Gender differences in dietary intakes: What is the contribution of motivational variables?

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ABSTRACT

Background: Differences between men and women in dietary intakes and eating behaviors have been reported and could be explained by gender differences in motivational variables associated with the regulation of food intake. Our main objectives were to identify gender differences in dietary intakes, eating behaviors and motivational variables and to determine how motivational variables were associated with dietary intakes and eating behaviors in men and women. **Methodology:** Sixty-four men and 59 premenopausal women were included in the study and presented cardiovascular risk factors. The regulation of eating behaviors scale was completed to assess motivational variables. A validated food frequency questionnaire was administered to evaluate dietary intakes and subjects completed the Three-Factor Eating questionnaire to assess eating behaviors. **Results:** Men had higher energy intake, energy density and percentage of energy from lipids and lower percentage of energy from carbohydrates than women ($P \leq 0.04$). Men also had a lower emotional susceptibility to disinhibition than women ($P = 0.0001$). Women reported a higher score for eating related self-determined motivation in the regulation of eating behaviors (i.e. eating related SDI) than men ($P = 0.002$). The most notable gender difference in the pattern of associations was that eating related SDI was negatively associated with energy density (r = -0.30; $P = 0.02$), only in women. **Conclusions:** Women had a better dietary profile and higher eating related SDI than men. However, gender differences in dietary variables might be explained by a potential gender specific pattern of association of eating related SDI with dietary intakes and eating behaviors.

INTRODUCTION

Gender differences have been reported for dietary intakes and eating behaviors (Li *et al.*, 2012). More specifically, previous studies reported that women have higher fruit and vegetables consumption and tend to have greater interest in healthy diets and desire to eat food lower in calories than men (Fagerli & Wandel, 1999; Rolls *et al.*, 1991). Gender differences in eating behaviors have also been reported, women generally showing higher dietary restraint and disinhibition levels than men (Provencher *et al.*, 2003a). It has been shown that disinhibition is positively associated with energy intake (Lindroos *et al.*, 1997) and energy density (Goulet *et al.*, 2008) whereas dietary restraint is generally negatively associated with energy intake and dietary fat intakes (de Castro, 1995; Lindroos *et al.*, 1997).

Motivation to adopt healthy eating is recognized as a potential factor involved in the regulation of dietary intakes and eating behaviors (Ashida *et al.*, 2012). Accordingly, the Self-Determination Theory (SDT) (Deci & Ryan, 1985; Ryan & Deci, 2000) emphasizes the importance of motivation quality and proposes that the regulation of a behavior may take many forms that correspond to different behavioral regulatory styles according to motivation, which differ by their self-determination level. Another key postulate from the SDT addresses the processes that facilitate internalization of nonself-determined regulatory styles towards more self-determined regulatory styles (Deci & Ryan, 1985; Ryan & Deci, 2000). Moreover, the SDT has identified three basic psychological needs which are autonomy, competence, and relatedness that foster the process of internalization and development of optimal motivation and personal well-being (Ryan & Deci, 2000). With regard to the regulation of eating behaviors, Pelletier et al. (2004) showed that global self-determined motivation in life predisposes individuals to adopt a more self-determined orientation in the regulation of eating behaviors. Studies also showed that behaviors regulated by self-determined motivation promote adoption of healthy eating behaviors and long-term maintenance of healthy eating habits (Pelletier *et al.*, 2004; Williams *et al.*, 2002), and could also be a protective factor against social pressures unfavourable to healthy eating behaviors (Mask & Blanchard, 2011; Pelletier *et al.*, 2004). However, literature about the potential influence of motivation on eating behaviors is scarce. In addition, according to the SDT, the same behavior can be regulated differently between individuals (Verstuyf *et al.*, 2012), which suggests that it might not fulfill the same role in men and in women. Although gender differences related to motivational factors have not been specifically investigated in a dietary context, literature suggests that women generally display a more self-determined motivational profile compared to men in a diversity of life domains, such as sports, leisure, interpersonal relationships and education (Vallerand, 1997).

To our knowledge no study has yet investigated the contribution of motivational variables in explaining gender differences in dietary intakes and eating behaviors. In addition, the pattern of associations relating motivational variables to dietary intakes and eating behaviors according to gender has never been documented. Moreover, while the adoption of healthy eating habits is encouraged in the prevention of chronic diseases (NCEP ATP III, 2002), dietary changes remain difficult to achieve for many individuals. In order to favour adherence to healthy eating habits in men and women, we first need to get a better understanding of its underlying factors using a gender specific approach. According to the literature, motivation related to the regulation of food intake and eating behaviors is clearly one of these underlying factors. In a context of intervention, it would thus be beneficial to identify motivational factors influencing healthy eating according to gender, to promote optimal support in dietary changes. The main objective of our study was therefore to identify gender differences in dietary intakes, eating behaviors and motivational variables and to verify whether some gender differences in motivational variables could explain differences observed between men and women in dietary intakes and eating behaviors. We also wanted to determine how motivational variables were associated with dietary intakes and eating behaviors in men and women, separately.

METHODOLOGY

1.1 Participants

This study was conducted among a sample of 64 men and 59 premenopausal women aged between 25 and 50 years old and presenting cardiovascular risk factors. Data presented in this article correspond to baseline values from a nutritional intervention study aiming at assessing changes in dietary variables in men and women in response to a nutritional intervention promoting the Mediterranean diet (MedDiet). This latter study is a part of a broader research project in which our research team was interested to document differences between men and women in response to the MedDiet both in a controlled setting (i.e. all meals adjusted to energy needs were provided to subjects for four weeks) and also in a more real life intervention context (nutrition education program). When designing the study we decided to focus on premenopausal women and to compare them to men in the same age range because we wanted to maximize the potential impact of sex-related hormones on metabolic changes observed in response to the MedDiet (Bedard *et al.*, 2012). Therefore, in order to be able to compare results obtained in a controlled setting to those obtained in the more real life context we have used the same inclusion criteria.

In women, a follicle-stimulating hormone (FSH) measurement was performed if needed (e.g., when women presented periods irregularities) to confirm the premenopausal status (FSH < 20 IU/l) (Landgren *et al.*, 2004). Men and women included in the study had to present slightly elevated LDL-Cholesterol (C) concentrations (between 3.0 and 4.9 mmol/L) (Grundy *et al.*, 2004) or a total-C to HDL-C ratio ≥ 5.0 mmol/L, and at least one of the four following criteria of the metabolic syndrome (NCEP ATP III, 2002) : 1) triglyceride concentrations ≥ 1.7 mmol/L; 2) fasting glycaemia between 6.1 et 6.9 mmol/L; 3) blood pressure concentrations ≥ 130/85 mm Hg; 4) waist circumference ≥ 80 cm in women and ≥ 94 cm in men (International Diabetes Federation, 2006). Participants also had to have a stable body weight (± 2.5 kg) for a minimum of three months prior to the beginning of the study and to be implicated in food purchases and/or meal preparation at home. We excluded men and women who had cardiovascular events and who used medication that could affect dependent variables under study. Smokers, participants with an alcoholism history, pregnant women and participants with a high Mediterranean score (Medscore > 29, concordant with a typical Mediterranean food pattern) (Goulet *et al.*, 2003) were also excluded. Briefly, the Medscore (range between 0-44 points) was calculated based on the 11 components of the Mediterranean pyramid, i.e. grains; fruits; vegetables; legumes, nuts and seeds; olive oil; dairy products; fish; poultry; eggs; sweets and red meat/processed meat, and allowed to assess the level of adherence to the Mediterranean food pattern, i.e. healthy dietary intakes. A high score for food groups found at the bottom of the pyramid (e.g., legumes) reflects a high consumption whereas a high score for food groups found at the top of the pyramid (e.g., red meat) reflects a low consumption, as previously described (Goulet *et al.*, 2003). In addition, men included in the study were matched to women for LDL-C concentrations and age. All participants voluntarily agreed to participate in the research project and were recruited through different media advertisements in the Québec City Metropolitan area. This study was approved by the Laval University Research Ethics Committee. Written informed consent was obtained from all men and women prior to their participation in the study.

1.2 Measurements

1.2.1 Motivational variables

Basic psychological needs scale (Gagné, 2003) is a 21-item questionnaire that assesses three basic psychological needs, i.e. autonomy (7 items), competence (6 items) and relatedness (8 items), which are determinants of motivation according to Self-Determination Theory (SDT) and mediate the impact of social factors on individual's level of self-determined motivation. More specifically, autonomy reflects a desire to engage in activities and to be the origin of one's own behavior; competence is defined as the need to interact effectively with one's environment to produce desired outcomes while preventing undesired events; relatedness is defined as the need to feel connected to and accepted by significant others in a social milieu (Gagné, 2003). Each item was measured on a 7-point Likert scale, which allowed calculating three subscale scores corresponding to the satisfaction of each of the three needs.

The Global motivation scale (GMS-28) (Guay *et al.*, 2003; Vallerand, 1997) is a questionnaire that assesses fundamental motivation in life and displays high level of reliability and validity among the adult population (Vallerand, 1997). This scale includes 28 items and assesses intrinsic motivation (12 items) (which refers to engaging in an activity for it own sake and experience of pleasure and satisfaction derived from participation), identified regulation (4 items) (i.e. refers to behaviors that are performed by choice because the individual judges them as important), introjected regulation (4 items) (i.e. refers to behaviors that are in part internalized by the person) and external regulation (4 items) (i.e.

refers to behaviors that are not self-determined because they are regulated through external means such as rewards and constraints), and amotivation (4 items) (i.e. pertains to the lack of intentionality and therefore refers to the relative absence of motivation (neither intrinsic or extrinsic)). Each item was measured on a 7-point Likert scale, which allowed calculation of the global self-determination index (SDI).

The Regulation of eating behaviors scale (Pelletier *et al.*, 2004) is a 24-item validated questionnaire that assesses self-determined motivation for the regulation of eating behaviors. Items included in this questionnaire (4 items per self-determined regulatory styles) assess intrinsic motivation (e.g., "I like to find new ways to create meals that are good for my health"), different self-determined regulatory styles which are integrated (e.g., "Eating healthy is an integral part of my life"), identified (e.g., "I believe it will eventually allow me to feel better"), introjected (e.g., "I feel I must absolutely be thin") and external (e.g., "Other people close to me insist that I do"), and amotivation (e.g., "I don't know why I bother") (Ryan & Deci, 2000). Each item was measured on a 7-point Likert scale, which allowed calculation of the eating related SDI (Vallerand, 1997), specific to eating regulation.

1.2.2 Dietary Variables

A validated food frequency questionnaire (FFQ) (Goulet *et al.*, 2004) was administered to participants. The FFQ is based on typical foods available in Québec, contains 91 items and 33 subquestions and was administered by a registered dietitian. Participants were questioned about the frequency of intake for different foods and drinks during the last month and could report the frequency of these intakes in terms of day, week or month. Macronutrient and micronutrient intakes obtained from the FFQ were evaluated using the Nutrition Data System for Research (NDS-R, version 4.03_31) software.

1.2.3 Eating Behaviors and Meal Preparation Frequency

Eating behaviors were assessed by the Three-Factor Eating Questionnaire (TFEQ) (Stunkard & Messick, 1985), a 51-item validated questionnaire which assesses three factors that refer to cognitions and behaviors associated with eating: dietary restraint (21 items) (conscious control of food intake with concerns about shape and weight), disinhibition (16 items) (overconsumption of food in response to a variety of stimuli associated with a loss of control on food intake) and hunger (14 items) (food intake in response to feelings and perceptions of hunger). More specific subscales are also derived from these three general eating behaviors (Bond *et al.*, 2001; Westenhoefer *et al.*, 1999): rigid restraint, flexible restraint, habitual susceptibility to disinhibition, emotional susceptibility to disinhibition, situational susceptibility to disinhibition, internal hunger, and external hunger (see **Table 2**). As for involvement in meal preparation, referring to active implication in meal organization and preparation, participants had to complete a questionnaire where the following question was asked: " Considering that there are 14 meals in a week (taking into account lunch and dinner only), how many times per week are you involved in meal preparation?" Participants had to choose among categories defined as follow: Never, 1-3 time(s)/week, 4-6 times/week, 7-9 times/week, 10-12 times/week and 13-14 times/week, which allowed to assess weekly frequency in meal preparation.

1.2.4 Anthropometric and Metabolic Profile

All anthropometric and metabolic variables were measured in the fasting state. According to standardized procedures (Lohman *et al.*, 1988) height was measured to the nearest millimeter with a stadiometer (Seca 222 Mechanical Telescopic Stadiometer), body weight was measured to the nearest 0.1 kg on a calibrated balance (BWB-800S Digital scale, Tanita), and body mass index (BMI) was then calculated. Waist circumference measure was also taken to the nearest millimeter according to standardized procedures (Lohman *et al.*, 1988). Percentage of body fat was estimated using the Tanita body-fat analyser (Tanita-BC-418 body-fat analyser, Tanita Corp., Tokyo, Japan). Basic lipid profile and glucose and insulin levels were measured with a blood serum sample taken after a 12-hour overnight fast.

Statistical Analyses

Student's t-test allowed comparisons of characteristics related to motivational variables, dietary intakes, eating behaviors, and anthropometric and metabolic profile, whereas the Fisher's Exact test was performed to compare weekly frequency of meal preparation (categorical data) between men and women. The Fisher's Exact test was also performed to compare weekly frequency of meal preparation between men and women individually matched for their level of eating related SDI (largest difference within pair set at 3 units of SDI). For variables not normally distributed, a transformation was performed. However, these variables are presented as raw data in the tables. Pearson correlation analyses were performed to examine the association between global SDI and eating related SDI, and also in order to examine how eating related SDI was associated with dietary intakes and eating behaviors. A covariance analysis (Lsmean procedure) was performed in order to determine if gender differences in dietary intakes were still significant when accounting for eating related SDI. The probability level for significance used for the interpretation of all statistical analyses was set at a α level of $P \leq 0.05$. All analyses were performed using SAS statistical software (version 9.2, SAS Institute Inc., Cary, NC).

RESULTS

Table 1 shows characteristics of men and women in terms of their age, anthropometric variables and metabolic profile. Men and women included in our study were about the same age and had similar levels of total-C, LDL-C, fasting glucose and fasting insulin, but men had higher BMI, waist circumference, total-C to HDL-C ratio and triglyceride levels than women, whereas women had higher percentage of body fat and HDL-C levels than men.

Table 2 presents dietary intakes and eating behaviors in men and women. Men had higher energy intake, energy density and percentage of energy provided by lipids while they had lower percentage of energy provided by carbohydrates than women. In addition, 43.8%, 28.1% and 100% of men and 57.6%, 42.4% and 100% of women had respectively lipid, carbohydrate and protein intakes within acceptable macronutrient distribution range. According to meal preparation, men had a lower weekly frequency of meal preparation than women ($P < 0.0001$), with 4.8% versus 22.0% of men and women respectively, reporting a frequency of meal preparation between 13-14 times a week. As for eating behaviors measured with the TFEQ, the only significant gender difference observed was a lower score for emotional susceptibility to disinhibition in men than in women.

Table 3 shows basic psychological needs and motivational profile in men and women. No gender differences were observed for basic psychological needs for autonomy, competence and relatedness, and for the global SDI and its respective subscales. As for the regulation of eating behaviors scale represented by the eating related SDI, men reported a significantly lower score in eating related SDI than women. More specifically, intrinsic motivation and integrated regulation were lower in men than in women. Pearson's correlation analyses were conducted to determine if there were significant associations between the global and the eating related SDI, in men and women. A significant and positive association between the global and the eating related SDI was observed in men ($r = 0.50$; $P < 0.0001$) as well as in women ($r = 0.53$; $P < 0.0001$). Analyses were also performed to verify whether some gender differences in eating related SDI could explain differences observed between men and women in dietary intakes. Accordingly, gender differences in energy density and percentage of energy provided by carbohydrates remained significant after statistical adjustment for eating related SDI (Lsmean $P \leq 0.02$). However, gender difference in the percentage of energy provided by lipids was no longer significant (Lsmean = 0.08) after adjustment for eating related SDI. In order to verify whether gender differences in eating related SDI could explain the difference observed between men and women as regard to weekly frequency of meal preparation, we individually matched men and women with similar eating related SDI. After this procedure it was found that mean eating related SDI levels were respectively 93.0 ± 24.8 in men and 93.4 ± 25.2 in women (t-test, $P = 0.95$). Then with a total of 42 pairs formed, results showed that a significant gender difference remained for weekly frequency of meal preparation, with men presenting lower weekly frequency of meal preparation than women (Fisher's Exact test, $P = 0.005$).

Correlation analyses were conducted to determine how eating related self-determined motivation was associated with dietary intakes and eating behaviors, in men and women. **Table 4** shows that except for the significant and negative association between eating related SDI and energy density in women, no other dietary variables were associated with eating related SDI among men and women. However, for eating behaviors among men, eating related SDI was significantly and positively associated with flexible restraint, but negatively associated with emotional susceptibility to disinhibition and hunger, more specifically with internal hunger. It was also found that eating related SDI was negatively associated with percentage of body fat. In women, eating related SDI was significantly and negatively associated with disinhibition, more precisely with situational susceptibility to disinhibition, and with external hunger. A trend for a negative association between eating related SDI and emotional susceptibility to disinhibition was also observed in women. Moreover, eating related SDI was also negatively associated with BMI, percentage of body fat and waist circumference in women.

DISCUSSION

Our results suggest that women reported a healthier dietary profile, namely lower energy density, and also had globally a healthier metabolic profile than men. Previous studies support our results by showing that women tend to have better overall diet quality than men (Garriguet, 2009; Liebman *et al.*, 2006). Furthermore, studies showed that dietary intakes of low energy density are associated with a better quality of dietary intakes and a lower BMI (Raynor *et al.*, 2012; Rolls *et al.*, 2005) and evidence of the beneficial influence of healthy eating habits on health status are well established in the literature (Bacon *et al.*, 2005; Sofi *et al.*, 2008). This brings support to the observation that the lower energy density in the diet of women was accompanied by a lower BMI and by a healthier lipid profile than what was found in men. As for eating behaviors, the only gender difference was for emotional susceptibility to disinhibition with women having higher level than men. A similar difference was previously shown in other studies (Delahanty *et al.*, 2002; Waller & Matoba, 1999).

According to motivational profile, men and women reported similar basic psychological needs satisfaction and similar level of global self-determined motivation. In addition, our results suggest that for both genders, a higher level of global self-determined motivation in life domains is associated with a higher level of eating related self-determined motivation. However, our results also showed that for a given level of global self-determined motivation, women show higher level of eating related self-determined motivation than men. One of the postulates of the SDT indicates that motivation is determined by the top-down effect from motivation at the next level up in the hierarchy, respectively, the global, eating related and situational motivation (Vallerand, 1997). In fact, this postulate proposes that higher hierarchical level of motivation can influence the level below. Although our study does not allow establishing causal associations, it could be hypothesized that global self-determined motivation can influence the level of eating related self-determined motivation in both men and women. However, because no gender differences were observed according to global SDI, other factors are clearly involved in determining the level of eating related self-determined motivation and could explain the difference in eating related SDI between men and women.

According to the SDT, more self-determined forms of behavioral regulation will be promoted if the basic psychological needs are satisfied (Ryan & Deci, 2000). Despite the lack of gender differences in basic psychological needs at the global level, it is possible, based on the hierarchical model of motivation proposed by Vallerand (1997), that gender differences exist in basic psychological needs satisfaction, more specifically related to dietary behaviors. The level of satisfaction of these psychological needs could influence eating related level of self-determined motivation, i.e. dietary self-determined motivation, but also ultimately the behavior, i.e. meal preparation and dietary intakes. Questionnaires evaluating basic psychological needs related to satisfaction at work (Deci *et al.*, 2001) and in relationships (La Guardia *et al.*, 2000) have been previously developed, but no such questionnaire exists for dietary behaviors. Therefore, it would be of interest to develop a tool to assess basic psychological needs more specifically related to dietary behavior in order to test this hypothesis.

Overall, our results indicate that women had higher level of eating related self-determined motivation and a diet of better quality than men, which agree with previous study indicating that higher level of self-determined motivation or motivation more autonomously regulated is associated with dietary intakes of better quality (Pelletier *et al.*, 2004). Other gender-related factors than gender differences in eating related SDI seem to be involved in determining dietary intakes and behaviors since analyses performed indicated that when men and women where compared while adjusting for eating related SDI women still had a lower energy density, a higher percentage of energy provided by carbohydrates and a higher frequency of meal preparation than men. For example, it is possible that factors such as nutrition knowledge (Baker & Wardle, 2003) and attitudes (Emanuel *et al.*, 2012) might explain some gender differences in dietary intakes and eating behaviors.

The pattern of associations of eating related SDI with dietary intakes and eating behaviors was investigated in men and women. Globally, our results agree with the literature indicating that a higher self-determined motivation was associated with better dietary profile and with eating behaviors predisposing to a healthier body weight management (Hays *et al.*, 2002; Provencher *et al.*, 2003b). The most notable difference between men and women in the pattern of associations was that eating related SDI was significantly associated to dietary intakes, only in women. In fact, eating related SDI was associated with lower energy density in women only. Thus, level of self-determined motivation appears to be translated into concrete actions to modify eating habits in women, which is not the case in men. This gender difference in the association between eating related SDI and dietary intakes (i.e. association in women and not in men) suggest that even if men were increasing their eating related SDI, this would not necessarily allow matching-up the quality of the dietary profile observed in women. Results of our covariance analyses showing that gender differences in dietary intakes were still observed after adjustment for eating related SDI bring support to this suggestion. Intervention studies aiming at increasing eating related SDI in men and women will be needed to properly test this hypothesis.

In terms of clinical implications, our study allowed characterizing motivational profile, dietary intakes and eating behaviors in men and women presenting cardiovascular risk factors and is therefore a first step toward a better understanding of factors that could potentially help developing efficacious interventions aimed at promoting healthier eating habits and eating behaviors in a preventive health care context (Patrick & Williams, 2012). From our study, we are confident that intervention favouring an increase in eating related SDI will be beneficial for men and women but it can be suspected, according to our results, that changes in dietary intakes and eating behaviors in response to such an intervention will not be the same in men and women. Future intervention studies should be addressed to clarify how individual's motivation related to healthy eating can impact on nutritional intervention outcomes, and identify potential gender differences in this regard. Moreover, intervention studies designed to favour an optimal motivational profile in men and women are also needed.

Some limitations of the study need to be mentioned. First, our sample of men and women represents individuals with cardiovascular risk factors, which is not representative of the general population. Although anthropometric and metabolic variables were measured, dietary intakes were self-reported which cannot exclude the risk of misreporting dietary intakes. Nevertheless, our study has important strengths namely the fact that analyses were conducted distinctively in men and women according to motivational and behavioral variables, and dietary intakes. It is also the first study that has closely examined the associations of motivational profile with dietary intakes and eating behaviors, specifically targeting individuals presenting cardiovascular risk factors and who could therefore clearly benefit from improving their eating habits.

In conclusion, although men and women showed similar level of global self-determined motivation in life domains, women presented higher level of eating related self-determined motivation related to eating regulation than men. According to our results, the more favourable dietary profile observed in women could not be solely attributed to their higher level of eating related SDI. This observation might be explained by the fact that the pattern of associations of eating related SDI with dietary variables and eating behaviors was not the same in men and women.

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Table 1. Physiological characteristics of men and women

	Men (n=64)		Women (n=59)		
Variables	Mean	SD	Mean	SD	t-value
Age (years)	41.0	7.9	41.8	6.7	0.60
Body weight (kg)	96.6	15.5	77.9*	16.6	7.50
Body mass index (kg/m^2)	30.8	4.4	29.6*	6.0	2.10
Body fat (%) ¶	26.7	4.5	39.2*	6.2	11.46
Waist circumference (cm)	106.1	10.2	95.8*	11.5	-5.53
Total cholesterol (C) (mmol/L)	5.7	0.8	5.8	0.8	0.87
LDL-C (mmol/L)	3.6	0.7	3.6	0.7	0.07
HDL-C (mmol/L)	1.2	0.2	1.4*	0.3	6.06
Total-C/HDL-C ratio	5.1	1.0	4.2*	0.9	-5.37
Triglycerides (mmol/L)	1.9	0.8	1.5*	0.6	-2.95
Fasting glucose (mmol/L)	5.3	0.6	5.2	0.7	1.34
Fasting insulin (pmol/L)	100.5	45.0	88.5	45.4	-1.79

Analyses presented in this table are based on the Student's t-test procedure in SAS.
For lipid-lipoprotein variables, glycemia and insulinemia, n=63 men and n=58 women.
* Values significantly different between men and women ($P \leq 0.05$).
¶ For percentage of body fat, n=52 men and n=48 women.

Table 2. Dietary intakes and eating behaviors in men and women

	Men (n=64)		Women (n=59)		
Variables	Mean	SD	Mean	SD	t-valu
Dietary intakes					
Energy intake (kJ)	12824	3749	10280*	2389	-4.60
Energy density (kJ/g)	5.52	1.00	5.06*	0.71	-3.05
Carbohydrates (% of total energy)	42.2	5.3	44.5*	5.8	2.69
Proteins (% of total energy)	18.3	2.5	17.8	2.8	-1.19
Lipids (% of total energy)	36.8	4.8	35.1*	4.5	-2.06
Eating behaviors					
Dietary restraint	5.9	3.2	6.9	4.1	1.18
Flexible restraint ¶	1.9	1.4	2.4	1.6	1.76
Rigid restraint ¶	1.7	1.3	1.8	1.7	0.46
Disinhibition	6.0	2.8	6.2	2.8	0.48
Habitual susceptibility to disinhibition ¶	0.6	1.0	0.7	1.0	0.12
Situational susceptibility to disinhibition	3.0	1.4	2.5	1.5	-1.84
Emotional susceptibility to disinhibition	0.8	1.0	1.6*	1.2	3.98
Hunger	4.8	3.0	4.2	2.9	-1.12
Internal hunger ¶	1.9	1.8	1.6	1.6	-1.16
External hunger ¶	1.8	1.5	1.8	1.4	-0.10

Analyses presented in this table are based on the Student's t-test procedure in SAS.

* Values significantly different between men and women ($P \leq 0.05$).

¶ For the TFEQ completion, n=63 men; for flexible restraint, n=60 men and n=58 women; for rigid restraint, n= women; for habitual susceptibility to disinhibition, n=58 women; for internal hunger, n=60 men and n=58 women; for external hunger, n=62 men and n=58 women.

Table 3. Basic psychological needs, global and eating related motivation in men and women

	Men (n=63)		Women (n=59)		
Variables	Mean	SD	Mean	SD	t-value
Basic psychological needs					
Autonomy	38.1	5.1	37.2	5.7	-0.91
Competence	34.0	4.5	33.5	4.4	-0.57
Relatedness	43.9	5.4	44.4	6.6	0.44
Global motivation scale					
Global self-determination index	34.2	12.9	32.8	14.4	-0.57
Regulation of eating behaviors scale					
Intrinsic motivation	21.1	4.2	23.1*	3.5	2.96
Integrated regulation ¶	19.5	4.7	21.3*	4.2	2.15
Identified regulation ¶	24.9	2.8	25.3	2.5	0.81
Introjected regulation	9.4	4.0	9.2	3.7	-0.28
External regulation	7.8	4.2	6.5	2.9	-1.83
Amotivation	5.5	2.0	4.9	1.7	1.86
Eating related self-determination index	85.3	25.7	100.3*	26.3	3.18

Analyses presented in this table are based on the Student's t-test procedure in SAS.

* Values significantly different between men and women ($P \leq 0.05$).

¶ For the questionnaire on the Basic psychological needs, n=63 men; for the global motivation scale, n=63 men and n=58 women; for the regulation of eating behaviors scale, n=63 men; for integrated regulation, n=62 men; for identified regulation, n=58 women.

Table 4. Associations between eating related self-determination index and dietary intakes, eating behaviors and anthropometric profile in men and women

	Eating related self-determination index			
	Men (n=63)		Women (n=59)	
Variables	r	*p*	r	*p*
Dietary intakes				
Energy intake (kJ)	0.12	0.34	-0.16	0.23
Energy density (kJ/g)	-0.06	0.64	-0.30	0.02
Carbohydrates (% of total energy)	-0.01	0.92	-0.13	0.32
Proteins (% of total energy)	0.11	0.38	-0.007	0.96
Lipids (% of total energy)	-0.08	0.54	0.11	0.39
Eating behaviors				
Dietary restraint	0.09	0.50	-0.0005	1.00
Flexible restraint	0.33	0.01	0.09	0.52
Rigid restraint	0.01	0.93	-0.04	0.74
Disinhibition	-0.15	0.24	-0.26	0.04
Habitual susceptibility to disinhibition	-0.07	0.60	-0.09	0.49
Situational susceptibility to disinhibition	-0.05	0.70	-0.25	0.05
Emotional susceptibility to disinhibition	-0.35	0.005	-0.25	0.06
Hunger	-0.27	0.03	-0.18	0.18
Internal hunger	-0.30	0.02	-0.12	0.37
External hunger	-0.12	0.33	-0.25	0.06
Anthropometric profile				
Body mass index (kg/m^2)	-0.12	0.34	-0.33	0.01
Body fat (%)	-0.31	0.03	-0.43	0.002
Waist circumference (cm)	-0.17	0.19	-0.30	0.02

Analyses presented in this table are based on the Pearson correlation procedure in SAS.