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From beef to beans: Eating motives and the replacement of animal proteins with plant proteins among the Finnish consumers

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Paper prepared for presentation at the EAAE-AAEA Joint Seminar
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Abstract

A better understanding of motives underlying changes in consumers' food choices is needed for designing more effective interventions toward more sustainable and healthy diets. The aim of the study was to examine how eating motives were associated with self-reported changes in the consumption of beef, beans, and tofu. The study analyzed a nationally representative survey on the adult population living in Finland (N = 1,048). The eating motives were measured with the Eating Motivation Survey (TEMS) that distinguishes between 15 eating motives. Six clusters of consumers based on self-reported changes in food choices were identified with latent class analysis (LCA). ANOVA with planned contrasts revealed that Natural Concerns, Health, and Weight Control were higher, and Convenience and Price were lower higher among those who had an established diet including beans and tofu, as compared to those who consumed only beef. Those undergoing a dietary change expressed a higher endorsement of Natural Concerns, Health, Sociability, Social Image and Price than those with an established diet including beans and tofu. Moreover, those with a past attempt to consume beans and tofu endorsed a higher level of Price than those with an established diet. The results suggest that eating motives are associated with changes toward more sustainable food consumption patterns in which meat/beef is replaced with vegetable proteins.

Keywords: motivation, food choice, consumers, sustainable food consumption, vegetable proteins

Intended for seminar theme: "Models of food consumption behavior and their predictive power"

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From beef to beans: Eating motives and the replacement of animal proteins with plant proteins among the Finnish consumers

Food consumption patterns have significant impacts on health and the environment. Recent discussions on the sustainability of food production and consumption have increasingly paid attention to the role of animal products in producing environmentally hazardous effects, particularly in terms of climate change (Fiala, 2008; Popp, Lotze-Campen, & Bodirsky, 2010; Stehfest *et al*., 2009; York & Gossard, 2004). It has been estimated that substituting meat with plant proteins would significantly reduce the costs of climate change mitigation (Stehfest *et al*., 2009) and would reduce cancer risk associated with the consumption of red meat and processed meat (Nordic Council of Ministers, 2013; World Cancer Research Fund, 2013). However, social and cultural factors may complicate efforts to diminish meat use, as meat is culturally embedded in Western food cultures as the centre of the meal (Fiddes, 2004). Consumers also value the taste of meat and many people consider it as a healthy and necessary part of the diet (Verbeke *et al*. 2010).

The consumption of meat has steadily increased in the Western countries during the past decades (Vinnari & Tapio, 2009; Natural Resources Institute Finland, 2013), whereas that of plant proteins has been stable (de Boer, Helms, & Aiking, 2006). In Finland meat holds a central place in meals and food purchases (Vinnari, Mustonen & Räsänen, 2010) as is the case in other Nordic countries, too. Since meat has a high status in Western cultures, social and cultural forces opposing a change from meat to plant proteins are strong (de Boer, 2006).

The key motivation for eating is hunger but how and what we choose to eat is determined by other factors (Lowe & Levine, 2005). Previous research on dietary interventions have examined how behavior change is associated with habit, motivation, goals, beliefs about own capabilities, and knowledge (Guillaumie, Godin, & Vézina-Im, 2010), as well as attitudes, social norms, self-efficacy, and intention (Rothman, Sheeran & Wood, 2009). However, there are yet few studies on the association between eating motives and changes in diets, particularly as concerns transition from meat-based diets to more sustainable practices of eating. On one hand, there is evidence that differences in diets are associated with eating motives. Individuals describing their diet as low in red meat have been found to attribute greater importance to health, natural content, weight control and ethical concern in their food choice as compared to those who described their diets as being "standard", whereas vegetarians have been found to differ significantly from those describing their diet as "standard" only on ethical concern (Pollard, Steptoe & Wardle, 1998). The reasons for adopting a meat-free diet have been found to be associated with health concerns, a sense

of disgust and food appearance related to meat, animal welfare and weight control (Smith, Burke, &Wing, 2000).

On the other hand, food choice motives may act as a barrier to adopting healthy and environmentally sustainable diets. For example, price, taste and convenience have been found to act as barriers to consuming healthy food items (Lappalainen *et al*., 1997). More specifically, the less healthy dietary habits among individuals belonging to low socio-economic status (SES) groups are in part attributable to the higher priority they give to price and familiarity and the lower priority they give to health motives (Konttinen *et al*., 2012). In another study, price was perceived as being the most important barrier to climate-friendly food choices but it was only weakly associated with food choices; instead, habit and disbelief in the effects of food consumption on the climate were most strongly associated with the omission of climate-friendly choices (Mäkiniemi & Vainio, 2013).

Previous research suggests that dietary change can be divided into initiation stage and maintenance stage and that there are different automatic and reflective components involved in these stages. There is evidence that the reflective processes are important in the initiation of new behaviors but the maintenance of dietary choices involves the formation of habits that are automatic processes operating beyond individuals' full awareness. (Rothman *et al*., 2009.) In this article we examine how eating motives are associated with dietary changes related to reducing animal and increasing plant proteins. We focus on self-reported changes in the consumption of beef, beans, and tofu. We expect that differences in eating motives are associated with differences in participants' diets and that the endorsement of reflective motives, such as healthiness and natural concerns, is stronger among those who are undergoing a dietary change as compared to those who have established dietary habits. Next we review previous research on eating motives, as well as the consumption of beef and animal proteins before turning to our empirical analysis and results.

Eating motives

Multiple measures have been developed to measure motives associated with food choices. For example, Food Choice Questionnaire (FCQ) is a widely used measure that originally distinguishes between nine motivational dimensions underlying food choice: health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity and ethical concern (Steptoe *et al*., 1995). However, a Finnish study using FCQ found six dimensions: health, convenience, pleasure, ethicality, familiarity and price (Konttinen *et al*., 2012). The food-related lifestyle instrument (FRL) measures 23 lifestyle dimensions in five major life domains: ways of shopping, cooking methods, quality aspects, consumption situations and purchasing motives

(Brunsø & Grunert, 1995; Scholderer, Brunsø, Bredahl, & Grunert, 2004). Health and Taste Attitude Scales (HTAS), in turn, measure the importance of health (general health interest, light product interest and natural product interest) and taste (craving for sweet foods, using food as a reward and pleasure) aspects of foods in the food choice process (Roininen *et al*., 2001). The current study uses the Eating Motivation Survey (TEMS) that is based on the review of eleven measures of eating/food choice motives, such as FCQ (Renner *et al*., 2012). TEMS identifies 15 different motivations for food choices: liking the food, visual appeal, pleasure, affect regulation, need/hunger, sociability, social norms, social image, weight control, health, price, convenience, habits, traditional eating, and concern for nature. As a result, TEMS brings together previously developed measures allowing a fine-grained and multifaceted characterization of motives associated with food choice. Research using TEMS has found that Liking, Habits, Need/Hunger, and Health motivate eating behavior most often (Renner *et al*., 2012). There is some evidence that Health and Weight Control may be core, higher-order motives of food choice, at least in Westernized cultures (Steptoe *et al*., 1995; Lindeman & Stark, 1999; Schupp & Renner, 2011b).

Meat and plant protein consumption in Finland

In 2013, the average per capita meat consumption – consisting almost exclusively of pork, beef, and poultry – in Finland was 75 kg, which was below the European Union (EU-27) average of 86 kg. However, whereas in the European Union as a whole, meat consumption has been relatively stable since the early 1990s, in Finland there has been a steady increase. (Lihatiedotus, http://lihatiedotus.fi/www/fi/tilastot/lihan_kulutus_euroopassa.php). Statistics show that meat and meat products have an important position as a source of protein: In 2007, 29–34% of protein intake among Finns was obtained from meat dishes, 25% from cereal and bakery products, and 23% from milk and dairy products whereas only 2–4% was gained from vegetables and vegetable dishes (The National Findiet 2007 Survey, see also EFSA, 2012).

Previous research indicates that there is socio-demographic variation in the consumption of meat. A survey on health and dietary habits of 15- to 64-year-old Finns revealed that in total 43% (52% of men and 37% of women) of the population had eaten meat on three or more days in the week preceding the survey (Heldán *et al*., 2013). One in ten respondents had not eaten meat at all. The frequency of meat consumption decreased with the age: while 62% of 25- to 34-year-old men ate meat at least three days a week, respectively among 55- and 64-year-old the frequency was only 48%. For women, the pattern was similar but shift was more modest: from 41% to 34%. The consumption frequencies also indicated that men with a higher educational level ate meat more often than less educated men, whereas for women the opposite association with

education was recorded: the higher the education level, the lower the meat consumption. Regarding fresh vegetable consumption in total 44 % (35% of men and 50% of women) of the population had eaten fresh vegetables on 6–7 days in the week preceding the survey. (Heldan *et al*., 2013; Lallukka *et al*., 2007; Roos *et al*., 2008.)

Beans have been a part of European diets for centuries (Cubero, 2011; Shurtleff & Aoyagi, 2013). In Finland, broad beans have been cultivated since the 15th century and they were commonly used for e.g. bean soup. Peas have been cultivated and eaten in Finland for centuries and they are still currently used as a side dish or as an ingredient in a traditional pea soup. Other beans or lentils have not been a part of the traditional Finnish cuisine or mainstream food culture. Lately, tofu and other soya-based products have been introduced on the Finnish market. A study conducted in Finland (Jallinoja *et al*., under review) showed that Finns eat pulses infrequently. Peas were the most frequently used pulses, whereas tofu and other soy products being the least frequently used pulse products. A half of the respondents never ate tofu and more than a half never consumed soy milk, soy milk products or other soy products. All pulse foods were consumed more frequently among vegetarians compared to non-vegetarians. Dried or canned beans were, for example, consumed at least once a week by 55%, and 2–3 times a month by 24% of the vegetarians, compared to 8% and 17% of the non-vegetarians, respectively. The consumption of plant proteins appears to cumulate, as frequent bean consumers also ate other plant protein sources frequently. Moreover, current food practices were found to be associated with future intentions.

The study by Jallinoja *et al*. thus suggests that pulse eating is largely a vegetarian practice in Finland. Indeed, vegetarianism is still a small-scale phenomenon in Finland, with only 2–4% of the population being vegetarians. The proportion has remained approximately the same since the mid-1980s (Vinnari *et al*., 2010.) As a comparison, Mudryj *et al*. (2012) found that 13.1% of Canadian adults were pulse consumers and Mitchell *et al*. (2009) showed that 7.9% of US residents were pulse consumers (data from NHANES).

Hypotheses

In this study we examined how eating motives were associated with changes in food consumption patterns related to animal and plant proteins. We focused on the analysis of the replacement of beef with beans and tofu. We tested the hypothesis that those who are undergoing a change in food consumption patterns have different eating motives from those with established diets. We assumed that some eating motives − Health, Nature Concerns, and Weight Control − facilitate dietary change whereas some other motives – Price, Convenience and Habit− function as barriers to dietary change.

We developed more specific hypotheses after identifying the consumer groups. First, based on previous studies, we expected Health, Nature Concerns and Weight Control motives to be higher, and Habit, Price and Convenience to be lower among those consumers who include beans and tofu in their diet as compared to those who only consume beef (H1) (e.g., Pollard, Steptoe & Wardle, 1998; Konttinen *et al*., 2012; Lappalainen *et al*., 1997; Mäkiniemi & Vainio, 2013). Second, we expected Health, Nature Concerns and Weight Control motives to be higher and Habit, Convenience and Price to be lower among those who are undergoing a dietary change towards beans and tofu than among those who have an established diet including beans and tofu (H2) (Rothman *et al*., 2009). Third, we expected that those who have attempted to consume beans and tofu in the past endorse higher levels of Habit, Price and Convenience as compared to those whose established diet includes beans and tofu (H3) (Konttinen *et al*., 2012; Lappalainen *et al*., 1997; Mäkiniemi & Vainio, 2013).

Materials and methods

Data sample

The data was collected with an online questionnaire with one reminder, directed to the members of a consumer panel by a commercial marketing research company, representative sample of 15−63-year-old Internet users living in Finland. The questionnaire was kept available to the invited sample until a nationally representative sample with respect to age, gender and level of education was reached. Of the contacted consumers, 16% completed the questionnaire, yielding 1,048 complete answers. Such a response rate can be regarded as fairly common in internet surveys. As the consumer panelists receive email invitations to questionnaires frequently, it was expected that many ignore the invitation.

The mean age of the participants was 42 years and was very close to that of the general population (Official Statistics of Finland, 2013). Women were slightly over-represented in the present data compared to population statistics (58% vs. 49%). Those living in Uusimaa region in and around capital district were somewhat over-represented compared to population statistics (41% vs. 30%), whereas other regions, especially Western Finland (15% vs. 20%) were under-represented. Comparison of education with population statistics was difficult because of different classifications used in the questionnaire and population statistics. However, it appears that those with college or university degree were over-represented in the data (21% vs. 10%). About 6.7% of the participants were vegetarians as compared to a population survey showing that 4.2% of Finns were vegetarians in 2012 (Official Statistics of Finland, 2012).

Measures

The variables analyzed in this study were part of a longer questionnaire. We included the items measuring the eating motives (the TEMS scale, Renner *et al*., 2012), self-reported past and future changes in the consumption of beef, bean and tofu, and socio-demographic variables.

TEMS scale. We used a brief version of TEMS including 45 items where three items measured each eating motive. The participants were requested to indicate, on a 7-point scale (1= "never applies" … 7 = "applies always"), how relevant the eating motives were for explaining why the participants ate certain foods. The English version of TEMS was translated into the Finnish language by two researchers. The Finnish translation was compared to the original German version by a researcher who was bilingual in Finnish and German. The Finnish translation was pilot tested qualitatively allowing the participants freely comment the items. Based on the discussions, two items measuring Sociability ("because it is social" and "so that I can spend time with other people") were replaced with the items "because it is pleasant to eat with others" and "because other people eat it". The revised version was tested on a targeted sample of potential pulse consumers.

Changes in food consumption patterns. The participants were requested to indicate how their consumption of beef, beans and tofu had changed in previous 2-3 years on a four-point scale (1 = "no consumption", 2 = "consumption has decreased", 3 = "consumption has remained stable", 4 = "consumption has increased"). After that, the participants were requested to indicate how they expected their consumption of these food items to change in the coming 2−3 years on the same 4-point scale (changed into future tense). We also included participants' self-reported consumption of poultry and fish into the analysis as background variables.

Moreover, the participants were requested to indicate their gender, age, highest level of education (1 = comprehensive school – 4 = university degree), and the place of residence (1 = more than 100,000 inhabitants, 2 = at least 15,000 inhabitants, 3 = less than 15,000 inhabitants).

Statistical methods

The reliability of the TEMS scale including 15 factors was verified with confirmatory factor analysis (CFA) using AMOS version 21.0 (Arbuckle, 2011). *CFA* assesses the fit of a measurement model (the associations of the scale items to their designated latent variables) and a structural model (the associations between latent variables). Several fit indices were used for assessing the goodness of fit of the model. The χ^2/df index ≤ 3 (Carmines & McIver, 1981), the *CFI* index $\geq .95$ (Bentler & Bonett, 1980), and the *RMSEA* index $\leq .05$ (Browne & Cudeck, 1993)

indicate an excellent fit. Indices based on χ^2 were interpreted with caution. This is because with large samples, even small failures in the model will be highly significant.

Latent class analysis (LCA) with Latent Gold 4.5 was used for forming the consumer clusters based on participants' self-reported consumption of beef, beans and tofu. *LCA* identifies unobservable clusters of individuals based on patterns in the observed variables (Magidson & Vermunt, 2002). Alternative models ranging from a model with one class to a model with eight classes were estimated. With 6 nominal indicators the data is likely to be sparse and in such cases the L^2 statistic does not follow a chi squared distribution (Magidson & Vermunt, 2004). In such cases it is recommended to use the BIC value to compare the models. The one with the lowest BIC value was a 6-class model and it was chosen for further analysis (Table 1).

	BIC(LL)	*AIC(LL)*	*Npar*	*L²*	*df*	*p-value*
1-Cluster	13196.69	13107.50	18	4024.513	1030	2.2e−348
2-Cluster	11932.94	11749.61	37	2628.625	1011	3.60E−144
3-Cluster	11375.52	11098.06	56	1939.075	992	9.90E−64
4-Cluster	11158.17	10786.58	75	1589.587	973	1.90E−32
5-Cluster	10962.32	10496.58	94	1261.593	954	7.00E−11
6-Cluster	10940.13	10380.25	113	1107.264	935	7.90E−05
7-Cluster	11003.51	10349.50	132	1038.506	916	0.0029
8-Cluster	11052.48	10304.33	151	955.3453	897	0.086

Table 1. The results of fitting various LC models.

Socio-demographic variables and self-reported consumption of poultry and fish were used in the LCA model as inactive covariates. This means that their effect was not included in the estimation of the model, but they provided useful descriptive information on the cluster members and their dietary changes.

ANOVA was used for comparing eating motives between the clusters. In ANOVA, the mean scores for the eating motives were used. Three sets of planned contrasts were conducted to examine the relationships between eating motives and food consumption patterns. The first set of contrasts was conducted between the clusters including those who consumed only beef vs. those including beans and tofu in their diets (H1). The second set of contrasts was conducted between the clusters representing established consumption of beans and tofu vs. ongoing dietary change (H2). The third set of contrasts was conducted between the clusters representing established consumption of beans and tofu vs. past dietary change in beans and tofu consumption (H3).

Eating motive	Item	α	β
Liking	…because I have an appetite for it	.77	.78***
	…because it tastes good		.66***
	…because I like it		.78***
Habits	…because I am accustomed to eating it	.84	.82***
	…because I usually eat it		.81***
	…because I am familiar with it		.77***
Need & Hunger	…because I need energy	.65	.61***
	…because it is pleasantly filling		.65***
	…because I'm hungry		.58***
Health	…to maintain a balanced diet	.86	.82***
	…because it is healthy		.83***
	…because it keeps me in shape		.82***
Convenience	…because it is quick to prepare	.81	.83***
	…because it is the most convenient		.62***
	…because it is easy to prepare		.86***
Pleasure	…because I enjoy it	.79	.66***
	…in order to indulge myself		.81***
	…in order to reward myself		.80***
Traditional Eating	…because it belongs to certain situations	.60	.57***
	…out of traditions		.71***
	…because I grew up with it		.49***
Natural Concerns	…because it is natural	.85	.87***
	…because it contains no harmful substances		.81***
	…because it is organic		.74***
Sociability	…because it is pleasant to eat with others	.72	.80***
	…because it makes social gatherings more comfortable		.82***
	…because other people eat it		.47***
Price	…because it is inexpensive	.83	.89***
	…because I don't want to spend any more money		.75***
	…because it is on sale		.73***
Visual Appeal	…because the presentation is appealing	.83	.81***
	…because it spontaneously appeals to me		.79***
	…because I recognize it from advertisements		.76***
Weight Control	…because it is low in calories	.85	.91***
	…because I watch my weight		.71***
	…because it is low in fat		.83***
Affect Regulation	…because I am sad	.89	.87***
	…because I am frustrated		.86***
	…because I feel lonely		.83***
Social Norms	…because it would be impolite not to eat it	.77	.74***
	…to avoid disappointing someone who is trying to make me happy		.71***
	…because I am supposed to eat it		.74***
Social Image	…because it is trendy	.71	.74***
	…because it makes me look good in front of others		.67***
	…because others like it		.64***

Table 2. The TEMS scale. Cronbach's alphas and standardized factor loadings, *** $p < .001$.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Liking															
2. Habits	.30***														
3. Need & Hunger	.39***	.47***													
4. Health	.12***	.53***	.36***												
5. Convenience	.19***	.39***	.28***	-.02											
6. Pleasure	.46***	.21***	.26***	.11***	.20***										
7. Traditional Eating	.20***	.30***	.24***	.13***	.23***	.41***									
8. Natural Concerns	.11***	.26***	.19***	.50***	-.02	.13***	.16***								
9. Sociability	.16***	.18***	.19***	.17***	.15***	.45***	.54***	.20***							
10. Price	.11***	.15***	.20***	-.04	.36***	.20***	.26***	-.07*	.14***						
11. Visual Appeal	.03	.06*	.03	.02	.19***	.33***	.28***	.04	.37***	.24***					
12. Weight Control	-.07	.22***	-.02	.43***	.01	.08**	.10***	.20***	.20***	.09**	.30***				
13. Affect Regulation	-.01	.06*	.01	.02	.19***	.37***	.25***	.08**	.27***	.25***	.47***	.23***			
14. Social Norms	-.07*	.09**	.08**	.07*	.13***	.21***	.38***	.09**	.40***	.26***	.50***	.27***	.49***		
15. Social Image	-.02	.14***	.07*	.14***	.13***	.28***	.35***	.14***	.48***	.16***	.58***	.32***	.54***	.63***	
16. Gender (1 = female, 2 = male)	-.14***	-.18***	-.11***	-.24***	-.15***	-.16***	-.14***	-.19***	-.16***	-.04	-.19***	-.16***	-.20***	-.09**	-.12***
17. Age	-.11***	-.04	-.16***	.02	-.15***	-.22***	-.10**	-.09**	-.10**	-.13***	-.19***	.09**	-.24***	-.12***	-.16***
18. Level of education (1 = comprehensive school – 4 = university degree)	-.04	-.01	-.11***	.08**	-.02	-.06	-.05	-.07	-.01	-.15***	-.03	.08**	-.08*	-.07*	-.02
19. Place of residence (1 = over 100,000 inhabitants – 3 = below 15,000 inhabitants)	-.05	.03	-.01	.03	-.02	-.03	.13***	.09**	.01	-.03	-.08**	.00	-.02	.04	.01
Mean	5.43	4.78	4.93	4.47	4.53	4.00	3.69	3.56	3.51	4.23	2.74	3.32	2.04	2.54	2.07
SD	.81	.84	.98	1.18	.96	1.01	.96	1.36	1.09	1.10	.99	1.29	1.05	1.00	.88

Table 3. Bivariate correlations, means and standard deviations between the main variables (mean scores) and background variables.* $p < .05$, ** $p < .01$, *** $p < .001$.

Cluster blocks	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Wald	*p-value*	R^2
	No change			Ongoing	Past change	No change			
Cluster size %	25.4	23.2	23.0	12.1	8.9	7.5			
Past change: beef							121.14	0.000	0.31
No consumption	0.03	0.00	0.01	0.00	0.00	1.00			
Consumption has decreased	0.14	0.25	0.13	0.74	0.36	0.00			
Consumption has remained stable	0.76	0.67	0.81	0.19	0.54	0.00			
Consumption has increased	0.06	0.08	0.06	0.07	0.10	0.00			
Past change: beans							144.36	0.000	0.48
No consumption	1.00	0.01	0.14	0.01	0.54	0.08			
Consumption has decreased	0.00	0.09	0.03	0.01	0.29	0.01			
Consumption has remained stable	0.00	0.74	0.76	0.39	0.15	0.54			
Consumption has increased	0.00	0.15	0.07	0.60	0.02	0.37			
Past change: tofu and other soya products							155.34	0.000	0.43
No consumption	1.00	0.99	0.35	0.10	0.43	0.09			
Consumption has decreased	0.00	0.00	0.05	0.06	0.34	0.05			
Consumption has remained stable	0.00	0.01	0.56	0.43	0.12	0.55			
Consumption has increased	0.00	0.00	0.04	0.41	0.10	0.31			
Future consumption: beef							139.81	0.000	0.36
No consumption	0.02	0.00	0.00	0.00	0.01	0.99			
Consumption will decrease	0.12	0.22	0.09	0.70	0.24	0.00			
Consumption will remain stable	0.83	0.74	0.90	0.30	0.68	0.00			
Consumption will increase	0.03	0.04	0.01	0.00	0.06	0.01			
Future consumption: beans							249.71	0.000	0.52
No consumption	0.92	0.03	0.00	0.00	0.21	0.04			
Consumption will decrease	0.00	0.03	0.00	0.01	0.09	0.00			
Consumption will remain stable	0.03	0.77	0.95	0.28	0.46	0.61			
Consumption will increase	0.05	0.17	0.05	0.71	0.24	0.35			
Future consumption: tofu and other soya products							165.34	0.000	0.70
No consumption	0.98	0.98	0.00	0.00	0.05	0.04			
Consumption will decrease	0.00	0.00	0.01	0.01	0.21	0.00			
Consumption will remain stable	0.00	0.00	0.97	0.45	0.49	0.68			
Consumption will increase	0.02	0.02	0.02	0.54	0.25	0.28			

Table 4. The results of the latent class analysis.

Results

Validity of the TEMS scale

The *CFA* model exhibited an excellent fit with the data sample (χ^2 = 2,414.666***, *df* = 840, χ^2/df = 2.875, *CFI* = .929, *RMSEA* = .042). Factor loading ≥ .30 (Kline, 2011) and Cronbach's alpha ≥ .70 were used as a cutoff for high construct validity. All factor loadings were high and Cronbach's alpha was in the acceptable range for thirteen out of the fifteen factors (see Table 2). Bivariate correlations < .80 were used as a cutoff for satisfactory discriminant validity (Brown, 2006). All bivariate correlations were below .80 (Table 3). The results confirm the overall validity of TEMS scale on the Finnish sample.

Clusters based on changes in the consumption of beef, beans and tofu

Six consumer clusters were identified based on the past changes and future intentions regarding the consumption of beef, beans and tofu. The 6-cluster *LCA* model provided diverse cluster sizes varying between 7.5% and 25.4% (Table 4). The R^2 values indicated that the proportion of variance explained by the 6-class model was highest for the future consumption intentions for tofu.

The clusters no. 1, 2, 3 and 6 were interpreted as representing "no change" clusters. The first cluster was largest, including consumers who consumed beef and did not consume beans and tofu. The second cluster included consumers who consumed both beef and beans. The third cluster included consumers who consumed beef, beans and tofu. The sixth cluster of participants had a stable past consumption of beans and tofu and no consumption of beef. They reported their consumption patterns to remain the same in the future.

The fourth cluster was interpreted as being in the middle of an ongoing change towards plant proteins. The participants had already reduced their consumption of beef and increased their consumption of beans and tofu. Moreover, they had intentions to decrease their consumption of beef and increase their use of beans and tofu in the future.

The fifth cluster was interpreted as representing past attempt to consume beans and tofu. It included participants who either did not consume beans or tofu, or had reduced their consumption of beans and tofu in the past. The consumption of beef, beans and tofu was most likely to remain the same in the future.

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Gender						
female	0.54	0.55	0.48	0.70	0.64	0.86
male	0.46	0.45	0.52	0.30	0.36	0.14
Age group						
15-24 years	0.15	0.17	0.16	0.29	0.24	0.27
25-34 years	0.18	0.21	0.18	0.28	0.18	0.38
35-49 years	0.27	0.30	0.35	0.24	0.29	0.22
50-64 years	0.40	0.31	0.31	0.18	0.28	0.13
The level of education						
comprehensive school	0.12	0.04	0.07	0.07	0.10	0.05
gymnasium	0.10	0.19	0.15	0.21	0.22	0.18
vocational school	0.27	0.16	0.16	0.16	0.21	0.14
university degree	0.52	0.60	0.62	0.56	0.48	0.63
Place of residence						
over 100,000 inhabitants	0.34	0.45	0.47	0.56	0.52	0.65
at least 15,000 inhabitants	0.43	0.42	0.39	0.34	0.36	0.26
under 15,000 inhabitants	0.23	0.13	0.14	0.11	0.12	0.09
Diet						
Does not follow any diet	0.74	0.72	0.73	0.64	0.63	0.10
Follows some diet	0.26	0.28	0.27	0.36	0.37	0.90
Past change: poultry						
No consumption	0.02	0.01	0.01	0.06	0.01	0.67
Consumption has decreased	0.05	0.05	0.10	0.27	0.15	0.12
Consumption has remained stable	0.66	0.57	0.65	0.39	0.52	0.15
Consumption has increased	0.27	0.37	0.24	0.27	0.32	0.06
Past change: fish						
No consumption	0.07	0.02	0.04	0.03	0.05	0.27
Consumption has decreased	0.09	0.10	0.08	0.09	0.12	0.12
Consumption has remained stable	0.57	0.52	0.61	0.39	0.45	0.42
Consumption has increased	0.27	0.36	0.27	0.49	0.38	0.19
Future consumption: poultry						
No consumption	0.02	0.01	0.01	0.05	0.01	0.65
Consumption will decrease	0.03	0.07	0.05	0.38	0.09	0.13
Consumption will remain stable	0.86	0.82	0.88	0.44	0.74	0.19
Consumption will increase	0.09	0.10	0.06	0.12	0.15	0.02
Future consumption: fish						
No consumption	0.06	0.03	0.02	0.02	0.04	0.30
Consumption will decrease	0.00	0.02	0.01	0.07	0.04	0.10
Consumption will remain stable	0.68	0.62	0.73	0.31	0.44	0.51
Consumption will increase	0.26	0.33	0.24	0.59	0.49	0.09

Table 5. The sociodemographic characteristics of the clusters.

	1 Beef only		2 Established beans & tofu consumption		3 Ongoing dietary change		4 Past dietary attempt		Contrast 1 vs. 2	Contrast 3 vs. 2	Contrast 4 vs.2
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	F(1,598)	F(1,457)	F(1,409)
Liking	5.41	0.85	5.40	0.79	5.51	0.74	5.54	0.92	0.01	1.83	1.93
Habits	4.84	0.88	4.77	0.78	4.83	0.81	4.92	0.95	1.11	0.56	2.05
Need & hunger	5.01	0.97	4.88	0.96	5.06	0.97	4.91	1.05	2.60	3.20	0.07
Health	4.25	1.24	4.62	1.04	4.85	1.17	4.67	1.19	16.69***	4.13*	0.10
Convenience	4.72	0.98	4.48	0.97	4.48	0.99	4.53	0.84	8.73**	0.00	0.16
Pleasure	3.95	1.04	4.00	0.98	4.13	0.99	4.01	1.14	0.35	1.71	0.02
Traditional eating	3.77	1.06	3.66	0.95	3.77	0.89	3.74	1.02	1.83	1.25	0.50
Natural concerns	3.18	1.29	3.80	1.28	4.14	1.34	3.69	1.35	34.16***	6.18*	0.46
Sociability	3.51	1.16	3.50	1.08	3.77	1.01	3.65	1.21	0.01	6.14*	1.15
Price	4.27	1.10	4.07	1.14	4.37	1.06	4.39	1.13	4.62*	6.51*	5.00*
Visual appeal	2.68	1.04	2.76	1.03	2.75	0.92	2.86	1.15	.95	0.02	0.56
Weight control	3.15	1.34	3.37	1.26	3.39	1.27	3.49	1.23	4.22*	0.02	0.58
Affect regulation	1.95	1.00	2.08	1.06	2.17	1.10	2.16	1.08	2.47	0.68	0.35
Social norms	2.47	1.06	2.60	0.95	2.59	1.02	2.62	1.14	2.45	0.01	0.04
Social image	1.97	0.89	2.11	0.90	2.30	0.84	2.12	0.99	3.19	4.66*	0.02

Table 6. ANOVA with planned contrasts where an established diet including only meat (1), ongoing dietary change (3) and past dietary change (4) were compared to an established diet including beans and tofu (2).

The items measuring poultry and fish consumption were used as inactive covariates in the analysis and were used for interpreting dietary changes in the clusters (Table 5). The participants belonging to the first three clusters had stable past consumption of poultry and fish and this trend was going to remain stable in the future. The fourth cluster had a diffuse consumption trend for poultry. In this cluster, the past consumption of fish was either stable or had increased and was most likely to increase in the future. The participants belonging to the fifth cluster consumed poultry and fish regularly and had intentions to increase their fish consumption in the future. The participants in the sixth cluster most likely did not consume poultry and consumed fish regularly.

ANOVA with planned contrasts was used for comparing socio-demographic characteristics between clusters (the first cluster was used as the reference cluster). Statistically significant differences between the clusters emerged with respect to gender, age, level of education and diet ($p < .05$). As compared to the other clusters, there were more males in the second and the third cluster, and more females in the sixth cluster. The participants in the second and third cluster were older and those in the fourth and sixth cluster were younger than in other clusters. The participants in the fifth cluster had a lower level of education than those in other clusters. The participants in the sixth cluster were more likely to live in big cities than those in other clusters. Moreover, the participants belonging to the second and third clusters were less likely to follow a special diet, and the participants belonging to the sixth cluster were more likely to follow a special diet than others.

Hypothesis testing: Planned contrasts

ANOVA with three sets of planned contrasts were conducted for testing the research hypotheses. The first set of planned contrasts was conducted between those whose diet included both beans and tofu (clusters 3 and 6) vs. the cluster consuming only beef (cluster 1). Five statistically significant differences emerged (Table 6). The participants whose diet included beans and tofu endorsed higher levels of Natural Concerns, Health, and Weight Control than those who consumed only beef. Moreover, the participants whose diet included beans and tofu endorsed lower levels of Convenience and Price than those who consumed only beef. There was no difference in Habit between the groups, so Hypothesis 1 was confirmed regarding five out of six hypothesized differences in eating motives.

The second set of planned contrasts was conducted between the cluster representing ongoing change (cluster 4) vs. the clusters representing established diet including beans and tofu (clusters 3 and 6). Five statistically significant differences emerged. The participants undergoing a dietary change endorsed higher levels of Natural Concerns, Health, Sociability, Social Image and

Price than those with an established diet including beans and tofu. Concerning Health and Natural Concerns, Hypothesis 2 was confirmed. However, the difference in Price was contrary to what was hypothesized. Moreover, Sociability and Social Image were not included in Hypothesis 2.

The third set of planned contrasts was conducted between the cluster representing a past attempt to consume beans and tofu (cluster 5) vs. the clusters representing established diet including beans and tofu (clusters 3 and 6). One statistically significant difference emerged. The participants with a past dietary attempt endorsed a higher level of Price as compared to those with an established diet. There was no difference in Habit and Convenience between the groups and therefore Hypothesis 3 was partially confirmed.

Discussion

In this article we tested the assumption that changes in diet regarding animal and plant proteins are associated with differences in eating motives. We found evidence that some eating motives were related to dietary change toward the replacement of animal proteins with plant proteins whereas other motives represent a contradiction to change. The participants whose diet included beans and tofu endorsed a higher level of Natural Concerns, Health and Weight Control and a lower level of Convenience and Price than those who did not consume beans and tofu. Moreover, those participants whose were undergoing a dietary change towards the consumption of plant proteins endorsed a higher level of Natural Concerns, Health, Sociability, Social Image and Price, than those with an established diet including beans and tofu. On the other hand, those with a past dietary attempt endorsed a higher level of Price motive than those with an established diet.

These findings suggest that Natural Concerns, Health and Weight Control motives are important for adopting and maintaining potentially more sustainable and healthier diets (e.g., Carlsson-Kanayama & González, 2009; Godfray *et al.*, 2010; World Cancer Research Fund, 2013; Nordic Council of Ministers, 2012). This finding is line with previous findings suggesting that these three motives represent higher-order core motives (Renner *et al.*, 2012). Moreover, it appears that the endorsement of these core motives is higher among those consumers who are undergoing dietary change as compared to those with an established diet with beans and tofu, suggesting that these motives may function as a motivational force during dietary change.

Moreover, we found evidence that Convenience and Price motives function as barriers to substituting meat with plant proteins. These motives were higher among those who consumed only beef as compared to those with an established diet including beans and tofu. Surprisingly, Price was higher among those who were undergoing a dietary change towards increased use of

beans and tofu as compared to those with an established diet including beans and tofu. It is possible that price is one motive for replacing meat with vegetable proteins. It is also possible that those who are replacing beef with beans and tofu are constantly comparing price differences between different products and therefore are likely to pay attention to price during the period of dietary transition. In contrast, those with an established diet do not actively think about the price difference between the products.

The level of social motives – Sociability and Social Image – was high among the consumers undergoing a dietary change suggesting that social context is important when adopting new dietary patterns. Strong and supportive social networks have been found to explain successful dietary change (Sorensen *et al*., 2007). However, social motives are not necessarily associated with the consumption bean and tofu, in particular. It is possible that people who are undergoing a dietary change are more prone than others to mirror their choices to other people and the communities around them, and reflect on how they their new diet impacts on their fitting in.

In this article we suggested that eating motives are associated with changes in diets. However, it is possible that eating motives are relatively stable. For instance, those who have heightened concerns over health and weight may also be interested in and test various diets that might enhance their health and help in weight-management, and their motives do not necessarily change even though their practices do. For example, followers of low-carbohydrate diet are more likely to regard health and weight-managing aspects of foods as important and placed less value on sociability and pleasures connected to food (Jallinoja *et al*., 2014).

Limitations. This study was based on the analysis of cross-sectional data, and the causal relationships between eating motives and food consumption patterns remain mainly hypothetical. Opposite causal associations between eating motives and changes in food choices could also be possible. Therefore, longitudinal and experimental studies are needed to better understand the causal mechanisms between eating motives and food consumption patterns. More research is needed to identify whether food choices change at different phases of dietary change from animal to plant protein, and if this is the case, how eating motives can be effectively influenced. Moreover, this study analyzed self-reported behavior that is subject to social desirability bias, meaning that participants might exaggerate the frequency of socially desirable behavior (Chung & Monroe, 2003). For example, if the participants did not consume beans and/or tofu regularly but perceived it as desirable behavior, they were likely to respond as having intention to increase their consumption in the future. However, this tendency is weaker in online studies than face-to-face interviews. Previous research has also shown that food consumption patterns are habitual and therefore individuals are not necessarily fully aware of motives associated with their

food choices in some cases, and therefore make *post hoc* justifications for their habits (Köster, 2009; van't Riet, Sijtsema, Dagevos, & De Bruijn, 2011; Wood & Neal, 2009; Vainio & Mäkiniemi, 2014). However, the infrequent consumption of pulses in the data (Jallinoja *et al*. under review) suggests that the majority of Finns do not feel a social pressure to report frequent consumption of beans or tofu.

Despite these limitations, we suggest our results are useful for understanding how to influence the sustainability of food choices via political measures. First, around one-fourth of the respondents consumed beef and no beans or tofu, nor did they have intentions to change their patterns. Effecting a transformation from animal to plant proteins in this group may prove difficult. Political measures appealing to health, natural concerns and weight control are not likely to be effective in this group. However, this group could benefit from new food products where meat has been partly replaced by plant proteins and that are relatively cheap and easy to prepare. Second, the results show that most beef-eaters do not object to eating plant proteins. Almost half of the respondents had established patterns in which beef eating was combined with consuming beans and/or tofu. These findings suggest new possibilities for promoting flexitarianism and providing consumers with the possibilities to add vegetable proteins into their diets. In the long run, this may also facilitate the acceptability of meat reduction strategies, and encourage people to reflect on the sustainability of their eating patterns.

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