



## Motivated to eat green or your greens? Comparing the role of motivation towards the environment and for eating regulation on ecological eating behaviours – A Self-Determination Theory perspective

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### ABSTRACT

Agriculture being responsible for 35% of gas emission worldwide (Foley, 2011), it is now relevant more than ever before to adopt more sustainable eating behaviours. Given its nature, ecological eating is considered both an eating and an environmental behaviour. The literature, however, has yet to identify whether ecological eating is primarily associated with motivation towards the environment or the regulation of eating. Using Self-Determination Theory framework, the present research aimed to identify the principal motivational predictors of ecological eating by using a path model combining and comparing the predicting value of eating and environmental motivation on ecological eating behaviours. Results suggest that ecological eating predominately belongs to the environmental domain, is mainly related to self-determined motivation towards the environment, and to a lesser extent, self-determined motivation towards eating. Understanding the motivational processes underlying ecological eating is critical to designing efficient intervention and directing future research.

### 1. Introduction

Accounting for 35% of gas emissions, biodiversity loss, degradation of land and pollution of freshwater, food production and agriculture are undeniable environmental threats (Foley et al., 2005; Foley et al., 2011). The environmental pressure of agriculture is not expected to decrease in the upcoming years as it is estimated that by 2050, the demand for food will increase by 70 to 100% as a direct result of population growth (Godfray et al., 2010). There is consequently a growing pressure, on already limited land, to increase food production. Yet, lands may not be used efficiently since only 62% of crop production is destined to human consumption while 35% of lands are used for livestock production (Foley et al., 2011). Considering the growing population, research has been focused on finding ways to increase agriculture productivity, often at the expense of the environment (Foley et al., 2005). Emerging research on sustainable food production suggests that dietary changes such as reducing meat consumption and shifting how lands are allocated to diverse foods production, could help us palliate the environmental harm and meet the dietary needs of a growing population (KB et al., 2018). However, motivating people to change and adopt environmentally sustainable habits remains a challenge. As a result, we have to ensure that our interventions are designed in a way that makes them as

efficient and impactful as possible.

Currently, ecological eating has been considered both an eating and an environmental behaviour because, while not mutually exclusive, healthy foods also tend to be more environmentally friendly options (Tilman & Clark, 2014; Clark et al. 2019). Additionally, an analysis of global diet data conducted by Tilman & Clark (2014) revealed that we are currently seeing changes in global diets caused by urbanization and rising incomes. Globally, people are transitioning towards diets that are high in processed food, refined sugar, refined fats, oils, and meats. These diet shifts are creating additional environmental pressure as they are generating significantly more greenhouse gas emissions than healthier diets (e.g., Mediterranean, pescetarian or vegetarian; Tilman & Clark, 2014). Considering the link between diet and the environment, it is relevant to investigate the motives pertaining to ecological eating.

However, we have yet to identify whether people adopting ecological diets are primarily driven by a motivation to regulate their eating behaviours or the environment. This means that we still have not established the domain to which ecological eating primarily belongs. This subject has consequently been studied using either an environmental or an eating perspective. This gap in the literature is problematic since understanding the motives underlying the adoption of ecological diets is critical in designing efficient interventions leading to sustained

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habits change. Therefore, the main purpose of this study was to examine whether ecological eating is a matter primarily of eating or environmental motivation. To achieve this goal, we propose to rely on Self-Determination Theory (Ryan & Deci, 2017).

### 1.1. Self-Determination Theory

Self-Determination Theory is a leading theory in human motivation and is widely used across multiple domains (see Ryan & Deci, 2017, for an in-depth review of the theory). Self-Determination Theory has greatly and still contributes to research on eating regulation (Williams et al., 1996; Guertin et al., 2017) and environmental behaviours (Green-Demers et al., 1997; Masson & Otto, 2021). More specifically, the theory allows us to understand how such behaviours are initiated and maintained. Central to Self-Determination Theory is the notion of motivational quality. The theoretical framework suggests that individuals engage in various behaviours for different reasons depending on the degree of internalization of the behaviour. The theory suggests that there are six types of motivation for which people engage in various behaviours. Each type of motivation or regulation differ in terms of motivational quality, or level of internalization. Self-Determination Theory suggests that the more internalized the motivation for a domain, the more self-determined the person is. (Ryan & Deci, 2017). Starting from the least self-determined to the most self-determined types of motivation, *amotivation* refers to behaviours that are engaged in without intentionality or purpose; that is, when a person is disengaged. A person engaging in an action under such regulation does so, but the behaviour is meaningless to them. The next type of motivation is extrinsic motivation. This type of motivation is divided in four types of regulations (external, introjected, identified and integrated). *External regulation* is the least self-determined regulation amongst extrinsic motivation. People engaging in behaviours with such regulation do so for external reasons such as social pressure, to obtain a reward and/or to avoid a punishment. Following is *introjected regulation*, which refers to behaviours motivated by shame, guilt, fear of disapproval or ego. Introjected behaviours are executed to avoid such feelings. *Identified regulation* refers to behaviours perceived as important to the person and performed for a specific purpose. The most self-determined type of extrinsic motivation is integrated regulation. *Integrated regulation* describes behaviours carried on by the person because they are in accordance with the person's different values and/or goals. Lastly, there is intrinsic motivation. It is considered the optimal type of motivation since people engaging in behaviours with such motivation do it for the satisfaction, or the pleasure, they get from engaging in the behaviour (Ryan & Deci, 2017). According to the theory, regulations at the lower end of the continuum (i.e., amotivation, external and introjected) are defined as "non-self-determined" forms or regulation; whereas regulations located at the upper end of the continuum (i.e., identified, integrated and intrinsic) are defined as "self-determined" (Ryan & Deci, 2017).

It is also worth mentioning that the more self-determined people are in their regulation of a behaviour, the more committed they are and the more they persist, and maintain that behaviour even in conflicting environments (Baxter & Pelletier, 2020; Ryan & Deci, 2017). For example, a person that is highly self-determined for ecological eating behaviours should be more involved and have more frequent and stable ecological eating habits, whereas a person that is non-self-determined for ecological eating should tend to have inconsistent, unpredictable, and less persistent behavioural patterns. This means that individuals guided by non-self-determined motivations are more likely to change their habits if it becomes inconvenient or if the external pressure to maintain a behaviour is removed (Lavergne & Pelletier, 2015). When it comes to behavioural regulation, whether it is in the environmental or eating domain, research has demonstrated clear advantages of fostering a self-determined regulation over a non-self-determined regulation.

#### 1.1.1. Motivation for the regulation of eating

As demonstrated by multiple studies conducted by Pelletier et al. (2004) and Pelletier & Dion (2007), there is a positive association between self-determined motivation and healthy eating behaviours (e.g., fruits and vegetables, and whole grains), and a negative association between non-self-determined motivation and healthy eating behaviours. Guertin et al. (2017, 2018) have also shown that non-self-determined motivation is positively associated with unhealthy eating behaviours such as consuming processed meats and fast food. Since the consumption of unhealthy foods generally also have a bigger environmental impact than the consumption of healthy foods (Clark et al., 2019), ecological eating may be a matter eating motivation. Research indeed suggests that food-related motivation is a significant predictor of ecological eating behaviours. For example, a study by Schösler et al. (2014) has shown that people who have higher levels of self-determined motivation for eating regulation are more likely to select meat that is produced in an environmentally friendly way. Motivation for the regulation of eating may therefore be a significant predictor of ecological eating.

#### 1.1.2. Motivation for the environment

Research in the environmental domain has been supporting for over 20 years the role played by self-determined motivation on environmental motivation. For instance, Pelletier and Lavergne (2016) and Pelletier et al. (2011) report that self-determined motivation is related to various forms of positive environmental behaviours such as recycling, conserving water, and biodegradable products, whereas non-self-determined motivation was not as significant predictor of these behaviours. Specifically, the studies report that self-determination for the environment was related to reusing behaviours (e.g., reusing the unused side of paper), recycling behaviours (e.g., returning deposit beverage containers to store), purchasing behaviours (e.g., buying biodegradable products) and energy conservation behaviours (e.g., using environmentally friendly forms of transportation). Additionally, Desmarais (2019) suggests that environmental behaviours can be categorized in two distinct types of behaviours: positive and negative environmental behaviours. Positive environmental behaviours regroup behaviours that have a positive impact on the environment (e.g., recycling, activism, energy-saving habits). In opposition, negative environmental behaviours refer to habits and behaviours that have a harmful impact on the environment (e.g., wasting, throwing compostable and recyclable material in the trash). According to this research, positive environmental behaviours are positively associated to self-determined motivation and is not associated to non-self-determined motivation, whereas negative environmental behaviours are negatively associated with self-determined motivation and positively associated to non-self-determined motivation (Desmarais, 2019). This suggests that increasing self-determined motivation leads to more positive behaviours and less negative behaviours. In the light of these findings, and since ecological eating behaviours are considered a form of environmental behaviours, it may also be relevant to test its association with environmental motivation.

### 1.2. Limitations of the existing research

To date, researchers have examined their relationship of eating and environmental motivation on behaviour in their respective domains. Although it is possible that the two types of motivation overlap when examining their role on ecological eating behaviours, the motivational factors associated to ecological eating remain unexplored. To the best of our knowledge, only the study of Schösler et al. (2014) has examined ecological eating within the framework of Self-Determination Theory and this study only examined the relationship between food-related motivation and ecological behaviours. Schösler et al. (2014) recruited over 1000 consumers from various backgrounds to complete an online survey. Participants were invited to complete a novel questionnaire

about food-related motivation and answer a set of questions measuring the frequency of their meat consumption, the quantity of meat consumed, their organic meat purchase habits, general preference and frequency of plant-based options. Authors observed that internalized eating-related motivation was associated with consumption of organic and alternative meats, as well as lower frequency of meat consumption and smaller portion size.

Although this study represents a first attempt to link ecological eating behaviours to Self-Determination Theory, it has important limitations. Firstly, the scale that was used to measure food-related motivation has not been systematically validated and did not include the full spectrum of motivational types suggested by the Self-Determination Theory. Secondly, the scale designed by the authors included several items that referred directly to the dependent variables that the authors were trying to predict. For example, some items such as “I like it best to purchase everything in one shop” or “I like it best to have my food packaged, I believe that is more hygienic” are most likely indicators of habits or preferences related to ecological eating rather than measures of the motivation for such behaviour. Finally, and more importantly, it was not very clear whether motivation for ecological eating and meat consumption were behaviours that originated exclusively from motivation for the regulation of eating behaviour or motivation towards the environment. Taking these factors into consideration, we believe that further research is warranted using a validated measure of motivation for eating behaviours and motivation towards the environment.

More specifically, research has not shown whether ecological eating primarily belongs to the eating or the environmental domain. Ecological eating behaviours being at the crossroad of the eating and environmental domains, it cannot be considered as a part of a domain more than the other without proper analysis. Additionally, the role of eating and environmental motivation has yet to be compared and joined to test its association with ecological eating behaviours. This gap in the literature leaves room to interpretation and makes it hard for policy-makers to target their interventions in the objective of having a meaningful impact, not only on ecological eating, but also on the climate crisis at large.

### 1.3. Current study

The main objective of this research was to identify how eating and environmental motivation are related to ecological eating behaviours. More precisely, we aimed to identify which of these two domains principally pertain ecological eating behaviours. To answer this question, we asked participants questions about different considerations when buying meat. Since livestock production drives by itself 14% of anthropogenic greenhouse gas emission (Food and Agriculture Organization, 2013), this study focused on meat consumption considerations as an indicator of ecological eating behaviours. Such information is critical as it should help us target and create more meaningful interventions that are impactful environmentally. Using a path analysis model, we propose to test the association of self-determined motivation and non-self-determined motivation for eating regulation and towards the environment with pro-environmental, harmful environmental, healthy eating, unhealthy eating and ecological eating behaviours. More importantly, this approach allows us to measure the individual impact of each domain on ecological eating behaviours will control for the impact of the other domain.

## 2. Methodology

### 2.1. Participants

The sample included 496 undergraduate students recruited via a student pool from a Canadian university. The sample is composed of students enrolled in introduction or second-year classes in psychology, communication or linguistics. Participants received partial course

credits for participating in this study. Participants were invited to reflect on day-to-day behaviours that are typically involved in issues related to environmental degradation and health by completing a study examining how environmental factors can affect their health. In average, participants were aged 19.07 years ( $SD = 2.44$ , range = 17–40). Most participants identified as female (77.2%), while the rest identified as male (22.4%). One participant did not identify to any gender and another preferred not to disclose their gender. Participants reported being Caucasian (49.6%); Asian (19.5%); Middle Eastern or Arab (12.3%); Afro-American or Afro-Caribbean (6.7%); Native American (0.8%); other (8%); and 1.3% preferred not to disclose.

### 2.2. Procedures

Participants completed the online survey through Qualtrics in a laboratory setting, which took approximately 45 min. Before completing the survey, participants were asked to read and sign a consent form. After consenting, participants were invited to answer questionnaires about their (1) motivation for engaging in environmental behaviours, (2) motivation for regulating their eating behaviours, (3) pro-and harmful environmental behaviours, (4) healthy and unhealthy eating behaviours, and (5) ecological behaviours.

### 2.3. Measures

#### 2.3.1. Environmental motivation

To assess their motivation towards the environment, participants completed the Motivation Towards the Environment Scale (MTES; Pelletier et al., 1998). The MTES measures motives underlying participants' actions for the environment using 24 items (four items per subscale). The MTES is composed of six subscales each representing different types of regulation of the Self-Determination Theory. The subscales represent intrinsic motivation (e.g., “for the pleasure I experience while I am mastering new ways of helping the environment”), integrated regulation (e.g. “taking care of the environment is an integral part of my life”), identified regulation (e.g. “I think it is a good idea to do something about the environment”), introjected regulation (e.g. “I would feel guilty if I did not”), external regulation (e.g. “my friends insist that I do it”) and amotivation (e.g. “I don't really know; I do not know what I am getting out of it”). While completing the questionnaire, participants indicated their level of agreement for each item using a scale ranging from 1 (*does not correspond at all*) to 7 (*corresponds exactly*). Scores of intrinsic, integrated and identified regulations were transformed into a composite score representing self-determined motivation. The remaining regulation subtypes (introjected, external and amotivation) items were averaged and transformed into a composite score representing non-self-determined motivation. In this study, the internal consistency was of 0.92 for self-determined motivation (intrinsic  $\alpha = .87$ ; integrated  $\alpha = .87$ ; and identified  $\alpha = .87$ ) and 0.71 for non-self-determined motivation (introjected  $\alpha = .82$ ; external  $\alpha = .81$ ; amotivation  $\alpha = .86$ ).

#### 2.3.2. Eating motivation

Participants completed the Regulation of Eating Behaviours Scale (REBS; Pelletier et al., 2004) to measure the motives underlying their eating behaviours. Similar to the MTES, the REBS is composed of six subscales with four items each, for a total of 24 items. Each subscale refers to the different types of regulations proposed by Self-Determination Theory. The scales represent intrinsic motivation (e.g. “it is fun to create meals that are good for my health”), integrated regulation (e.g. “Because eating healthy is congruent with other important aspects of my life”), identified regulation (e.g. “Because I think it is a good idea to try and regulate my eating behaviours”), introjected regulation (e.g. “Because I would be humiliated if people thought I was not in control of my eating behaviours”), external (e.g. “people nag me to do it”) and amotivation (e.g. “I do not know why I

bother"). Participants were asked to rate their level of agreement with each statement on a scale from 1 (*does not correspond at all*) to 7 (*corresponds exactly*). Internal consistency proven being adequate, as suggested by alphas of 0.89 for self-determined motivation (intrinsic  $\alpha = .87$ ; integrated  $\alpha = .86$ ; identified  $\alpha = .78$ ) and 0.84 for non-self-determined motivation (introjected  $\alpha = .81$ ; external  $\alpha = .87$ ; amotivation  $\alpha = .83$ ).

### 2.3.3. Pro- and harmful environmental behaviours

Participants completed a scale quantifying the frequency in which participants engage in different environmental behaviours. The scale contains two subscales with nine items each, for a total of 18 items. The scale was developed in the context of a dissertation and was validated across six studies (Desmarais, 2019). Each item states a positive or negative environmental behaviour, and the participants must indicate how frequently they engage in this behaviour using a Likert scale ranging from 1 (*never*) to 7 (*always*). The items included in the questionnaire falls in two types of behaviours, either pro-environmental (e.g. "Buy products or material made from recycled products") or harmful environmental behaviours (e.g. "buy items with a lot of packaging"). To quantify the overall frequency in which participants engage in ecological behaviours, the overall mean score of pro-environmental behaviours items was computed. The same process was applied using the items referring to harmful environmental behaviours. Internal consistency on the pro-environmental behaviours and harmful environmental behaviours subscale revealed being satisfactory yielding alphas of 0.77 and 0.70 respectively.

### 2.3.4. Eating behaviours

Participants completed the Healthy and Unhealthy Eating Behaviours Scale (HUEBS; Guertin et al., 2020) to measure individuals' eating behaviours according to the most recent recommendations of Canada's Food Guide. This scale quantifies the frequency to which participants eat different types of food items on a regular basis. In total, the scale contains 22 items divided in two subscales. There are 11 items referring to healthy foods (e.g., "I eat fruits"; "I eat whole grains") and 11 items referring to foods that should be consumed in moderation (e.g., "I use white sugar"; "I eat fast food"). Participants were asked, using a scale ranging from 1 (*not true at all*) to 7 (*very true*), to rate whether or not they generally include these food items in their diet. Internal consistency on the healthy and unhealthy subscales revealed to be satisfactory yielding alphas of 0.70 and 0.81 respectively.

### 2.3.5. Ecological eating

Since meat consumption is a notably environmentally harmful eating habit, we decided to focus our efforts on the different elements of meat production taken into consideration by participants before buying or consuming meat (Popp et al., 2010). To do so, we used a scale designed by De Boer et al. (2007). The scale contains 12 items divided in two subscales. There are six items measuring feelings of ease or unease with the animal origin of meat, and 6 items measuring attention paid to the welfare of livestock animals when one is purchasing meat. The purpose of this study was to measure ecological eating behaviours. Since the first subscale was measuring feelings related to meat consumption and origins, not actual behaviours, we excluded it from our study. Thus, we retained the second subscale tapping consumers' concerns and meat purchase behaviours. Participants had to indicate the extent to which they agreed with each item using a scale ranging from 1 (*do not agree at all*) to 7 (*strongly agree*). Each item measured different types of production or environmental concerns that may be taken into consideration before buying meat (e.g. "If I buy meat, I want to know whether it has been produced in an environmentally friendly way"). Internal consistency for these six items was satisfactory yielding an alpha of 0.80.

## 2.4. Data analysis plan

Our strategy followed various steps to identify the primary domain of ecological eating behaviours. First, an exploratory path analysis model using eating regulation self-determined motivation and non-self-determined motivation, as well as environmental self-determined motivation and non-self-determined motivation, was conducted to identify how eating and environmental motivation and behaviours can jointly be used to identify which domain is primarily associated with ecological eating. Second, we specifically tested the paths between self-determined motivation and non-self-determined motivation for the environment on pro-environmental behaviours, harmful environmental behaviours, and ecological eating. We also tested the relationship between self-determined motivation and non-self-determined motivation for eating regulation on healthy, unhealthy, and ecological eating behaviours. We added eating and environmental behaviours to the path model, as their relationship to their domain-specific motivation has been previously established. This also allowed us to see how the different motivational orientations were simultaneously associated with behaviours in their specific domain and with ecological eating. The model that was tested is shown in Figure I. All analyses were conducted using R (version 4.0.5) and the *lavaan* package (R Core Team, 2020; Rosseel, 2012).

## 2.5. Hypotheses

Based on past research, we hypothesize that higher self-determined motivation towards the environment will be associated with (1a) more pro-environmental behaviours and (1b) less harmful environmental behaviours, whereas higher non-self-determined motivation towards the environment will be associated with (2a) less pro-environmental behaviours and (2b) more harmful environmental behaviours. It is also hypothesized that higher self-determined motivation for eating regulation will be associated with (3a) more a higher consumption of healthy foods and (3b) a lower consumption of unhealthy foods; whereas higher non-self-determined motivation for eating regulation will be associated with (4a) a lower consumption of healthy foods and (4b) a higher consumption of unhealthy foods. In relation to ecological eating, it is hypothesized that (5a) self-determined motivation and non-self-determined motivation for eating regulation and for the environment will be associated with ecological eating, but will be primarily related to (5b) self-determined motivation towards the environment when testing the joint impact of eating regulation. It is also expected that ecological eating will be negatively correlated with (6a) unhealthy eating behaviours and (6b) harmful environmental behaviours, but positively correlated with (6c) pro-environmental behaviours and (6d) healthy eating.

## 3. Results

### 3.1. Preliminary analyses

The data were screened for missing and out-of-range values, univariate and multivariate outliers and normality. Missing data screening was conducted at the participant and variable level. Screening at the participants level revealed that one participant had more than 30% missing data. This participant was consequently removed from the analysis (Tabachnick & Fidell, 2018). Screening at the variable level revealed 0.7% or less missing data for all variables. Therefore, missing data were replaced at the variable level using the expectation-maximization algorithm.

### 3.2. Detecting insufficient effort responding and random responses

Based on the work of Huang et al. (2012) about detecting insufficient effort responding we used different approaches to identify participants

who might not have answered our questionnaire truthfully.

### 3.2.1. Infrequency approach

The questionnaire included four validation questions meant to identify random responses. Based on this criterion, we identified five participants who wrongly answered at least two out of four validation questions. These participants were removed from the analysis.

### 3.2.2. Completion time

To identify participants who completed the questionnaire too quickly, participants' completion time was transformed into a standardized score and participants who scored below or over 3.29 on that variable were removed from the analysis. Based on this criterion, 13 participants were removed from the analysis.

### 3.2.3. Outliers

Values with standardized scores over or below 3.29, on a given variable, were winsorized to the next acceptable value (Field, 2017). For multivariate outliers, no outliers at  $p < .001$  were detected using the Mahalanobis distance.

Guided by the aforementioned procedure, 19 participants were removed from the original sample ( $n = 496$ ). All the analyses presented in this study were performed on the 477 remaining participants.

## 3.3. Descriptive statistics

The correlation matrix suggests that most variables are significantly related to each other, but not to the extent that would require combining or removing some variables from the analysis. As expected, environmental self-determined motivation was related to environmental non-self-determined motivation as well as to pro-environmental behaviours, harmful environmental behaviours, and ecological eating. Furthermore, eating self-determined motivation was negatively related to eating non-self-determined motivation and unhealthy eating, as well as, positively related to healthy eating and ecological eating. On its end, ecological eating was related to both types of environmental and eating behaviours. The means, standard deviations, and correlations between the variables are presented in Table 1.

These correlations support hypothesis 6a and 6b since ecological eating is negatively correlated with unhealthy eating behaviours and harmful environmental behaviours. Ecological eating is positively correlated with pro-environmental behaviours and healthy eating behaviours, providing support to hypotheses 6c and 6d.

## 3.4. Path analysis

As an attempt to test whether ecological eating belongs primarily to the eating or environmental domain, we conducted a path analysis testing a dual model testing the association of motivation for the regulation of eating and the environment.

Maximum likelihood estimation was used to assess the fit of the path

model. The fit indices revealed an adequate model fit for the hypothesized model ( $normed \chi^2 = 2.25$ ,  $CFI = 0.986$ ,  $TLI = 0.951$ ,  $RMSEA = 0.051$ ,  $CI_{90} [0.023, 0.080]$ ,  $SRMR = 0.033$ ). Most of the hypothesized paths were significant, except for the associations between environmental non-self-determined motivation and pro-environmental behaviours, as well as pro-environmental behaviours and ecological eating, and the association between eating non-self-determined motivation and unhealthy eating behaviours. Overall, nine paths out of 12 were significant and in the expected direction. Results are shown in Fig. 1.

### 3.4.1. Effects on Pro-Environmental behaviours

Environmental self-determined motivation was positively associated with pro-environmental behaviours ( $\beta = .52$ ,  $p < .001$ ) which provides support for hypothesis 1a. However, hypothesis 2a was not supported since environmental non-self-determined motivation was not significantly linked to pro-environmental behaviours ( $\beta = -.02$ ,  $p = .527$ ). In overall, 29.6% of the variance in pro-environmental behaviours was explained by the exogenous variables of the model.

### 3.4.2. Effects on harmful environmental behaviours

Environmental self-determined motivation ( $\beta = -.36$ ,  $p < .001$ ) and environmental non-self-determined motivation ( $\beta = .22$ ,  $p < .001$ ) were negatively and positively associated with harmful environmental behaviours, respectively. This supports hypotheses 1b and 2b. This part of the model explained 15.5% of the variance in harmful eating behaviours.

### 3.4.3. Effects on healthy eating behaviours

Eating self-determined motivation ( $\beta = .43$ ,  $p < .001$ ) was positively related to healthy eating behaviours, whereas eating non-self-determined motivation ( $\beta = -.09$ ,  $p < .021$ ) was negatively related to healthy eating behaviours, providing support to hypotheses 3a and 4a. The suggested part of the model explained 21.3% of the variance observed in healthy eating behaviours.

### 3.4.4. Effects on unhealthy eating behaviours.

The level of eating self-determined motivation ( $\beta = -.29$ ,  $p < .001$ ) was negatively associated with unhealthy eating behaviours, therefore supporting hypothesis 3b. Eating non-self-determined motivation ( $\beta = .00$ ,  $p = .957$ ) was not associated with unhealthy eating behaviours and therefore, hypothesis 4b was not supported. The present model explained 8.7% of the variance in unhealthy eating behaviours.

### 3.4.5. Effects on ecological eating

In terms of the environment, environmental self-determination ( $\beta = .29$ ,  $p < .001$ ) was positively associated with ecological eating, whereas environmental non-self-determined motivation ( $\beta = -.06$ ,  $p = .209$ ) was not associated with ecological eating. Relative to eating, eating self-determined motivation ( $\beta = .13$ ,  $p = .003$ ) as well as eating non-self-determined motivation ( $\beta = .10$ ,  $p = .031$ ) were both positively associated with ecological eating but to a lesser extent than environ-

**Table 1**  
Descriptive statistics: Means, standard deviations and correlation between the variables.

Variable	M	SD	1	2	3	4	5	6	7	8	9
1. Environmental SDM	4.7	1.1	-	0.18**	0.41**	-0.01	0.56**	-0.31**	0.30**	-0.04	0.36**
2. Environmental NSDM	3.2	0.7		-	0.07	0.52**	0.06	0.18**	-0.03	0.06	0.08
3. Eating SDM	4.8	1.1			-	-0.11*	0.22**	-0.17**	0.45**	-0.30**	0.25**
4. Eating NSDM	2.9	1.0				-	-0.05	0.15*	-0.15**	0.04	0.07
5. PEB	3.8	0.9					-	-0.32**	0.38**	-0.13*	0.46**
6. HEB	3.3	0.9						-	-0.19**	0.28**	-0.22**
7. Healthy eating	4.8	0.8							-	-0.04	0.32**
8. Unhealthy eating	3.8	1								-	-0.09*
9. Ecological Eating	3.6	0.9									-

Note.  $N = 477$ . SDM = self-determined motivation; NSDM = non-self-determined motivation; PEB = pro-environmental behaviours; HEB = harmful environmental behaviours. \* =  $p < .05$ ; \*\* =  $p < .001$ .



internalized motivation reported by Schösler et al. (2014), our study additionally suggests that differentiating environmental motivation from eating regulation motivation may be important. When this is done, motivation towards the environment is more strongly related to ecological eating than eating motivation. This suggests that a majority of people may be more inclined to adopt ecological eating behaviours out of concerns for the environment; not necessarily because ecological eating behaviours may be good for their health.

This could be happening because the current importance given to the protection of the environment and healthy eating in people's lives differs considerably for both domains. Although it is difficult to compare objectively the importance given to the two life domains, we can assume that the degradation of the environmental conditions and the increasing impact of green gas emissions are becoming more dominant as these topics are discussed on a regular basis in the media because the consequences related to climate change are made salient. Also, as indicated in the introduction, it is becoming clear that biodiversity loss, degradation of land and pollution of freshwater, food production and agriculture are undeniable environmental threats (Foley et al., 2005; Foley et al., 2011), that, in combination with population growth, are putting more and more pressure on the environmental impact of agriculture to respond to the demand for food (Godfray et al., 2010). Although the importance given to healthy eating is still something that represents an important goal in people's lives, this goal appears to be less important in the media possibly because this problem has been already addressed and that people have been exposed to a considerable amount of information on what to eat and how to eat healthier diets.

However, motivating people to change their eating behaviours and to adopt environmentally sustainable habits remains a challenge. Although healthy foods tend to be more environmentally friendly options (Tilman & Clark, 2014; Clark et al. 2019), an analysis of global diet data suggests that the current changes in diets are affected by situational contexts like urbanization and a hectic lifestyle, which lead people to adopt more easily accessible diets that are high in processed food, refined sugar, refined fats, oils, and meats (Tilman & Clark, 2014). In other words, social environments influence overall eating habits (Hawkins et al., 2020) and facilitate the adoption of negative (unhealthy) eating habits in young adults (Øygard & Klepp, 1996; Gruber, 2008; Bevelander et al., 2011). These diet shifts are not only less healthy, they are creating additional environmental pressure as they are generating significantly more greenhouse gas emissions than healthier diets (e.g., Mediterranean, pescetarian or vegetarian; Tilman & Clark, 2014).

Pelletier et al. (2016) have however challenged the assumption that eating behaviours are mainly driven by external factors and offer another perspective grounded on Self-Determination Theory framework (Ryan & Deci, 2017). These authors suggest that more emphasis should be put on the ability of each individual to engage in behaviours that are pleasurable to them, and consistent with their values and identity. This could be done through psychological needs supportive environments as well as messages that target both the intrinsic goals associated with healthy eating and sets of information associated with different phases of the behaviour change process (Pelletier, Guertin, & Rocchi, 2017). In the end, this could lead each individual to become autonomous in the regulation of their own eating behaviours.

Similarly, information in the media encourages the adoption of pro-environmental behaviours. As a result, more and more people indicate that they are aware of the degradation of the environment, but, as several authors have mentioned, this does not necessarily translate into more actions to protect the environment (Gifford, 2008; Vlek & Steg, 2007). However, research grounded in Self-Determination Theory has shown that autonomous motivation consistently relates moderately or strongly to environmentally beneficial behaviours, while controlled motivation and its regulation styles slightly correlate positively with pro-environmental behaviours, while some studies find a negative correlation or no correlation at all (Desmarais, 2019).

Our results suggest that ecological eating may predominately relate with the environmental domain, and to a lesser extent, the eating domain. They also demonstrate that Self-Determination Theory is a valuable theoretical framework that can integrate various perspectives on pro- and harmful-environmental behaviours, and healthy and unhealthy eating behaviours. Finally, our findings support that autonomous motivation, compared to controlled motivation, represents an important determinant of pro-environmental behaviour, healthy eating, and ecological eating. Therefore, understanding the motivational processes underlying these behaviours, and more specifically ecological eating, is critical to designing efficient intervention and directing future research.

#### 4.1. Limitations and future research

The sample of the present study was mostly constituted of young undergraduate students. This sample might therefore not be completely representative of the general population. Considering that the Self-Determination Theory framework has previously proven to replicate, in the eating and environmental domain, across multiple ethnic, socio-economic and age groups (Deci & Ryan, 2008), we remain positive that the findings offer an accurate picture from the larger population. We, however, recognize that this contribution to the field would benefit from replication in diverse populations.

Considering the disproportionate environmental impact of meat consumption, this study used considerations surrounding the welfare of livestock animals when they purchase meat, as defined by De Boer et al. (2007) scale, as an indicator of ecological eating behaviours. However, considerate meat purchase and consumption are solely one type of ecological eating behaviour. Therefore, additional research is needed to assess whether the predominant role of environmental motivation translates into other types of ecological eating behaviours. This effect could be tested with behaviours such as food waste, packaging, transportation, food portions or types of foods consumed. Further research should consider including other measures of ecological eating that includes various types of behaviours, not solely habits surrounding meat purchase and consumption.

Researchers may also want to examine the proposed model by adding self-determined and non-self-determined health motivation as exogenous variables in the model. Although eating regulation is an important daily practice and certainly plays a role in the adoption of ecological eating behaviours, health, the environment, and animal rights seem to represent the main reasons for reducing meat purchase and consumption behaviours (Fox & Ward, 2008; Rosenfeld & Burrow, 2017). Thus, it may be that motivation for health plays a more important role than motivation for eating regulation when considering ecological eating, and potentially a more or less important role than motivation for the environment, but this remains to be determined.

Given that individuals who reduce meat purchase and consumption do so for a variety of reasons, it would be important for future research to consider these motives when examining the association between motivation and ecological eating behaviours. It may be that health and environmental motives for reducing meat purchase and consumption play a moderating role in the association between motivation and ecological eating. Specifically, health-related motives may strengthen the relationship between self-determined motivation for eating regulation and ecological eating and weaken the relationship between self-determined motivation for the environment and ecological eating, whereas environment-related motives may strengthen the relationship between self-determined motivation for the environment and ecological eating and weaken the relationship between self-determined motivation for eating and ecological eating.

##### 4.1.1. Cultural, geographic, and socio-economic implications

Considering the role of cultural, geographic, and socio-economic influences on eating behaviours, the present results should be

interpreted with caution outside a North American context. Considering the discrepancies in the agricultural productivity across countries (Gollin et al., 2014), it is realistic to assume that ecological food availability and diversity may vary depending on the person's country or region of residence. Despite the relatively scarce literature on this matter, we can hypothesize that the variety and availability of eco-friendly food options may be limited in remote regions, low socio-economic neighbourhoods, and developing countries. Verly-Jr et al. (2021) suggested that adherence to a healthier and environmentally friendly diet is associated with a 15 to 22% increase in grocery costs. This means that healthier and environmentally friendly diets may represent unrealistic ideals for individuals from lower socio-economic status. It may as well be of relevance for future research to explore the impact of other factors such as gender, life stages, and household composition (e.g. are the participants living on their own or with roommates, parents, a romantic partner, or with their children) on ecological eating. Research has indeed previously demonstrated that social contexts have strong influences on food purchase and eating behaviours (Gruber, 2008; Bevelander et al., 2011). In sum, researchers should be mindful of the influences of cultural, geographical, and socio-economic factors when designing interventions and quantifying ecological eating behaviours.

## 5. Conclusion

The present study offers relevant insight into the prominent role of environmental motivation in its association with ecological eating. We believe that this study supports the relevance of considering motivation and its contextual domain when promoting and inciting people to adopt new ecological eating habits. This study additionally positions the Self-Determination Theory framework as a relevant and useful tool not only to predict such habits, but also to create useful interventions and enhance their effectiveness.

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## CRedit authorship contribution statement

**Ariane J. Gauthier:** Conceptualization, Formal analysis, Writing – original draft. **Camille Guertin:** Conceptualization, Methodology, Investigation, Writing – review & editing. **Luc G. Pelletier:** Conceptualization, Methodology, Supervision, Writing – review & editing.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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