants if they have prepared workshop recipes at home.

There were several inconsistencies between predicted and actual relationships between construct variables and intention, which may warrant the investigation of other behavior change models, such as the Health Belief Model or Social Learning Theory, to the behavior of sustainable eating. Future interventions should aim to include multiple methods of changing behavior, including persuasive verbal communication, modeling and experiential learning. Consideration should also be given to ensuring sufficient sample size to allow for analysis of the effects of each component of an intervention using multiple communication methods. Ideally, future studies assessing the behavioral change with respect to sustainable eating will perform a priori focus groups and sufficient pilot testing to minimize limitations in conclusions from the survey tool itself.

Future research could examine the specific behavioral, normative and control beliefs associated with sustainable eating. Once specific beliefs are identified, interventions can be developed to: enhance beliefs already existing; create new beliefs; and make new and existing beliefs important to individuals when making food choices (Ajzen, 1985). The field of sustainable eating is relatively new, so it is essential to discover the specific perceived barriers and motivators of university students to: eating locally, eating meatless meals and cooking at home. Young adults are an ideal population within which to study the long-term health outcomes of newly-acquired sustainable eating habits.

Conclusion

The present study adds to the current research base, an investigation applying the Theory of Planned Behavior to predicting and modifying intentions to eat sustainably in a university student population. Health promotion campaigns to promote sustainable eating may exhibit a

selection-bias toward the inclusion of participants who already value, and practice sustainable eating. Therefore, future interventions on university campuses should aim to increase awareness of sustainable eating practices among the general population. Hands-on learning experiences, such as cooking workshops, allow students to practice the skills required to carry out the desired behaviors, thereby increasing self-efficacy and decreasing perceived barriers.

The Theory of Planned Behavior stipulates that attitudes, subjective norm and perceived behavioral control are independent predictors of behavioral intention (Ajzen, 1991). In the present study, constructs found to be significant in predicting each individual behavior varied with respect to the behavior, as did the effect of the intervention in modifying these construct measures. While attitudes toward sustainable eating behaviors are more commonly researched, it is essential to investigate the social and practical context within which individuals make food choices, in order to develop interventions effective at modifying behavior.

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Tables

Table 1: Demographic Characteristics, Survey 1 (n = 92)

	N (%)	Mean ± SE
Gender		
Female	72 (78.3)	N/A
Male	19 (20.7)	
No response	1 (1.1)	
Age		
<18 years	4 (4.3)	
18-24	63 (68.5)	21.7 ± 3.61
25-29	11 (12.0)	
30+	6 (6.5)	
No response	8 (8.7)	
BMI		
<18.5	9 (9.8)	
18.5-24.9	57 (62.0)	22.0 ± 2.89
25-29.9	15 (16.3)	
No response*	11 (12.0)	
Level of study		
Freshman year (Year 0)	9 (9.8)	
Year 1	20 (21.7)	
Year 2	13 (14.1)	N/A
Year 3	13 (14.1)	
Year 4	3 (3.3)	
Graduate (Master's, PhD)	18 (19.6)	
Other	7 (7.6)	

No response	9 (9.8)	
Faculty		N/A
Agricultural and Environmental Sciences	15 (16.3)	
Arts	22 (23.9)	
Arts and Science	2 (2.2)	
Education	4 (4.3)	
Engineering	4 (4.3)	
Environment	2 (2.2)	
Law	7 (7.6)	
Management	4 (4.3)	
Medicine	2 (2.2)	
Science	19 (20.7)	
Other	2 (2.2)	
No response	9 (9.8)	

*No response to either of the weight or height question, or both.

Table 2: Mean scores of TPB Construct Measures, Survey 1 and 2

	Survey 1		Survey 2		P-value[a]
	Mean score	SD	Mean score	SD	
Local eating					
Attitude	17.65	6.99	16.88	7.15	0.012*
PBC	3.26	.654	3.92	.837	0.028*
SN	2.90	.693	2.44	.966	0.856
Intention	3.35	.895	3.31	.903	0.197
Meatless meals					

Table 2: Mean scores of TPB Construct Measures, Survey 1 and 2

Attitude	17.13	8.02	18.65	8.15	0.264
PBC	4.04	.928	3.93	.906	0.981
SN	2.41	.572	2.84	.708	0.005*
Intention	3.25	1.00	3.49	.961	0.746
Cooking					
Attitude	17.97	7.74	18.82	8.23	0.125
PBC	3.35	.652	3.92	.837	0.001*
SN	2.90	.693	2.78	.980	0.277
Intention	4.10	.934	4.13	.694	0.813

a. P-value: Wilcoxon signed ranks test on paired data, alpha = 0.05, two tailed.
b. Asterisk denotes p-values less than 0.05.

Table 3: Standardized Coefficients of Predictors of Intention, Survey 1

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1[a]	(Constant)	0.733	0.575		1.275	0.206
	ATT	0.044	0.013	0.344	3.358	0.001
	SN	0.419	0.145	0.295	2.878	0.005
	PBC	0.237	0.141	0.173	1.68	0.097
2[b]	(Constant)	1.523	0.715		2.129	0.037
	ATT	0.009	0.013	0.078	0.694	0.49
	SN	0.064	0.149	0.048	0.432	0.667
	PBC	0.68	0.155	0.493	4.383	0
3[c]	(Constant)	1.57	0.693		2.267	0.027
	ATT	0.036	0.015	0.289	2.362	0.021
	SN	0.041	0.208	0.024	0.198	0.844
	PBC	0.242	0.13	0.225	1.867	0.067

a. Model 1 Predictors: (Constant), Attitude score, perceived behavioral control, subjective norm for Local Eating. Dependent Variable: intention for Local Eating.
b. Model 2 Predictors: (Constant), Attitude score, perceived behavioral control,

subjective norm for Home Cooking. Dependent Variable: intention for Home Cooking.

c. Model 3 Predictors: (Constant), Attitude score, perceived behavioral control, subjective norm for Meatless Meals. Dependent Variable: intention for Meatless Meals.

Appendices

Appendix A: Tables

Table 1. Survey Responses for Local Eating Behavior, Time 1

	N	Possible score range	Actual score range	Mean	SD
Behavioral beliefs*					
Local fruits and vegetables are more nutritious than conventional fruits and vegetables.	79	1-5	2-5	3.53	.985
Choosing local fruits and vegetables is more environmentally-friendly than choosing conventional fruits and vegetables	79	1-5	3-5	4.58	.612
Local fruits and vegetables taste better than conventional fruits and vegetables.	79	1-5	2-5	3.78	.956
Local fruits and vegetables are more expensive than conventional fruits and vegetables. (R)	79	1-5	1-4	2.76	.990
If I wanted to eat local fruits and vegetables, I would have difficulties finding where to buy them.(R)	79	1-5	1-4	3.16	.993
Outcome evaluations*					
It is important for me to eat food that is healthy.	78	-2 to 2	-1to 2	1.54	.618
It is important for me to eat food that is environmentally-friendly.	77	-2 to 2	-1 to 2	1.01	.769
The cost of food is important to me.	78	-2 to 2	-1 to 2	1.37	.824
It is important to me that my preferred foods are easily available.	78	-2 to 2	-1 to 2	1.12	.738
Attitude score*	77	-40 to 40	2 – 32	17.65	6.99

PBC (alpha = .613)	76	1 – 5	2- 4.75	3.26	.654
Whether or not I choose to eat local foods is entirely up to me.	76	1-5	2-5	3.99	.986
If I wanted to, it would be possible for me to eat mostly local foods over the next week.	78	1-5	2-5	3.23	1.06
I am confident that I can choose local foods over the next week.	78	1-5	2-5	3.18	.879
It would be difficult for me to choose local foods over the next week instead of non-local foods. (R)	78	1-5	2-5	3.32	.904
SN (alpha = .277)	76	2-10	2-4	2.59	.629
The people who are important to me expect me to eat locally.	79	1-5	2-5	2.64	.852
I feel under social pressure to purchase and consume local foods.	77	1-5	1-4	2.53	.791
Intention					
I intend to choose local foods as much as possible over the next week.	78	1-5	2-5	3.35	.895

1. Scaling of responses for all questions with possible score range from 1 to 5: 1 = strongly disagree, 2 = disagree, 3 = neutral/undecided, 4 = agree, 5 = strongly agree.

2. "(R)" denotes scores recoded prior to analysis as: 1 = strongly agree, 2 = agree, 3 = neutral/undecided, 4 = agree, 5 = strongly agree.

* Internal consistency is not required of indirect measures of the TPB constructs, as different accessible beliefs may be inconsistent with each other (Ajzen 2004; http://www-unix.oit.umass.edu/~aizen/faq.html)

Table 2: Survey Results for Home Cooking , Time 1

	N	Possible score range	Actual score range	Mean	SD
Behavioral beliefs					
By preparing my own meals, I am eating foods that are healthier than if I did not prepare my own	77	1-5	2-5	4.42	.714

meals.					
By preparing my own meals, I eat food that is more environmentally friendly than if I did not prepare my own meals.	77	1-5	2-5	3.97	.888
By preparing my own meals, I am eating food that tastes better.	76	1-5	2-5	4.01	.986
By preparing my own meals, I pay more for my total food expenses. (R)	76	1-5 (R)	1-5	3.76	.746
If I choose to prepare my own meals, I will have difficulties in meal planning and/or preparation. (R)	77	1-5 (R)	1-5	3.47	.926
Outcome evaluations					
It is important to me that the meals I want to eat are easy to prepare. (R)	78	-2 to 2	-2 to 2	.56	1.135
Attitude score*	76	-40 to 40	-4 to 32	18.00	7.74
PBC (alpha = .660)	65	1-5	1.5-4.5	3.35	.652
Whether or not I choose to prepare my own meals is entirely up to me.	77	1-5	2-5	4.01	1.05
If I wanted to, it would be possible for me to prepare my own meals as much as possible over the next week.	77	1-5	2-5	4.25	.962
I am confident that I can prepare my own meals over the next week.	65	1-5	2-5	4.06	1.014
It would be difficult for me to prepare my own meals over the next week.	65	1-5	1-5	2.42	.864
SN (alpha = .356)	77	1-5	2-5	2.90	.693
The people who are important to me expect me to prepare my own meals as much as possible.	77	1-5	2-5	3.32	.979
I feel under social pressure to prepare my own meals as much as possible.	77	1-5	1-5	2.48	.788
Intention					
I intend to prepare my own meals as much as possible over the next week.	77	1-5	2-5	4.10	.940

Table 3: Survey Results for Eating Meatless Meals, Time 1

	N	Possible score range	Actual score range	Mean	SD
Behavioral beliefs*					
Occasionally eating meatless meals is healthier than not doing so.	65	1-5	2-5	3.85	1.049
Occasionally eating meatless meals is more environmentally friendly than eating meals with meat.	65	1-5	2-5	4.12	1.053
Meatless meals can taste better than meals containing meat.	65	1-5	2-5	3.55	.936
Eating meatless meals more often is a way for me to save money on groceries.	65	1-5	1-5	3.89	1.048
If I wanted to eat meatless meals more often, I would have difficulties planning and preparing balanced meals. (R)	66	1-5	1-4	2.97	1.10
Outcome evaluations*					
It is important to me that my preferred foods are easily available.	78	-2 to 2	-1 to 2	1.12	.738
Attitude score*	64	- 40 to 40	-1 to 32	17.1	8.02
PBC (alpha = .700)	65	1-5	2-4.5	2.41	.572
Whether or not I choose to eat meatless meals more often is entirely up to me.	66	1-5	2-5	4.20	1.02
If I wanted to, it would be possible for me to eat meatless meals more often.	66	1-5	2-5	3.88	1.10
SN (alpha = .396)	65	1-5	2-4.5	2.41	.572
The people that are important to me expect me to eat meatless meals more often.	66	1-5	2-4	2.37	.675
I feel under social pressure to eat meatless meals more often.	66	1-5	2-5	2.45	.771
Intention					

I intend to eat meatless meals more often.	66	1-5	2-5	3.25	1.00

Table 4: Survey Response Frequencies, Time 1 (frequency, percent)

	Strongly disagree	Disagree	Neutral/ undecided	Agree	Strongly agree	No response
Local eating						
Local fruits and vegetables are more nutritious than conventional fruits and vegetables.	0 (0)	15 (16.3)	20 (21.7)	31 (33.7)	13 (14.1)	13 (14.1)
Choosing local fruits and vegetables is more environmentally-friendly than choosing conventional fruits and vegetables.	0 (0)	0 (0)	5 (5.4)	23 (25.0)	51 (55.4)	13 (14.1)
Local fruits and vegetables are more expensive than conventional fruits and vegetables.	0 (0)	7 (7.6)	25 (27.2)	25 (27.2)	22 (23.9)	13 (14.1)
If I wanted to eat local fruits and vegetables, I would have difficulties finding where to buy them.	0 (0)	43 (46.7)	9 (9.8)	24 (26.1)	3 (3.3)	13 (14.1)
It is important for me to eat food that is healthy.	0 (0)	1 (1.1)	2 (2.2)	29 (31.5)	46 (50.0)	14 (15.2)
It is important for me to eat food that is environmentally-friendly.	0 (0)	1 (1.1)	19 (20.7)	35 (38.0)	22 (23.9)	15 (16.3)
Local fruits and vegetables taste better than conventional fruits	0 (0)	7 (7.6)	25 (27.2	25 (27.2)	22 (23.9)	13 (14.1)

and vegetables.						
The cost of food is important to me.	0 (0)	5 (5.4)	2 (2.2)	30 (32.6)	41 (44.6)	14 (15.2)
It is important to me that my preferred foods are easily available.	0 (0)	3 (3.3)	8 (8.7)	44 (47.8)	23 (25.0)	14 (15.2)
Whether or not I choose to eat local foods is entirely up to me.	0 (0)	10 (10.9)	7 (7.6)	33 (35.9)	26 (28.3)	16 (17.4)
If I wanted to, it would be possible for me to eat mostly local foods over the next week.	0 (0)	26 (28.3)	18 (19.6)	24 (26.1)	10 (10.9)	14 (15.2)
I am confident that I can choose local foods over the next week.	0 (0)	19 (20.7)	31 (33.7)	23 (25.0)	5 (5.4)	14 (15.2)
It would be difficult for me to choose local foods over the next week instead of non-local foods.	0 (0)	17 (18.5)	25 (27.2)	30 (32.6)	6 (6.5)	14 (15.2)
The people who are important to me expect me to eat locally.	0 (0)	45 (48.9)	18 (19.6)	13 (14.1)	2 (2.2)	14 (15.2)
I feel under social pressure to purchase and consume local foods.	1 (1.1)	47 (51.1)	15 (16.3)	13 (14.1)	76 (82.6)	16 (17.4)
I intend to choose local foods as much as possible over the next week.	0 (0)	15 (16.3)	28 (30.4)	28 (30.4)	7 (7.6)	14 (15.2)
Home cooking						
By preparing my own meals, I am eating foods that are healthier than if I did not prepare	0 (0)	3 (3.3)	1 (1.1)	34 (37.0)	39 (42.4)	15 (16.3)

my own meals.						
By preparing my own meals, I eat food that is more environmentally friendly than if I did not prepare my own meals.	0 (0)	5 (5.4)	16 (17.4)	32 (34.8)	24 (26.1)	15 (16.3)
By preparing my own meals, I am eating food that tastes better.	0 (0)	7 (7.6)	15 (16.3)	24 (26.1)	30 (32.6)	16 (17.4)
By preparing my own meals, I pay more for my total food expenses.	3 (3.3)	61 (66.3)	5 (5.4)	5 (5.4)	2 (2.2)	16 (17.4)
If I choose to prepare my own meals, I will have difficulties in meal planning and/or preparation.	3 (3.3)	47 (51.1)	13 (14.1)	11 (12.0)	3 (3.3)	15 (16.3)
It is important to me that the meals I want to eat are easy to prepare.	2 (2.2)	16 (17.4)	14 (15.2)	28 (30.4)	18 (19.6)	14 (15.2)
Whether or not I choose to prepare my own meals is entirely up to me.	0 (0)	12 (13.0)	5 (5.4)	30 (32.6)	30 (32.6)	15 (16.3)
If I wanted to, it would be possible for me to prepare my own meals as much as possible over the next week.	0 (0)	8 (8.7)	4 (4.3)	26 (28.3)	39 (42.4)	15 (16.3)
I am confident that I can prepare my own meals over the next week.	0 (0)	9 (9.8)	4 (4.3)	26 (28.3)	26 (28.3)	27 (29.3)
It would be difficult for me to prepare my own meals over the next week.	1 (1.1)	48 (52.2)	7 (7.6)	6 (6.5)	3 (3.3)	27 (29.3)
The people who are important to me expect	0 (0)	19 (20.7)	23 (25.0)	26	9 (9.8)	15 (16.3)

me to prepare my own meals as much as possible.				(28.3)		
I feel under social pressure to prepare my own meals as much as possible.	1 (1.1)	49 (53.3)	18 (19.6)	7 (7.6)	2 (2.2)	15 (16.3)
I intend to prepare my own meals as much as possible over the next week.	0 (0)	7 (7.6)	9 (9.8)	30 (32.6)	31 (33.7)	15 (16.3)
Meatless Meals						
Occasionally eating meatless meals is healthier than not doing so.	0 (0)	10 (10.9)	11 (12.0)	23 (25.0)	21 (22.8)	27 (29.3)
Occasionally eating meatless meals is more environmentally friendly than eating meals with meat.	0 (0)	8 (8.7)	8 (8.7)	17 (18.5)	32 (34.8)	27 (29.3)
Meatless meals can taste better than meals containing meat.	0 (0)	11 (12.0)	16 (17.4)	29 (31.5)	9 (9.8)	27 (29.3)
Eating meatless meals more often is a way for me to save money on groceries.	1 (1.1)	8 (8.7)	9 (9.8)	26 (28.3)	21 (22.8)	27 (29.3)
If I wanted to eat meatless meals more often, I would have difficulties planning and preparing balanced meals.	0 (0)	30 (32.6)	7 (7.6)	24 (26.1)	4 (4.3)	27 (29.3)
It is important to me that my preferred foods are easily available.	0 (0)	3 (3.3)	8 (8.7)	44 (47.8)	23 (25.0)	14 (15.2)
Whether or not I choose to eat meatless meals	0 (0)	8 (8.7)	4 (4.3)	20	33 (35.9)	27 (29.3)

more often is entirely up to me.				(21.7)		
If I wanted to, it would be possible for me to eat meatless meals more often.	0 (0)	12 (13.0)	7 (7.6)	23 (25.0)	23 (25.0)	27 (29.3)
The people that are important to me expect me to eat meatless meals more often.	0 (0)	48 (52.2)	10 (10.9)	7 (7.6)	0 (0)	27 (29.3)
I feel under social pressure to eat meatless meals more often.	0 (0)	46 (50.0)	10 (10.9)	8 (8.7)	1 (1.1)	27 (29.3)
I intend to eat meatless meals more often.	0 (0)	21 (22.8)	12 (13.0)	27 (29.3)	5 (5.4)	27 (29.3)

Table 5: Response to "Do you eat meat, chicken, or fish?" (n = 92)

	N (%)
Yes	65 (70.7)
No	12 (13.0)
No response	15 (16.3)

Table 6: Frequencies of self-reported daily fruit and vegetable intake

	Time 1 (n = 82)	Time 2 (n = 53)
Number of servings	N (%)	N (%)
1 serving	5 (5.4)	7 (13.0)
2 servings	5 (5.4)	2 (3.7)
3 servings	8 (8.7)	4 (7.4)
4 servings	21 (22.8)	12 (22.2)

5 servings	20 (21.7)	17 (31.5)
6 servings	10 (10.9)	5 (9.3)
7 servings	6 (6.5)	5 (9.3)
≥ 8 servings	7 (7.6)	1 (1.9)
No response	10 (10.9)	1 (1.9)

Table 7: Mean self-reported daily fruit and vegetable (FV) intake

	Mean (number of servings FV/day)	SD	P-value*
Time 1 (n = 82)	4.65	1.81	
Time 2 (n = 53)	4.32	1.80	.386

*For matched pairs, Wilcoxon signed rank test, alpha = 0.05, two-tailed.

Table 8**. Principal Component Analysis, KMO and Bartlett's Tests, All Behaviors**

		Local Eating	Home Cooking	Meatless Meals
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.546	0.509	0.555
Bartlett's Test of Sphericity	Approx. Chi-Square	3.18	1.52	4.85
	df	3	3	3
	Sig.	0.365	0.679	0.183

Table 9. Regression Model Summaries for Predicting Intention to Eat Sustainably

Behavior	R	R Square	Adjusted R Square	Std. Error of the Estimate
Local Eating	.532[a]	0.283	0.252	0.778
Home Cooking	.509[a]	0.259	0.222	0.799
Meatless Meals	.405[a]	0.164	0.122	0.933

a. Predictors: (Constant), Attitude, perceived behavioral control, subjective norm for each behavior.

Table 10. One-way Analysis of Variance (ANOVA) to Predict Intention to Eat Sustainably

Model		Sum of Squares	df	Mean Square	F	Sig.
Beta1[a]	Regression	16.732	3	5.577	9.204	.000[a]
	Residual	42.416	70	0.606		
	Total	59.149	73			
2[b]	Regression	13.406	3	4.469	6.995	.000[a]
	Residual	38.328	60	0.639		
	Total	51.734	63			
3[c]	Regression	10.254	3	3.418	3.926	.013[a]
	Residual	52.231	60	0.871		
	Total	62.484	63			

a. Model 1 Predictors: (Constant), Attitude score, perceived behavioral control, subjective norm for Local Eating. Dependent Variable: intention for Local Eating.

b. Model 2 Predictors: (Constant), Attitude score, perceived behavioral control, subjective norm for Home Cooking. Dependent Variable: intention for Home Cooking.

c. Model 3 Predictors: (Constant), Attitude score, perceived behavioral control, subjective norm for Meatless Meals. Dependent Variable: intention for Meatless Meals.

Appendix B: Literature Review

Sustainable Eating Practices and the Theory of Planned Behavior

Eating Locally, Eating Meatless Meals and Cooking at Home

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A literature review submitted to McGill University in partial fulfillment of the requirements of the degree of M.Sc. (Applied) Nutrition.

Table of Contents

Introduction

Climate change involves changes in weather patterns, including precipitation patterns, winds, and global warming[1] (Environment Canada, 2010). Climate change has already increased food insecurity globally, and is predicted to negatively affect food availability, food accessibility, food utilization and food systems stability in the near future (Food and Agriculture Organization [FAO], 2008). The average surface temperature of the planet has increased by 1 degree Celsius over the past century, and is projected to increase by 2 to 6 degrees Celsius during the next 50 years (Environment Canada, 2005). This global warming trend is largely attributable to increased burning of fossil fuels through increased transportation, and intensive agricultural practices, consequently increasing emissions of greenhouse gases (GHGs) such as carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4) (FAO, 2008; Environment Canada, 2005). Once emitted, GHGs cannot escape the Earth's atmosphere, and instead remain trapped, absorbing heat radiating from the Earth (Environment Canada, 2005). Other consequences of climate change include acid rain, smog, decreased availability and potability of drinking water, and an increased frequency of natural disasters or unpredictable weather, in turn affecting food security and ultimately human health and safety (Environment Canada, 2010; FAO, 2008).

Sustainable eating practices include food consumption patterns that reduce an individual's contribution to climate change and optimize human health, by conserving natural and non-renewable resources and reducing contamination of the natural environment (Carlsson-Kanyama, 1998; Food and Agriculture Organization, 2008; Weber & Matthews, 2008; Tagtow & Harmon, 2009). Eating locally-produced and seasonal foods, eating meatless meals more often, and preparing a greater proportion of meals at home, are examples of sustainable eating

[1] Global warming is defined as an increase in the average surface temperature of the Earth.

behaviors, each providing a unique combination of environmental and personal health benefits (FAO, 2008).

Weatherell, Tregear and Allinson (2003) report that 58% of adults surveyed in the U.S. have high levels of concern for the environmental and health impacts of their food choices, and respondents report they have an increased interest in purchasing local foods. Despite becoming increasingly aware of the environmental and health issues potentially associated with their food choices, young adults report pragmatic issues, such as cost and convenience, which prevent them from making sustainable food choices (Escott-Stump, Jarratt & Mahaffie, 2002; Weatherell *et al.*, 2003).

The Theory of Planned Behavior (TPB) is a model for predicting human behavior, and proposes that an individual's decision to perform a specific behavior can be predicted by the individuals': attitude toward the behavior; perceived expectations from others to perform the behavior (subjective norms, SN); and perceived ability to perform the behavior (perceived behavioral control, PBC) (Ajzen, 1985). Using Ajzen's model to explain the behavior of sustainable eating, it can be predicted that an individual will engage in sustainable eating if: his/her attitudes toward sustainable eating, and the perceived outcomes of sustainable eating, are positive; there is perceived social pressure to engage in sustainable eating; and, the individual feels capable and in control of engaging in sustainable eating practices. This literature review will examine the possible health and environmental outcomes of three particular sustainable eating behaviors; eating locally, eating meatless meals more often and cooking at home more often. We then examine the application of the TPB to sustainable eating.

Behavior 1: Eating locally-produced and seasonal foods

Locally-produced foods can be purchased at farmer's markets and supermarkets, or can be obtained through participating in community gardens, community-supported agriculture, or growing produce at home (Ball, 2009). While there is no precise definition of the geographic range that constitutes a food being "local", the publicized "100-Mile Diet" is often recognized as being synonymous with eating locally (Rose et al. 2008; Byker, Rose & Serrano, 2010). The public and media interest in local eating follows the publication of several books, each detailing the fulfillment and hardships experienced through consuming a diet consisting of locally-produced foods exclusively, including "Coming Home to Eat" (Nabhan, 2003), and "100-Mile Diet: A Year of Local Eating" (Smith & MacKinnon, 2007).

Obtaining locally-produced foods, to replace foods from national or international sources, reduces GHG emissions from transportation, and reduces reliance on non-renewable resources such as fossil fuels. The concept of eating "closer to home" also entails choosing foods that are minimally processed, further reducing GHG emissions from processing, and reducing waste from packaging. "Food miles" is a term commonly used to describe the distance food products travel between the site of production (farm or factory) and the site of consumption (home, restaurant) (Pirog, Pelt Enshayan & Cook, 2001). GHG emissions and fuel usage can subsequently be calculated (Pirog *et al.*, 2001). Carlsson-Kanyama (1997) suggests using the calculation of the Weighted Average Source Distance (WASD), or the average distance a food travels from where it is produced to where it is consumed, as a means of comparing food miles of locally-sourced to non-locally-sourced foods. Since the proposal of WASD, it has been used in several studies to calculate and compare food miles associated with the final consumption of

certain foods (Pirog *et al.*, 2001; Xuereb, 2005). The Leopold Center for Sustainable Agriculture calculated that food travelled an average of 71.78 km, for three Iowa local food projects involving local farmers selling produce directly to hospitals, restaurants and conference centers, compared to travelling 2,488 km if the same foods had come from "conventional national sources" (Pirog *et al.*, 2001). Furthermore, obtaining an additional 10% of the 28 most commonly-purchased fruits and vegetables in Iowa from an Iowa-based producer instead of through a conventional national food-distribution system would save 280 to 346 thousand gallons of fuel, and prevent 6.7 to 7.9 million pounds of CO_2 from being emitted, with the exact savings varying with the chosen food distribution system (regional or local), and transportation method(s) (Pirog *et al.*, 2001). In another study using WASD, 58 commonly-consumed foods imported to Waterloo, Ontario, were found to travel 4,497 km on average, compared to an estimated 30 km for the same foods grown or raised in the Waterloo Region (Xuereb, 2005). Even more striking, is that all of the foods under study can be produced locally, and some of the produce is imported during "peak local harvest time" (Xuereb, 2005). Replacing these imported foods with the same items grown or raised in the Waterloo area could reduce GHG emissions by 49,485 tonnes, similar in effect to removing 16,191 cars from circulation (Xuereb, 2005).

The benefits to personal health from choosing local foods not only come indirectly, from an environmental standpoint, but also through the characteristics of diets consisting of locally-produced foods, which focus on minimally processed foods. Several surveys suggest that individuals who value and/or purchase local foods have higher fruit and vegetable intakes, and lower intakes of saturated fats (Pirog & Larson, 2007; Robinson-O'Brien, Larson, Neumark-Sztainer, Hannan & Story, 2009; Byker *et al.*, 2010). At present, there is no peer-reviewed

research that has demonstrated that locally-produced foods are more nutritious than non-locally-produced food. Even with this lack of evidence, 69% of a sample representative of the U.S. population agreed that local food is better for their health than non-local food (Pirog & Larson, 2007). Forty percent of the same respondents agreed that "science had proven that local food is healthier" than non-local food (Pirog & Larson, 2007).

Despite perceiving local foods as being more nutritious, tastier, and fresher, perceived barriers such as: the scarcity, lack of accessibility and irregularity of farmer's markets; the higher cost of local foods compared to national and/or imported foods available at supermarkets; the time and inconvenience involved in purchasing local foods; and the greater variety of food choices available at supermarkets, lead many consumers to prefer purchasing conventional foods (Vermeir & Verbeke, 2006; Chambers, Lobb, Butler, Harvey & Bruce Traill, 2007; Pirog & Larson, 2007; Robinson-O'Brien *et al*,. 2009). Given these deterrents, it is not surprising that over 50% of adults state supermarkets as their first-choice location for food shopping over local food stores or farmer's markets (Weatherell *et al*., 2003). Lobb, Butler and Harvey (2005) found that some participants in a focus group in New England were not even aware that grocery stores carried local produce, while others felt the labeling of local produce is unclear or missing, leading inevitably to a perceived inability to consciously choose local foods at grocery stores.

It can be logically deduced that one's ability and willingness to consume local foods is dependent upon actual availability of local, seasonal foods, which varies with respect to geographical location. Consequently, results obtained from studies evaluating consumers attitudes, motivations and barriers to consuming local foods are likely to be location-specific, and may not be representative of consumers living elsewhere. For instance, Montreal is home to several year-round public farmers' markets distributed throughout the city, each accessible with

public transportation with opening hours that extend beyond regular business hours of 9 am to 5 pm, Monday through Friday (Corporation de Gestion des Marches Publics de Montreal, 2011). In contrast, Robinson-O'Brien and Smith (2002) surveyed consumers in St. Paul, Minnesota, where locations and opening hours change daily, which may contribute to consumers' perceived inability to procure local foods. Furthermore, Robinson-O'Brien and Smith (2002) surveyed consumers who were entering grocery stores, resulting in a possible selection bias. These factors warrant an unbiased investigation into the attitudes, motivations and perceived barriers of Montreal-area consumers to eating local.

Organically-produced foods are also gaining consumer attention, as is evidenced by the inability of the North American organic food market to meet the consumer demand for organic foods (Willer & Yussefi, 2007). In Canada, food products carrying a "certified organic" label have met criteria set forth by the Canada Organic Regime, which was developed by the Government of Canada to provide regulations for organic food production (Canadian Food Inspection Agency [CFIA], 2011). Foods certified as being organic have been produced using no synthetic pesticides or fertilizers, which is proposed to lead to less soil erosion and less contamination of the natural environment (CFAI, 2011). The benefit of local foods, on the other hand, comes from the savings in environmental destruction imposed through shorter tranport distances. Furthermore, what constitutes a "local" food is variable, as no regulatory bodies certify foods as being "local". Due to the standards that foods need to meet in order to be certified organic and the increased consumer demand, there has been a trend to import organically produced foods to North America (Raynolds, 2004). Furthermore, organic food systems are becoming increasingly industrialized to meet consumer demand, with large-scale monoculture farming and landless livestock production (Stagl, 2002). The environmental and

health consequences arising from transportation of organic foods produced non-locally or non-regionally, and from intensification of the organic production process, suggests a possible narrowing of the sustainability-gap between organic and conventional food systems.

Behavior 2: Eating Meatless Meals

Livestock production is responsible for 8% to 10.8% of global greenhouse gas (GHG) emissions (Health Care Without Harm, n.d.; FAO, 2009; O'Mara, 2011). Due to the projected increase in demand for animal foods globally, GHG emissions from the agricultural sector are expected to increase by up to 50% by 2030 (Friel *et al.*, 2009; O'Mara, 2011). Emissions of CH_4 have already increased by 17% globally, from 1990 to 2005 (Interdepartmental Working Group on Climate Change [IWGCC], 2007). The greatest proportion of GHG emissions from animal production are N_2O and CH_4, and are mainly attributable to soil emissions from fertilizer use, and enteric methane production by cattle, respectively (IWGCC, 2007). While animal production methods exist that can mitigate GHG emissions and the subsequent impact of livestock production on the global climate, the intensive-production methods used most commonly in resourceful countries are not such methods (Friel *et al.,* 2009)

Intensive, industrial and grazing systems are the predominant forms of animal production in North America, and are becoming increasingly common in middle income countries in order to meet the growing demand for animal foods globally (FAO, 2009). Industrial, intensive animal production systems are defined as purchasing at least 90% of their feed from external, industrial sources, and contribute more than two-thirds of the global production of poultry and pork (FAO, 2009). These systems concentrate animals in feedlots, resulting in contamination of freshwater and nutrient depletion of the soil, due to more animal waste being disposed through waterways

instead of being put back on the land (FAO, 2009). Besides directly disrupting aquatic ecosystems and reducing water quality, industrial livestock production methods in North America use one-third of arable land to produce animal feed, primarily corn and soybeans, as monocultures, requiring increased use of pesticides, herbicides, and fertilizers (Horrigan, Lawrence & Walker, 2002; FAO, 2009). For raising ruminant animals such as cattle, high-quality grasslands in Canada are exploited using intensive grazing systems (FAO, 2009). Of the 80% of agricultural land used for grazing and to produce supplementary feed, an estimated 10 - 20% of land is degraded, resulting in lower fertility and productivity of the soil, release of carbon from organic matter deposits, and impaired water cycles (FAO, 2009).

Choosing non-animal sources of protein, such as legumes, tempeh or quinoa, instead of industrially-sourced animal protein, promotes conservation of natural resources, primarily water and arable land, and reduces GHG emissions (Bennett & Blaney, 2002; Pimentel & Pimentel, 2003; Serecon Management Consulting Inc prepared for Agriculture and Agri-Food Canada, 2005; Garnett, 2009; Garnett 2011). Weber and Matthews (2008) report that replacing less than 1 day per week's consumption of red meat and/or dairy with a vegetable-based diet could reduce GHG emissions by 4-5%. Replacing animal-based protein with non-animal protein is also demonstrated to reduce risk of cancer, heart disease, type 2 diabetes mellitus and prevent long-term weight gain, through a reduction in saturated fat intake, and an increase in dietary fibre intake (Bazzano *et al.*, 2001; Weatherell *et al.,* 2003; Newby, Tucker & Wolk, 2005; Genkinger & Koushik, 2007; Aune, Ursin & Veierød, 2009; Mitchell, Lawrence, Hartman & Curran, 2009; Sinha, Cross, Graubard, Leitzmann & Schatzkin, 2009; Mozaffarian, Micha & Wallace, 2010). The health and environmental benefits associated with eating meatless meals has generated an international movement, "Meatless Monday", developed and promoted by the Johns Hopkins

and Columbia University Schools of Public Health (Johns Hopkins Bloomberg School of Public Health, 2011). The "Meatless Monday" campaign encourages individuals to "one day a week, cut out meat" in order to increase the environmental sustainability and nutrient-density of their diets (Johns Hopkins Bloomberg School of Public Health, 2011). Health Canada and the United States Department of Agriculture (USDA) also include messages in their respective dietary guidelines suggesting that meat be replaced by legumes and meat alternatives regularly (USDA, 2010; Health Canada, 2008).

In elementary schools, studies have been conducted on the acceptability of modifying the menu of cafeterias within schools to include one vegetarian meal per week (Van Caneghem, Verschraegen, De Keyzer & Huybrechts, 2010). This environmental approach has been demonstrated to be effective at modifying dietary intake in children, when the meals are as acceptable by the children as the typical meal (Van Caneghem *et al.*, 2010). However, this approach is unique from promoting dietary change in adults who have choices to make not only when eating out, but also regarding food shopping and meal preparation. Henceforth, the methods of changing dietary behavior, including transitioning to more meatless meals, in "free-living" adults differ from those used in elementary schools.

Increased awareness of sustainability issues has resulted in universities and food service operations have resulted in efforts to provide more vegetarian and vegan options for patrons on campuses across North America (Valen, 1992; Rojas, 2007; Battaglia, Abba, Mehta & Kim, 2010). Unfortunately, little research exists on promoting plant-based diets or meatless meals from a public health perspective. The bulk of research conducted to-date on the topic have centered on vegetarianism or levels of vegetarianism, and not the act of replacing meat with non-animal sources of protein only occasionally. It can be assumed, however, that increasing

availability and visibility of vegetarian meal options may result in more university students choosing the vegetarian option.

The motivation to promote consumption of meatless meals on occasion, instead of converting to a completely vegetarian diet, may stem from the reality that more consumers will find it feasible to change one meal per week instead of their entire diet. Furthermore, it has been suggested that those following entirely vegetarian diets should follow an alternate "food guide", to account for nutrient differences between meat and meat alternatives (Venti & Johnston, 2002). Persons consuming a strictly vegetarian diet are at increased risk of iron deficiency anemia, vitamin B12 deficiency, and are potentially consuming inadequate amounts of calcium, vitamin D, zinc and essential fatty acids (Craig, 2010; Weaver, 1999). To minimize these health risks, the American Dietetic Association (ADA) has concluded that vegetarian diets should be planned, and may require fortified foods or supplements in order for dietary requirements to be met (ADA, 2009). In comparison, replacing meat with meat alternatives at the occasional meal is more likely to result in an increase in nutrient density of the diet, avoiding the risk of nutrient deficiencies that are possible with entirely vegetarian diets. Therefore, from a public health perspective, promotion of eating meatless meals more often may prove to be more economically advantageous than promoting total vegetarianism: health benefits are likely to outweigh potential adverse health outcomes such as deficiencies, and it is more realistic for the general population to follow through on replacing meat occasionally rather than all the time.

Prevalence of vegetarianism in university student populations varies widely between studies. For example, 23.9% of university students in Jordan were self-reported to be vegetarians, mostly for "weight control and economic reasons", compared to just 6.7% of students at Lakehead University in Thunder Bay, Ontario (Suleiman, Alboqai, Kofahi, Aughsteen & El

Masri, 2009; Kooshesh, 2010). Lack of knowledge and inconvenience of plant-based diets are reported as impediments to students choosing to not follow a plant-based diet (Suleiman *et al.*, 2009). To address these perceived barriers, the USDA, Health Canada, and any other organization wishing to promote meat alternative consumption should emphasize: the health benefits of going meatless more often; how to replace meat to optimize nutrient intake; and, ideas of how to prepare meat alternatives as these foods may be new to some consumers.

Behavior 3: Cooking Meals at Home

On any given day, 25% of Canadians will eat food prepared at a fast-food outlet (Garriguet, 2004), with the highest frequency of eating fast food seen in men aged 19 to 30 (Garriguet, 2004). In a sample of university students, 15% reported "typically eating lunch at a restaurant or at a fast-food outlet" (Davy, 2006). Frequently eating away from home poses a serious health risk. Eating just one meal away from home each week can result in a weight gain of two pounds over the course of one year, due to large portion sizes and excess fat intakes typical of many fast food meals (USDA, 2010). Eating foods away from the home instead of eating foods prepared at home is associated with decreased intakes of fruits, vegetables and whole grains, and increased intakes of saturated and trans fats (Moore, 2009; Larson *et al.*, 2006). Furthermore, young adults are reported to view cooking as "warming, picking-up, or assembling of prepared components", resulting in higher reliance of processed foods and snack-type foods (Serecon Management Consulting Inc prepared for Agriculture and Agri-Food Canada, 2005). Future generations are predicted to have even lower meal preparation involvement due to limited exposure to parent's cooking (Serecon Management Consulting Inc prepared for Agriculture and Agri-Food Canada, 2005). The current food preparation habits of young adults are likely to contribute to elevated chronic disease risk, and exacerbation of the obesity epidemic. It is

therefore essential to develop cooking skills and confidence in young adults, in order to establish healthy dietary habits which can be carried throughout life (Garcia, Sykes, Matthews, Martin & Leipert, 2010).

Canadians have experienced a shift in meal preparation habits, over the past century, whereby traditional, home, "from scratch", meal-preparation using whole, unprocessed ingredients is being replaced with the use of packaged and pre-prepared convenience foods (Jarratt & Mahaffie, 2002; Engler-Stringer, 2010; Pan-Canadian Public Health Network, 2010). A number of factors are suspected to be behind this transition, including: increased availability of pre-prepared and processed food products; decreased nutrition or home economics education in schools; and decreased transferring of cooking skills in the home (Jarratt & Mahaffie, 2002; Pan-Canadian Public Health Network, 2010). Food processing and packaging is necessary in order to improve accessibility and increase shelf-life of certain foods that cannot be produced locally (Heller & Keoleian, 2003). The shift in the North American diet from whole foods to heavily processed foods, however, has resulted in: increased energy inputs into the food system as a whole; increased waste from non-recycled packaging; and an overall reduction in dietary quality from decreased intakes of whole grains, fruits, and vegetables and increased intake of higher-fat and higher-sodium foods (Heller & Keoleian, 2003; Larson *et al.*, 2006; Wang, Kim, Gonzalez, MacLeod & Winkleby, 2007; Story, Kaphingst, Robinson-O'Brien & Glanz, 2008; Williams & Wikström, 2011).

University students are particularly at-risk of relying on pre-prepared and processed foods, as they are presented with the newfound responsibilities of grocery shopping, meal planning and meal preparation (Garcia *et al.*, 2010). Larson et al. (2006) report lack of time to be the greatest barrier to meal preparation among adults aged 18 to 23 years. Health Canada

recognizes that lack of time is a barrier for adults of all ages, to meal preparation (Jabs & Devine, 2006). As a result, the Health Canada website includes suggestions on how to prepare healthy meals under time constraints (Health Canada, 2008). Suggestions include planning meals to facilitate efficient grocery shopping, choosing "healthier" convenience items such as frozen vegetables, and storing leftovers (Health Canada, 2008). Higher perceived cost of fresh food compared to processed or pre-prepared foods may also deter young adults from preparing food at home (Larson *et al.*, 2006; Barton, Kearney& Stewart-Knox, 2011). In order for students to overcome these perceived barriers, information must be made available to students regarding how to prepare economic, healthy meals when feeling pressed for time.

Inadequate cooking skills and inadequate financial resources are reported by young adults to be barriers to home-meal preparation (Garcia *et al.*, 2010). In a survey of young adults, 23% of males and 18% of females report having "very inadequate" or "inadequate" cooking skills (Larson *et al.*, 2006). Never having been taught how to cook, and not wanting to learn how to cook, is reported to be the most significant barriers to meal preparation in one sample of college women (Soliah, Walter & Antosh, 2006). In both of these studies, skill in meal preparation is self-reported, and there is no evaluation of actual cooking ability or range of known cooking techniques. Byrd-Bredbenner (2004) found that the majority of sampled young adults overestimate their level of food preparation knowledge, suggesting that the actual percentage of students with inadequate cooking skills is lower than reported.

Lack of nutrition knowledge and lack of time required for cooking and grocery shopping, due to increased demands from socializing and studying, are reported barriers to cooking at home for university students (Larson *et al.*, 2006; Garcia *et al.*, 2010). Young adults preparing food at home are more likely to be consuming five servings of fruits and vegetables compared to

those reporting low food preparation involvement (Larson *et al.*, 2006). The association between home meal preparation and meeting dietary recommendations could be due to the difference in actual meal content, or it could be attributable to higher nutrition knowledge in the group of students preparing meals at home more often. Students who have greater knowledge of nutritional recommendations have been found to be more likely to meet those recommendations, by directly using nutritional recommendations to make specific food choices (Kolodinsky, Harvey-Berino, Berlin, Johnson & Reynolds, 2007; Jasti & Kovacs, 2010; Graham & Laska, 2011).

The Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) proposes a model for the prediction of human behavior, specifically for actions for which individuals do not have complete volitional control (Ajzen, 1985; Ajzen, 1991). According to the TPB (see Figure 1), the likelihood of an individual performing a behavior depends upon the individual's: attitude toward the behavior; perceived expectations from others to perform the behavior (subjective norms, SN); and perceived ability to perform the behavior (perceived behavioral control, PBC) (Ajzen, 1991; Ajzen, 2003). Intention is assumed to be an immediate antecedent to actual behavior, and due to the ease in measuring the former for many behaviors, intention is more often the outcome variable assessed in research studies than is actual behavior (Ajzen, 2002).

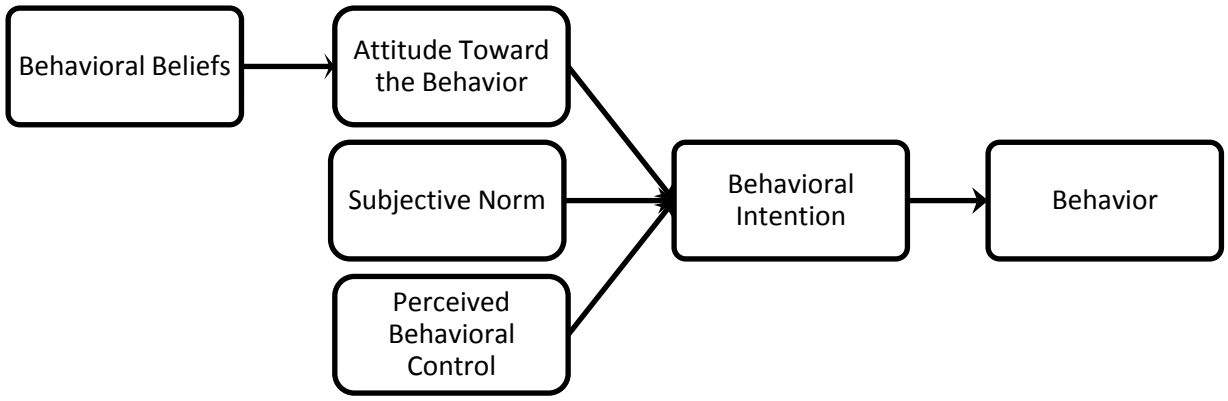

Figure 1. The Theory of Planned Behavior (Ajzen 1991).

Individuals must believe that their action has a positive impact, either on their personal health or on the environment, before they will change their behavior (Vermeir &Verbeke, 2006). Behaviors for which the participants' evaluation of outcomes are not easily assumed to be positive or negative, must be assessed in surveys through questions evaluating the participants': behavioral beliefs, or what is expected to come from performing a behavior, and evaluations of the outcomes arising from carrying out the behavior. Using this indirect method of measuring attitudes, the total attitude score for a given behavior is the sum of the products of each behavioral belief and corresponding outcome evaluation, calculated as follows: $A = \sum a_i b_i$, where 'a_i' is the score for each '*i*' behavioral belief, and 'b_i' is the score for each '*i*' outcome evaluation (Ajzen, 1991). When applied to sustainable eating, an individual who believes favorable outcomes will arise out of eating sustainably will have a higher attitude score, representing an attitude in favor of sustainable eating (Francis *et al.*, 2004). SN is also based on a set of beliefs: normative beliefs, or beliefs about how "important" others would want the individual to behave (Francis *et al.*, 2004). PBC, the third construct of the TPB model, is defined as the extent to

which a person feels capable of performing a behavior (Francis *et al.*, 2004). Questions in a TPB survey related to the construct of PBC typically assess perceived controllability, perceived difficulty and perceived self-efficacy with respect to performing the behavior (Francis *et al.*, 2004). In addition to independently influencing intention, PBC moderates attitude and SN in their relation to intention, ultimately influencing behavior (Rodgers, Conner & Murray, 2008). TPB has been used in a number of studies and we report here on the few which have been directed towards the analysis of sustainable eating behavior.

Robinson and Smith (2002) found that consumers' attitudes, subjective norms and intentions are supportive of purchasing sustainably-produced foods; however consumers did not feel confident in their ability to purchase sustainably-produced foods. The authors further report that individuals "identifying one's self as being environmentally-conscious" are found to have more supportive attitudes, and thereby more supportive intentions, to purchase sustainably-produced foods, when compared to individuals not identifying themselves as being environmentally-conscious (Robinson & Smith, 2002). In the same study, attitudes, subjective norms and perceived behavioral control were found to be independent predictors of intention to purchase sustainably-produced foods and account for 28.5% of the variance in intention to purchase sustainably produced foods (Robinson & Smith, 2002).

Bissonnette and Contento (2001) found that among a sample of 651 senior high school students, 83.9% of teens rated "healthfulness" of food as being an important, yet 30% to 40% of teens replied they did not know if foods grown locally had impacts on the environment or on their personal health (Bissonnette & Contento, 2001). Eighty-percent of the same sample said that it was "not important to them personally that food is grown nearby", while 69.5% stated that having the ability to eat their "favorite foods" all year-round is more important than where the

food is grown (Bissonnette & Contento, 2001). Following with these attitudes, 66.4% of teens had never asked the main grocery-shopper within their household to purchase foods "grown nearby", within the past two months (Bissonnette & Contento, 2001). This is in contrast with the findings of Robinson-O'Brien et al (2009), where 20.9% of 2516 adolescents reported that it was important that their food was locally grown, however the authors did not include a measure of intention or behavior.

Bissonnette and Contento (2001) used an "extended Theory of Planned Behavior" to predict intention, which includes measures of perceived social influences from parents and friends, perceived self-identity, and perceived responsibility. This "extended" model includes attitudes and variants of subjective norm in accordance with the original TPB model presented here; however the extended model does not include measures for PBC (Bissonnette & Contento, 2001). This extended model accounted for 31% of variance in intention to consume or purchase foods grown locally, leaving some variance possibly explained by unmeasured variables influencing intention such as PBC (Bissonnette & Contento, 2001; Zepeda, 2009).

There is a considerable lack of research available to which comparisons can be made on the topic of intentions to eat meatless meals (Wyker & Davison, 2010). Wyker and Davison (2010) found that "improved health" was rated as the greatest benefit from following a plant-based diet by 204 college students, although a perceived lack of available and affordable foods were reported to be barriers (Wyker & Davison, 2010). In this sample, attitudes, SN and PBC explained approximately 61% of the variance in predicting intentions to follow a plant-based diet in the next year, indicating the applicability of the TPB in predicting intentions to consume a plant-based diet (Wyker & Davison, 2010).

Collins (2010) assessed the effectiveness of a cooking lab on the attitudes, perceived level of comfort, skill, experience and behaviors with respect to cooking at home, on 24 university students (Collins, 2010). The food labs were conducted through an undergraduate course at Vermont University and consisted of weekly, 2-hour sessions involving preparation of 2 recipes in student pairs, for one semester (Collins, 2010). Collins (2010) found that following completion of the food lab series, students reported having increasing levels of perceived skill and knowledge of meal preparation, and decreased perceived difficulties in preparing meals. The favorable changes in perceived capability and difficulties were not linked to the frequency of home-meal preparation (Collins, 2010). The author conducted interviews with a sub-sample of participants, and found that perceived higher financial cost, length of time required and availability of pre-prepared foods may be barriers preventing students from increasing the frequency of meal preparation at home (Collins, 2010). Similarly, Wrieden *et al.* (2007) carried out a food skills intervention consisting of 10 weekly, 2-hour sessions (some involving education, some involving food preparation skills) and found significantly increased confidence in following a recipe. In contrast with the findings of Collins (2010), Wrieden *et al.* (2007) report a greater proportion of participants cooking from basic ingredients following the series of workshops. No correlation analyses were performed to assess if a relationship existed between the increased cooking confidence and the increased frequency of cooking from basic ingredients (Wrieden *et al.,* 2007).

Other sustainable behaviors involving food which have been recently investigated are gardening at home or at school. Various after-school gardening and nutrition programs report that following completion of these programs, participants have increased dietary fiber intake, increased fruit and vegetable intake, decreased body mass index (Davis *et al.*, 2011; Hermann *et*

al., 2006; Garden-Robinson, 2011). These studies only assessed dietary and physical activity behaviors, and made anthropometrical assessments: there were no survey items assessing participants' attitudes, perceived behavioral control or subjective norm regarding sustainable eating behaviors (Davis *et al.*, 2011). Community gardening has also been demonstrated to be associated with higher intakes of fruits and vegetables in adults, likely in part due to the cost-effectiveness of consuming produce grown at home compared with purchasing produce at a market or at a grocery store (Hopkins & Holben, 2010). Reducing resource consumption and composting are other sustainable behaviors for which studies have used the TPB to predict intentions or behaviors (Tonglet *et al.*, 2004; Mannetti *et al.*, 2004; Davis *et al.*, 2006). Despite the range of behaviors for which the TPB has been explored as an explanatory model, there remain fewer such studies with college or university student populations.

From this literature review, it is evident that concerns for personal health, environmental-wellbeing, cost and convenience are persistent in individuals' attitudes toward sustainable eating practices. Perceived difficulty in obtaining the appropriate foods, at an acceptable financial and opportunity cost are reported to be barriers to sustainable eating. The TPB model has been applied in investigating intentions to eat locally, choose sustainably-produced foods, and to follow a plant-based diet, in few studies. The applicability of TPB on cooking meals at home has yet to be demonstrated. There is a current paucity of data on the intentions of university students to eat sustainably, and related to interventions which have sought to modify these intentions.

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Appendix C: Contribution of Authors

Dr. Pierre-Paul Tellier reviewed promotional and educational materials used in this project, and provided feedback for the survey design.

Mary Hendrickson-Nelson reviewed the ethics application, multiple drafts of the literature review (NUTR 651) and the final report. She is also the PI of the project, having received the grant from the Sustainability Projects Fund.

Hugues Plourde reviewed the ethics application, multiple drafts of the literature review (NUTR 651) and the final report.

Tracy McDonough created the research questions and survey, and was responsible for organizing the events at which surveys were distributed. She also performed data entry and conducted the data analysis.

Appendix D: Consent forms

Consent Form for Cooking Workshop and Kiosk

This is to invite you to participate in a study entitled "Modifying university students' intentions to eat sustainably" which is being supervised by Hugues Plourde Ph.D., RD and Mary Hendrickson-Nelson M.Sc., RD, from the School of Dietetics and Human Nutrition at McGill University with funding from McGill's Sustainability Projects Fund. The purpose of this research is to investigate the intentions and practices of students regarding sustainable eating.

Your participation in the study will entail completion of two surveys. The survey will take around 10 minutes, and will be conducted in-person by Tracy McDonough, a member of the research team. The follow-up survey will be sent to you via email, two weeks from today. You will receive a link to complete the follow-up survey online, which will last around 10 minutes.

In this survey you will be asked to provide information about yourself (e.g. gender, age, education, height, weight); and answer questions regarding your eating behaviors and intentions.

Your participation is voluntary and you may choose not to participate, to withdraw at any time, or refuse to answer any question you don't want to. Upon completion of both surveys, you will be entered into a draw to win an iPod Touch.

Your name and email will never be revealed in written or oral presentations and no record will be kept of your name in association with the survey results.

You may contact Hugues Plourde, Ph.D., RD at (514) 931-1934 ext 34442; hugues.plourde@mcgill.ca; if you have any questions or concerns.

If you have questions about your rights as a research participant, or if you would like to verify the ethical approval of this study, please feel free to contact: Chair, McGill Research Ethics Board, Faculty of Agricultural and Environmental Sciences c/o Macdonald Research Office at 514-398-8716, or by e-mail research.macdonald@mcgill.ca.

I agree to complete this survey ___YES ___NO
I agree that the results of this survey may be used as described above ___YES ___NO
I agree to be contacted in two weeks to complete a second survey ___ YES ___NO
I agree that the results of the second survey may be used as described above ___YES ___NO

Participant's signature_____ Researcher's signature _____

Participant's printed name _____ Date _____

Consent form for Website Survey

This is to invite you to participate in a study entitled "Modifying university students' intentions to eat sustainably" which is being conducted by Hugues Plourde, Ph.D., RD and Mary Hendrickson-Nelson, M.Sc, RD, from the School of Dietetics and Human Nutrition at McGill University with funding from McGill's Sustainability Projects Fund. The purpose of this research is to investigate the intentions and practices of students regarding sustainable eating.

Your participation in the study will entail completion of two surveys. This is the first of two surveys, and will take around 10 minutes to complete. The second survey will be sent to you via email, two weeks from today. The second survey will last around 10 minutes.

The current survey will ask you to provide information about yourself (e.g. gender, age, education, height, weight); and answer questions regarding your eating behaviors and intentions. Upon completion of both surveys, you will be entered into a draw to win an iPod Touch.

By clicking "Enter", you are agreeing that we may use the results of the survey as described above, and you are agreeing to be contacted in two weeks.

Your name and email will never be revealed in written or oral presentations and no record will be kept of your name in association with the survey results.

You may contact Hugues Plourde, Ph.D., RD, at (514) 931-1934 ext 34442; hugues.plourde@mcgill.ca; if you have any questions or concerns.

If you have questions about your rights as a research participant, or if you would like to verify the ethical approval of this study, please feel free to contact: Chair, McGill Research Ethics Board, Faculty of Agricultural and Environmental Sciences c/o Macdonald Research Office at 514-398-8716, or by e-mail research.macdonald@mcgill.ca.

Exit Enter

Appendix E: Survey

Sustainable Eating Project Survey

Please answer each question to the best of your opinion or knowledge.

By providing us with your email, we may contact you in the event that you win the draw. You will also receive an email in two weeks with an invitation to complete a second survey. Your name or email address will never be used during the data analysis process or in dissemination of results (ex: presentation).

_____@_____

Please provide your age	____ years		
Please select your gender	☐ Male or ☐ Female		
Please provide your weight	____ kilograms or ____ pounds		
Please provide your height	____ meters or ___ feet ___ inches		
Select your current level of study	☐ Undergraduate	☐ Graduate (Master's or PhD)	☐ Post-doctoral
Select your faculty of study/research	☐ Agri. Env. Sci. ☐ Arts ☐ Arts & Sci.	☐ Environment ☐ Law ☐ Management	☐ Science ☐ Medicine ☐ Dentistry

	☐ Education ☐ Engineering	☐ Music ☐ Religion	☐ Other (not listed above)
Before today, have you ever (select any that apply):	☐ Attended a Sustainable Eating cooking workshop, ☐ Approached a Sustainable Eating kiosk, ☐ Visited the Fit@McGill website, ☐ Volunteered with the Sustainable Eating Project.		

The following section is about the foods you usually eat or drink. Think about all the foods you eat, both meals and snacks, at home and away from home.

1. How many portions of fruit and vegetables, of any sort, do you eat on a typical day?		___ 1 portion
Examples of fruit portions include:	Examples of vegetable portions include:	___ 2 portions
1 medium apple	½ cup cooked greens	___3 portions
½ cup canned, frozen or fresh fruit	1 cup raw greens	___ 4 portions
½ cup juice	½ cup fresh, frozen, canned vegetables	___5 portions

___6 portions

___7 portions

___ ≥8 portions

The following questions are going to ask you about eating locally.	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
2. Local fruits and vegetables are more nutritious than conventional fruits and vegetables.	1	2	3	4	5
3. Choosing local fruits and vegetables is more environmentally-friendly than choosing conventional fruits and vegetables.	1	2	3	4	5
4. Local fruits and vegetables taste better than conventional fruits and vegetables.	1	2	3	4	5
5. Local fruits and vegetables are more expensive than conventional fruits and vegetables.	1	2	3	4	5
6. If I wanted to eat local fruits and vegetables, I would have difficulties finding where to buy them.	1	2	3	4	5
7. I intend to choose local foods as much as possible over the next week.	1	2	3	4	5
8. The people who are important to me expect me to eat locally.	1	2	3	4	5
9. I feel under social pressure to purchase and consume local foods.	1	2	3	4	5
10. Whether or not I choose to eat local foods is entirely up to me.	1	2	3	4	5
11. If I wanted to, it would be possible for me to eat mostly local foods over the next week.	1	2	3	4	5
12. It is important for me to eat food that is healthy.	1	2	3	4	5
13. It is important for me to eat food that is environmentally-friendly.	1	2	3	4	5
14. The cost of food is important to me.	1	2	3	4	5
15. It is important to me that my preferred foods are easily available.	1	2	3	4	5
16. It is important to me that the meals I want to eat are easy to prepare.	1	2	3	4	5

17. I am confident that I can choose local foods over the next week.	1	2	3	4	5
18. It would be difficult for me to choose local foods over the next week instead of non-local foods.	1	2	3	4	5

The following questions are going to ask you about preparing your own meals.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
19. By preparing my own meals, I am eating foods that are healthier than if I did not prepare my own meals.	1	2	3	4	5
20. By preparing my own meals, I eat food that is more environmentally friendly than if I did not prepare my own meals.	1	2	3	4	5
21. By preparing my own meals, I am eating food that tastes better.	1	2	3	4	5
22. By preparing my own meals, I pay more for my total food expenses.	1	2	3	4	5
23. If I choose to prepare my own meals, I will have difficulties in meal planning and/or preparation.	1	2	3	4	5
24. I intend to prepare my own meals as much as possible over the next week.	1	2	3	4	5
25. The people who are important to me expect me to prepare my own meals as much as possible.	1	2	3	4	5
26. I feel under social pressure to prepare my own meals as much as possible.	1	2	3	4	5
27. Whether or not I choose to prepare my own meals is entirely up to me.	1	2	3	4	5
28. If I wanted to, it would be possible for me to prepare my own meals as much as possible over the next week.	1	2	3	4	5
29. I am confident that I can prepare my own meals over the next week.	1	2	3	4	5
30. It would be difficult for me to prepare my own meals over the next week.	1	2	3	4	5

The following questions are going to ask you about eating meatless meals.

31. Do you ever eat chicken, fish or red meat?	☐ Yes ☐ No

If you answered "Yes" to question #31 above, please continue to answer the next set of questions (#31 – 40).

If you answered "No" to question #31 above, do not complete the next set of questions. You are done the survey.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
32. Occasionally eating meatless meals is healthier than not doing so.	1	2	3	4	5
33. Occasionally eating meatless meals is more environmentally friendly than eating meals with meat.	1	2	3	4	5
34. Meatless meals can taste better than meals containing meat.	1	2	3	4	5
35. Eating meatless meals more often is a way for me to save money on groceries.	1	2	3	4	5
36. If I wanted to eat meatless meals more often, I would have difficulties planning and preparing balanced meals.	1	2	3	4	5
37. I intend to eat meatless meals more often.	1	2	3	4	5
38. The people that are important to me expect me to eat meatless meals more often.	1	2	3	4	5
39. I feel under social pressure to eat meatless meals more often.	1	2	3	4	5
40. Whether or not I choose to eat meatless meals more often is entirely up to me.	1	2	3	4	5
41. If I wanted to, it would be possible for me to eat meatless meals more often.	1	2	3	4	5
42. I am confident that I can prepare my own meals over the next two weeks.	1	2	3	4	5
43. It would be difficult for me to prepare my own meals over the next two weeks.	1	2	3	4	5

Appendix F: Research Ethics Board Certificate, #950-1110

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Research Ethics Board
Faculty of Agricultural and Environmental Sciences

McGill University
Macdonald Campus
21 111 Lakeshore
Saint-Anne-de-Bellevue, QC H9X 3V9

Tel: (514) 398-8716
Fax: (514) 398-8732
www.mcgill.ca/macdonald/research/compliance/human/

Certificate of Ethical Acceptability
Research Involving Humans

REB File #: 950-1110

Project Title: Modifying university students' intentions to practice sustainable eating

Principal Investigator: Tracy McDonough **Unit**: School of Dietetics and Human Nutrition

Status: Graduate Student **Supervisor:** Hugues Plourde and Mary Hendrickson-Nelson

Funding Agency and Title: Sustainability Projects Fund, McGill University. "Sustainable Eating". PI: Mary Hendrickson-Nelson, M.Sc., RD

Expedited Review ✓
Full Review

This project was reviewed and approved by

Grace S. Marquis

Grace S. Marquis, Chair
REB, Faculty of Agricultural and Environmental Sciences

Approval Period: December 12, 2010 **to** December 11, 2011

This project was reviewed and approved in accordance with the requirements of the McGill University Policy on the Ethical Conduct of Research Involving Human Subjects and with the Tri-Council Policy Statement: Ethical Conduct For Research Involving Humans

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*All research involving human subjects requires review on an annual basis. A Request for Renewal form should be submitted at least one month before the above expiry date.
*If a project has been completed or terminated and ethics approval is no longer required, a Final Report form must be submitted.
*Should any modification or other unanticipated development occur before the next required review, the REB must be informed and any modification can't be initiated until approval is received.

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Modifying students' intentions to eat sustainably

Tracy McDonough, M.Sc. (Applied) Nutrition Candidate
Hugues Plourde, Ph.D., R.D.
Mary Hendrickson-Nelson, M.Sc., R.D.
School of Dietetics and Human Nutrition

Pierre-Paul Tellier, M.D.
Director, Student Health Services

McGill University
Montreal, Quebec, Canada

McGill

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Sustainable Eating Practices

"…conserve natural and non-renewable resources, reduce contamination of the natural environment, and optimize human health" [1]

Examples:

- eating locally-produced foods
- cooking at home
- eating meatless meals

[1] Tagtow 2009.

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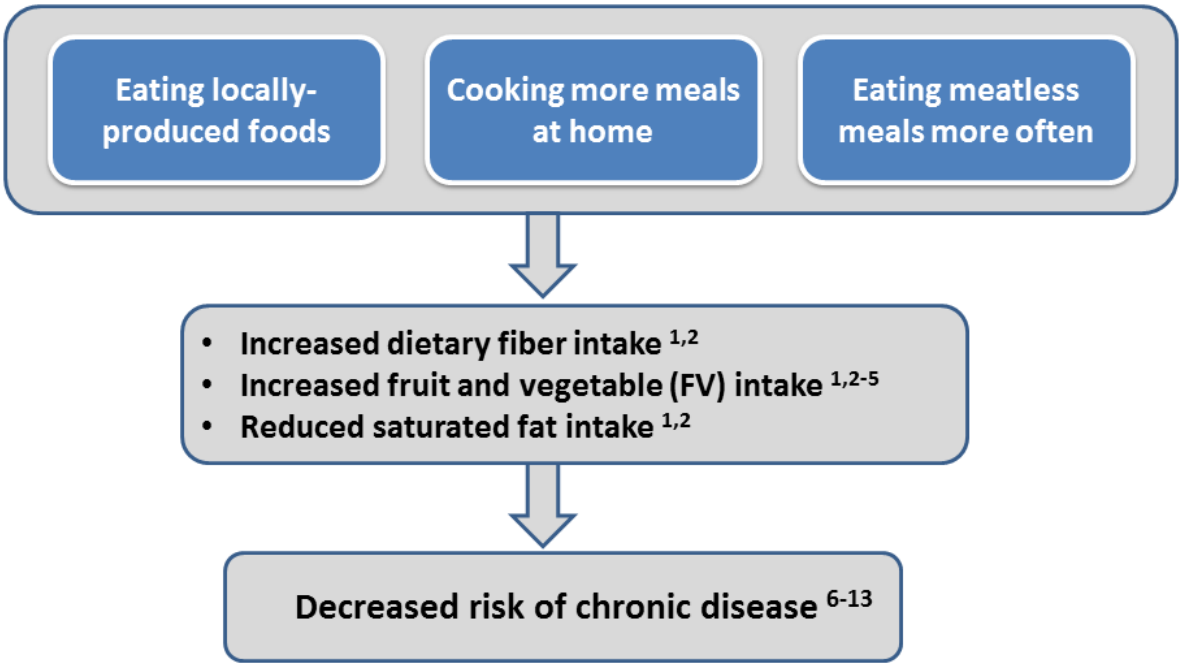
Sustainable Eating Practices



[1]Larson 2006, [2]Moore 2009, [3]Pirog 2007; [4]Robinson-O'Brien 2009; [5]Byker 2010 , [6]Bazzano 2001; [7]Weatherell 2003; [8]Newby 2005; [9]Genkinger 2007; [10]Aune 2009; [11]Mitchell 2009; [12]Sinha 2009; [13]Mozaffarian 2010.

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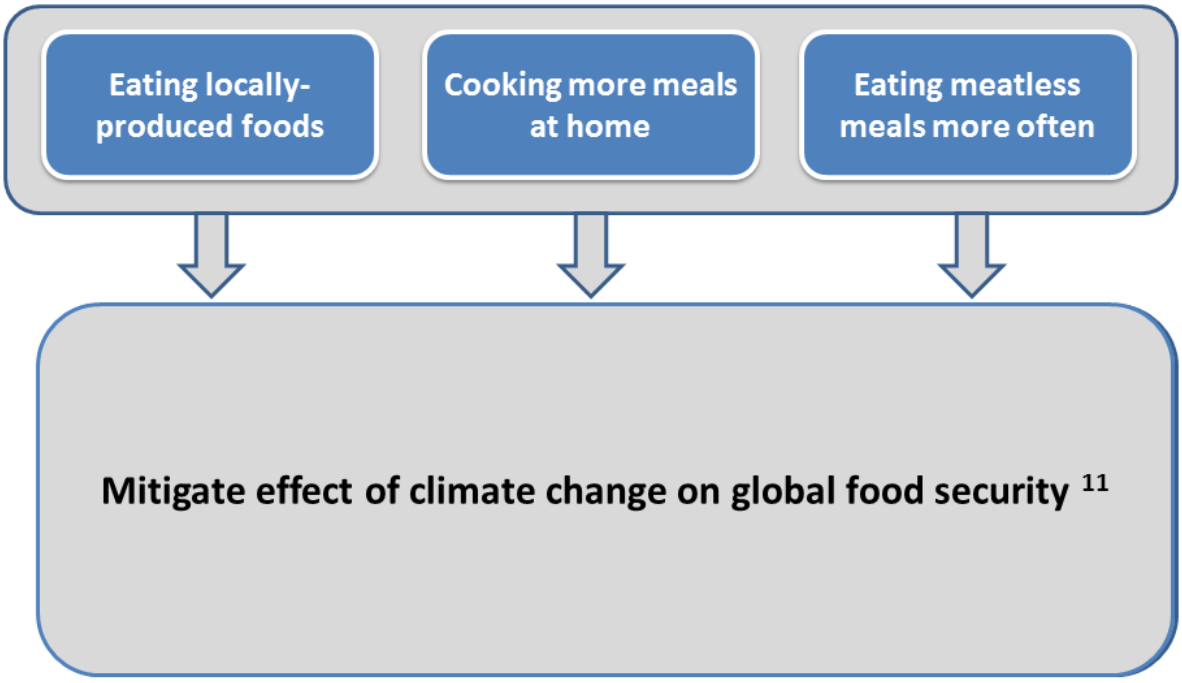
Sustainable Eating Practices



[1]Pirog 2001, [2]Heller 2003, [3]Larson 2006, [4]Wang 2007, [5]Bennett 2002, [6]Pimentel 2003, [7] Agri-Food Canada 2005, [8]Garnett 2009, [9]Garnett 2011, [10]Weber 2008, [11]Food and Agriculture Organization 2008

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University students' eating habits

- Weatherall 2003: 58% of adults (U.S.) report having "high levels" of concern for the environmental and health impacts of their food choices

- Barriers: inconvenience; perceived unavailability of sustainably-produced food; lack of knowledge, skills, time and financial resources [1-5]

[1]Garcia 2010, [2]Larson 2006, [3]Weatherall 2003, [4]Soliah 2006, [5]Escott-Stump 2002

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University students' eating habits

- Particularly at-risk of relying on pre-prepared, processed foods due to newfound responsibilities of moving away from family home [1,2]
    - Larson et al, 2006: 23% of males and 18% of females report having "very inadequate" or "inadequate" cooking skills
    - Garriguet (2006): highest frequency of eating fast food seen in men aged 19 to 30 (CCHS)

[1]Garcia 2010, [2]Larson 2006, [3]Garriguet 2006.

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Sustainable Eating Project

- Social marketing campaign, run through "Fit@McGill", a program operated by Student Health Promotion
- Collaborative effort by Sustainability Projects Fund, McGill Food and Dining Services, School of Dietetics and Human Nutrition, and Student Health Promotion
- Aims: increase awareness of sustainable eating practices, and enable students to modify behavior
- Promotion of the "7 Steps to Sustainable Eating"

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Sustainable Eating Project

Promotion of the "7 Steps to Sustainable Eating":

1. Eat locally- produced foods
2. Eat meatless meals more often
3. Cook at home more often
4. Shop at Farmers' Markets
5. Purchase foods with minimal packaging
6. Conserve, compost and recycle
7. Learn more about sustainability and share your knowledge

SPF- Grant #13

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Sustainable Eating Project

Animated kiosks

- Animated by McGill Dietetics stagiaires and peer educators at three events on-campus

Cooking workshops

- 5 workshops total (non-sequential)
- 20 minute discussion, led by a Dietetics stagiaire, followed by preparation of a vegetarian meal

Webpage

- Created within the pre-existing "Fit@McGill" website
- Included information on each of the sustainable eating behaviors (why, how-to)

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Sustainable Eating Project

Promotion of the "7 Steps to Sustainable Eating":

1. Eat locally- produced foods
2. Eat meatless meals more often
3. Cook at home more often
4. Shop at Farmers' Markets
5. Purchase foods with minimal packaging
6. Conserve, compost and recycle
7. Learn more about sustainability and share your knowledge

SPF- Grant #13

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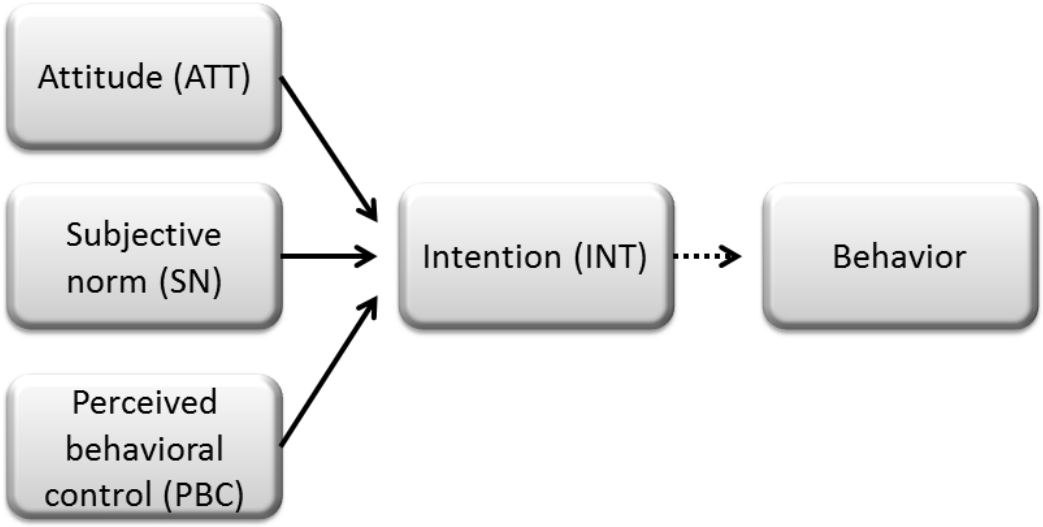
Theory of Planned Behavior (TPB)

- Model for the prediction of human behavior



Ajzen, 1991

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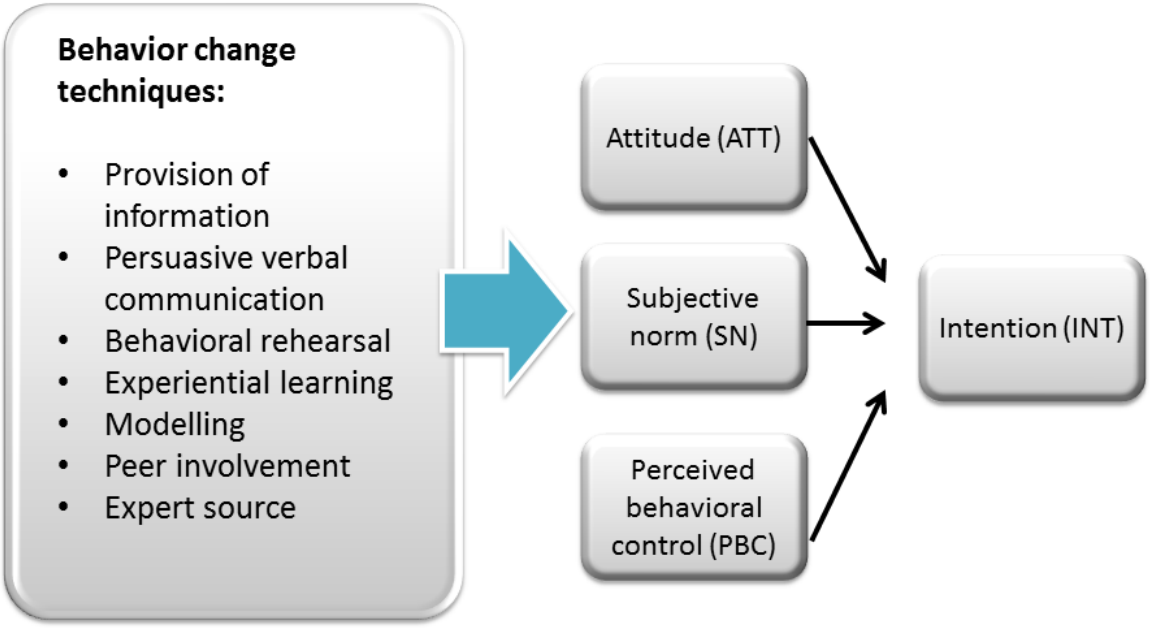
Theory of Planned Behavior (TPB)



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Theory of Planned Behavior (TPB)

Robinson et al (2002)	▪ Construct variables found to be independent predictors of intention to purchase sustainably-produced foods (28.5%)
Bissonette et al (2001)	▪ Extended model accounted for 31% of variance in intention to consume or purchase foods grown locally
Wyker et al (2010)	▪ Construct variables found to be independent predictors of intention to follow a plant-based diet (61%)
Collins (2010)	▪ One semester, cooking lab, University of Vermont ▪ Increased perceived skill, knowledge of cooking ▪ Decreased perceived difficulties in cooking
Wrieden et al (2007)	▪ 10-week food skills program ▪ Increased confidence to cook, and increased frequency of cooking at home

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Research Questions

RQ1. Are students intentions to perform each behavior predicted by their attitude, perceived behavioral control, and subjective norm?

RQ2. Following exposure to the Sustainable Eating Project, do students' intentions to eat locally, eat meatless meals, and cook at home more often increase?

RQ3. Is there an increase in fruit and vegetable intake secondary to an increase in intentions to eat sustainably?

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Methods: Data Collection

- 55 items, validated in previous studies[1-8]
- Pilot-tested for readability on 10 students and staff
- **Survey 1**
  - Collected at time of exposure to project
- **Survey 2**
  - Completed online two weeks following completion of Survey 1
  - Same as Survey 1
- Ethics approval
- Informed consent

[1]Robinson 2002, [2]Brug 2006, [3]Armitage 1999, [4]Chen 2007, [5]Arvola, 2008, [6]Rodgers 2008, [7]Shaharudin 2010, [8]Bogers 2004

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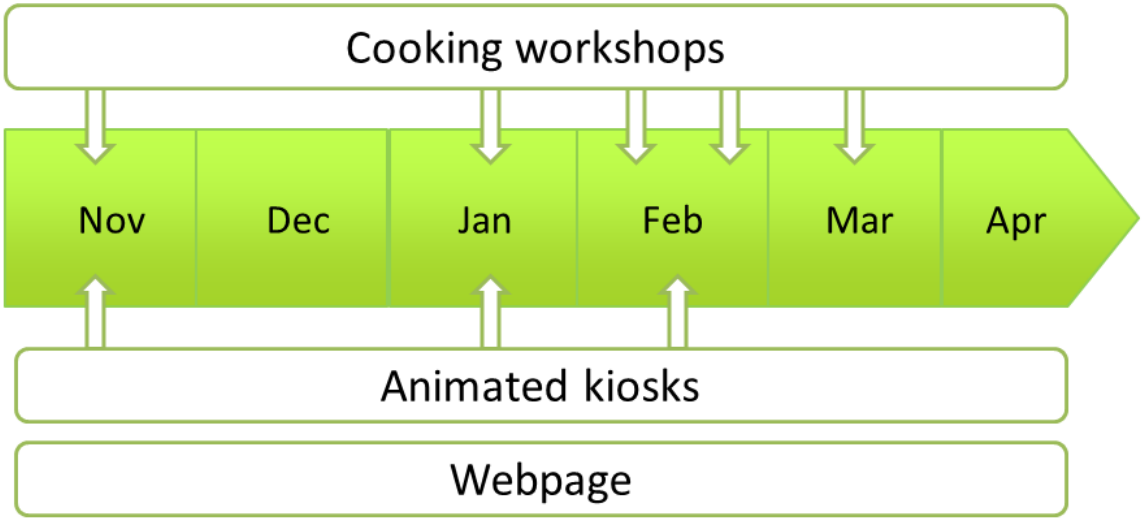
Methods: Data Collection



Collection period: Nov 2010 – Apr 2011

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Methods: Survey

Demographics

- Age, year of study, faculty, weight, height

Exposure to Project (1 item)

- "Before today, have you ever seen or visited a Sustainable Eating Project kiosk, cooking workshop or webpage?" Select all that apply.

Fruit and vegetable intake (1 item)

- "How many portions of fruit and vegetables, of any sort, do you eat on a typical day?"
- Response options: "1 serving" to "≥ 8 servings"
- Examples of serving sizes provided

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Methods: Survey

Eating locally, cooking at home, meatless meals

- Items for each construct, for each behavior: ATT, SN, PBC, INT
- Likert-type scale statements for each construct
- Response options: 1 through 5
  - 1 = strongly disagree, 2 = disagree, 3 = neutral/don't know, 4 = agree, 5 = strongly agree

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Methods: Survey

Attitude (8 items)

Behavioral beliefs (4 items)

- "It is important for me to eat food that is environmentally-friendly."
- Repeated for cost, availability, ease of preparation, healthy.

Outcome evaluations (4 items)

- "Choosing local foods is more environmentally-friendly than choosing conventional food."

Subjective norm (2 items)

- "The people who are important to me expect me to eat locally."

Perceived behavioral control (4 items)

- "I am confident I can eat locally as much as possible over the next week."

Intention (1 item)

- "I intend to eat locally as much as possible over the next week."

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Statistical Analyses

- Data collection and entry with LimeSurvey®
- Analysis with IBM® SPSS® Statistics 18.0.0
- Each behavior analysed individually
- Construct score calculations

- RQ 1: Multiple linear regression on Survey 1 data to test overall validity of model ($\alpha = 0.05$)
  - Dependent variable: INT
  - Independent variables: ATT, SN, PBC

- RQ 2 & 3: Two-tailed Wilcoxon signed ranks test on matched pairs ($\alpha = 0.05$):
  - Change in ATT, PBC, SN and INT scores
  - Change in fruit and vegetable intakes

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Results

- Survey 1, N = 91
  - Respondents completed Survey 1 at:
    - Animated kiosks (11%)
    - Cooking workshops (65%)
    - Webpage (24%)
- Survey 2, N = 45

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Post-hoc Power Calculation

Test	Variables	Power
T-test: Fixed model, single regression coefficient	Two-tailed Effect size $f^2 = 0.15$ $\alpha = 0.05$ Total sample size = 91 Number of predictors = 3	Critical t = 1.9876083 Df = 87 **Power (1-β) = 0.9548240**
F tests: Fixed model, R^2 deviation from zero	Effect size $f^2 = 0.15$ $\alpha = 0.05$ Total sample size = 91 Number of predictors = 3	Critical F = 2.7094021 Numerator df = 3 Denominator df = 87 **Power (1-β) = 0.8720903**
Two-tailed Wilcoxon signed ranks test on matched pairs	Two-tailed Effect size dz = 0.5 $\alpha = 0.05$ Total sample size = 45	Critical t = 2.018121 Df = 41.971834 **Power (1-β) = 0.8928477**

G*Power 3.1.3

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Sample Descriptives, Survey 1 (N=91)*

	%	Mean ± SE
Gender		
Female	78.3	N/A
Male	20.7	
No response	1.1	
Age (years)		
<18	4.3	21.7 ± 3.61
18-24	68.5	
25-29	12.0	
30+	6.5	
No response	8.7	
Body mass index (kg/m²)		
<18.5	9.8	22.0 ± 2.89
18.5-24.9	62.0	
25-29.9	16.3	
No response	12.0	

*P > 0.05 for sample characteristics between Survey 1 and 2

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Sample Descriptives, Survey 1, (N=91)*

Faculty	%
Agr. & Env. Sci.	16.3
Arts	23.9
Arts & Sci.	2.2
Education	4.3
Engineering	4.3
Environment	2.2
Law	7.6
Management	4.3
Medicine	2.2
Science	20.7
Other	2.2
No response	9.8

Level of study	%
Year 0	9.8
Year 1	21.7
Year 2	14.1
Year 3	14.1
Year 4	3.3
Graduate (Master's, Ph.D.)	19.6
Other	7.6
No response	9.8

*P > 0.05 for sample characteristics between Survey 1 and 2

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Results: RQ1, Prediction of intention

Multiple linear regression (*$P < 0.05$, t-test; **P-value < 0.05, ANOVA).

		Standardized coefficient, Beta	R	R Square	Adj R Square	SE
Local eating**	(Constant)		.532	0.283	0.252	0.778
	ATT	0.344*				
	SN	0.295*				
	PBC	0.173				
Home cooking**	(Constant)		.509	0.259	0.222	0.799
	ATT	0.078				
	SN	0.048				
	PBC	0.493*				
Meatless meals**	(Constant)		.405	0.164	0.122	0.933
	ATT	0.289*				
	SN	0.024				
	PBC	0.225				

Predictors: (Constant), PBC, ATT, SN

Results: RQ2, Change in intention

Two-tailed Wilcoxon signed ranks test on matched pairs (*$P < 0.05$).

	Construct	Survey 1	Survey 2
Eating Locally	ATT	17.65	**16.88***
	PBC	3.26	**3.30***
	SN	2.59	**2.44**
	INT	3.35	**3.31**
Home Cooking	ATT	17.13	**18.65**
	PBC	3.35	**3.92***
	SN	2.90	**2.78**
	INT	4.10	**4.13**
Meatless Meals	ATT	17.97	**18.82**
	PBC	4.04	**3.93**
	SN	2.41	**2.84***
	INT	3.25	**3.49**

Possible score ranges: ATT = -40 to 40; PBC, SN, INT = 1-5

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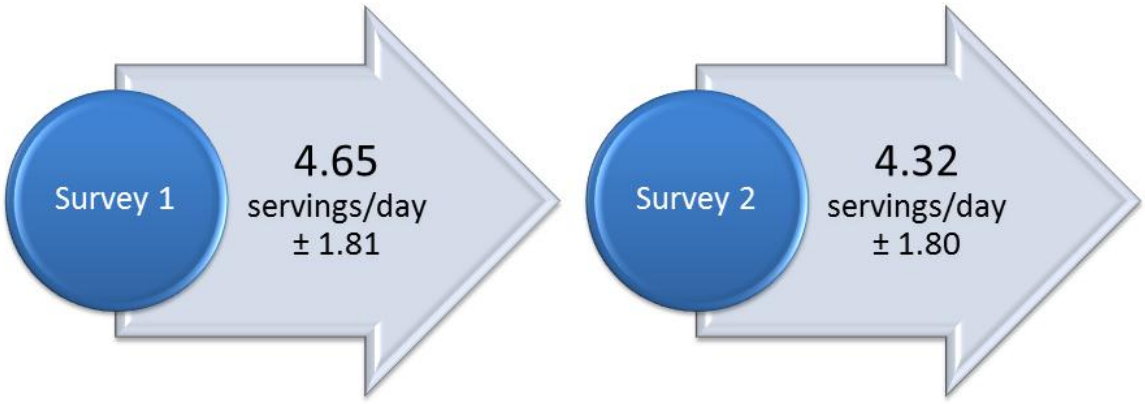
Results: RQ3, Change in FV Intake



P-value: .386

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Discussion, RQ1

- Not all construct variables were found to be independent predictors of intentions to eat sustainably
  - Contrary to expected results, and those from other studies, as previously presented[1-4]
  - Could be due to:
    - Little variability in responses
    - Survey items not capturing true attitudes, perceived control over the behavior or subjective norms

[1]Robinson 2002, [2]Bissonette 2001, [3]Wrieden 2007, [4]Wyker 2010.

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Discussion, RQ2

- Eating locally: ATT decreased due to decreased importance of eating food that is "healthy"
    - Possibly due to non-project related events
- Cooking at home: PBC increased
    - High mean level of intention (4.10) at Survey 1
- Meatless meals: no change in ATT; positive and favourable at Survey 1
- Why didn't we change all proposed predictors of behavior?
    - Lefebvre et al (1999): "multiple-channel delivery"
    - Non-uniform exposure to project/behavior change techniques

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Discussion, RQ3

- No change in FV intakes was expected due to lack of change in intentions
- Nelson (2009):
  - male college students: 3.2 svgs/d, female 3.3 svgs/d
- CCHS (2004):
  - Canadian adult (19+ years) average FV intake: 5.16 svgs/d

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Limitations

- Interpretation of what it means to eat locally, or cook at home
- No items assessing current or past behaviors [1,2]
- Survey items validated in other contexts
- Selection bias: Promotion of "sustainable eating"
- Sample size restriction
  - Analysis does not account for students that participated in more than '1 event'

[1]Bissonnette 2001, [2]Robinson 2002

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Future Directions

Research	Practice
• Identify motivators and barriers for specific individuals/groups • Further investigate TPB, in addition to other models for predicting behavior	• Develop interventions to address barriers/motivators of the client/group • Promote sustainable purchasing practices within institutions

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Appendix H: Colloquium Comments

Many of the comments were related to the presentation style (my mannerisms, pace, design of the slides) and are thus not included in the list of comments being addressed, below.

Q1. Why did we not analyze results by activity?

A. Sample size too small – see page 20 in final report.

Q2. How are we attempting to control selection bias?

A. Cannot control selection bias given the nature of the project. Students who are interested in the topic of sustainable eating will approach the kiosks, access the webpage and attend the cooking workshops. See final report, page 20 for suggestions on how to deal with selection bias in future research.

Q3. How would we change the workshops after? (ie. how would we run the workshops if we were to carry them out again?)

A. See final report, page 20.

Q4. Why did we ask for BMI?

A. We asked for self-reported height and weight, and calculated BMI from these data. We were using BMI as a health status indicator, to compare with the general Canadian population. See final report, page 13.

Q5. Why didn't we assess the PGSS cooking workshops?

A. The PGSS workshops were not funded by the Sustainability Projects Fund, and have been running from Sept 2011 onward. The data collection period for this project was from Nov 2010 to Apr 2011, and included collected data from workshops run during that time frame as stipulated by the SPF grant #13.

Q6. Was Survey 2 given after all of the cooking workshops?

A. No – a hyperlink to access Survey 2 was emailed to workshop participants two weeks following their completion of a specific cooking workshop. See final report, page 7.

Q7. Hypothesis was not clearly stated.

A. See final report, page 4.

Q8. Explain what values mean and their significance.

A. See "Comment" section in final report.

Q9. What are the strengths of this study, and how does it apply to the general population?

A. See final report page 20 and 22.

Q10. What season was this project completed in? Would this have impacted fruit and vegetable intake?

A. This is addressed in the final report, page 15.

Q11. Could the heterogeneous sample be affecting results?

A. It is unclear to me what is being inferred by calling the sample "heterogeneous". If it is related to the variable exposures to the project that each participant has, this is discussed in the final report, page 19.

Appendix I: Confirmation of Conference Presentation

The Eighth International Conference on
Environmental, Cultural, Economic & Social Sustainability
Robson Square, University of British Columbia
Vancouver, Canada
10 – 12 January 2012
www.SustainabilityConference.com

COMMON GROUND

12 January 2012

To Whom It May Concern,

This letter certifies that Tracy McDonough of McGill University, Montreal, Canada, attended the Eighth International Conference on Environmental, Cultural, Economic & Social Sustainability as an in-person participant. Tracy McDonough presented the paper, S12P0668 Modifying Students' Intentions to Eat Sustainably.

Yours Sincerely,

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Director
Common Ground Publishing
2001 S First St
Suite 202
Champaign, IL 61820 USA
www.CommonGroundPublishing.com

Appendix J: Author Guidelines for the International Journal of Environmental, Cultural, Economic and Social Sustainability

Found at: http://onsustainability.com/journal/publish-your-paper/#sg

General Requirements

- We only accept text files or files in .doc format (such as from Microsoft Word or OpenOffice). We do not accept PDF submissions or docx files.
- Papers should be approximately 2,000-5,000 words in length. They should be written as continuous expository narrative in a chapter or article style – not as lists of points or a PowerPoint presentation.
- Please remember that the papers are to be published in a fully refereed academic journal. This means that the style and structure of your text should be relatively formal. For instance, you should not submit a verbatim transcript of your oral presentation, such as 'Today I want to speak to you about …'.
- Paper submissions must contain no more than 30% of textual material published in other places by the same author or authors, and these other places must be acknowledged and cited; in other words, the remaining 70% of the paper must be unique and original to your current submission.
- Authors must ensure the accuracy of citations, quotations, diagrams, tables and maps.
- You may use any referencing style you choose, as long as you use it consistently and to the appropriate standards.
- Papers must have a minimum of five scholarly references.
- Spelling can vary according to national usage, but should be internally consistent.
- Papers should be thoroughly checked and proof-read before submission, both by the author and a critical editorial friend – after you have submitted your paper you are unable to make any changes to it during the refereeing process.
- Papers will be assessed by referees against ten criteria – or fewer if some criteria do not apply to a particular kind of paper (see the Peer Review Process).

Formatting Requirements

1. Please do not enter in Author details, Title information, Abstract or any other front matter. This information is supplied via your CGPublisher profile – you may change this information by logging into http://www.cgpublisher.com and modifying your profile there.

2. Refrain from using ‘Heading 1′ styles. Instead use ‘Heading 2-6′ styles, or simply increase the font size of your headings.

3. Refrain from using Word Drawing objects. Instead use images imported from a drawing program. Word Drawing objects will not be rendered in the typeset version.

4. In case of symbols, please only insert symbols using standard fonts (e.g. ‘WingDings’, ‘Arial Unicode MS’).

5. Please avoid using certain advanced Word features, such as:

    a. Background or font colours
    b. Drawing objects
    c. Automatic table of contents and table of indexes
    d. Autotext or Fields
    e. Bookmarks
    f. Highlighting, strike-through, embossing and other complex Word text formatting
    g. Forms

Illustration/Electronic Artwork Guidelines

- Figures and images must be clear and easy to view. We cannot improve the quality of images.

- Figures and tables need to be placed where they are to appear in the text. If preferred, you can also place images and tables at the end of your paper.

- Please refrain from using Word Drawing objects. Instead use images imported from a drawing program. Word Drawing objects will not be rendered in the typeset version.

Keyword Guidelines

- Keywords are extremely important in search engine rankings. To achieve better exposure for your paper, please make sure your keywords are clear and accurate.

Resubmission Policy

- If your paper has been rejected we will allow a maximum of TWO further resubmissions until TWO months prior to the anticipated publication date.

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