University doctoral (PhD) thesis theses

EXAMINING DIFFERENT ASPECTS OF EATING BEHAVIOUR IN HUNGARY

Mark Zoltán Szakály

Supervisor:

Dr. habil. Mihály Soós

associate professor

UNIVERSITY OF DEBRECEN

Károly Ihrig Business and Management Sciences

Doctoral School

Debrecen, 2025

1. RESEARCH HISTORY, OBJECTIVES AND PRESENTATION OF RESEARCH HYPOTHESES

In recent decades, the so-called civilization diseases have spread rapidly worldwide, and the deaths caused by them have been the highest for a long time (SZAKÁLY, 2011; ILSI EUROPE, 2018). Initially, civilizational diseases became more and more widespread in the most developed parts of the world, while less developed states were free from them. By the early 2000s, however, the situation was such that the wave of diseases reached less developed countries, while in the developed countries of the world the process slowed down and showed a decreasing trend for certain diseases (WHO, 2004). ILSI EUROPE (2018) also provides specific figures in its annual report. In Europe alone, between 11 and 26 million people suffer from food allergies or intolerances, 1.9 billion people have a body weight above normal in the world, 650 million of whom are obese, while 2 billion people do not get enough vitamins and minerals in their daily diet. The situation of school-age children is no better: by 2025, an estimated 268 million children will be overweight, 91 million of whom are obese.

Obesity is a consequence of many chronic diseases, such as cardiovascular disease, hypertension, cancer or type 2 diabetes. According to research by WESTERTERP AND SPEAKMAN (2008), poor diet is the primary risk factor for the worldwide spread of obesity, although lack of physical activity also plays a decisive role. Research on this topic soon revealed that the changed lifestyle of mankind is primarily responsible for the spread of chronic diseases (SZAKÁLY, 2011). Despite the increasing personal drive due to market competition, the accelerated pace of life, the high level of environmental pollution, stress and a sedentary lifestyle, the thousand-year-old eating habits of mankind have remained unchanged. A direct consequence of the diet not adapted to the changed lifestyle was the rapid spread of chronic diseases in the world, which significantly burdens the health systems of individual countries and at the same time causes economic damage.

JUDGE (2004), BÍRÓ ET AL. (1997) have shown that the quality of nutrition greatly influences health status. Many chronic non-communicable diseases are diet-dependent, 25-70% of which could be prevented by optimal food intake. In the development of cardiovascular diseases, the effect of diet is estimated at more than 30%, and in the case of

malignant tumors its share exceeds 35%. However, this number affects all types of cancer, but for example it plays a role in up to 70% of gastrointestinal malignancies, but also increases the risk of developing hormonally related tumours (JUDGE, 2004; SZAKÁLY, 2011).

Based on the above, my most important research goal is to examine the eating behavior of the Hungarian population. My main objective is to examine different aspects of eating behaviour using three eating scales (TFEQ, TEMS, HTAS), such as eating motivations, eating attitudes, and the choice between taste and health in relation to functional foods.

2. DESCRIPTION OF THE DATABASE AND THE METHODS USED

In order to examine the hypotheses presented in the previous chapter and achieve the objectives, I carried out comprehensive data collection using secondary and primary research methods. Two quantitative (questionnaire-based) procedures for 1000 people were used from primary methods. The following is a detailed description of the data collection and analysis methods used.

2.1. Methodology of secondary research

Secondary research is a very useful method, as it is a simple way to obtain the necessary information, saving time, energy and money. This method is best suited for general market, industry or consumer data collection. The use of secondary data helped me to establish my primary research and to evaluate and interpret the results obtained.

I started my research with thorough secondary data collection, during which I review the available national and international literature on the topic. My primary goal during the literature review was to lay the foundation for primary research in the case of questionnaire surveys.

Keeping in mind the achievement of the objectives outlined at the beginning of the thesis, I tried to present the topic of my dissertation in a logical way. The main topics covered in the literature review were: eating attitudes, eating motivations, healthy vs. tasty, health halo effect, functional foods, plant-based foods, food neophobia and food neophilia.

I analyzed Scopus, Science Direct, Web of Science, Research Gate, and Google Scholar in detail. I examined the data of the Central Statistical Office and Eurostat in detail. I have strived to ensure that both national and international scientific databases and publications are in the appropriate proportion in the dissertation. The gathering of a large number of sources is proof of the comprehensive work I have done in the field of secondary data and information collection.

2.2. Primary research methodology

As the second step of the research, primary data collection was carried out in the form of questionnaire surveys. In the following, I present the methodology of primary research according to models.

2.2.1. Research methodology of TFEQ-R21 and HTAS models

To examine eating attitudes (TFEQ-R21) and Health and Taste Attitude Scales (HTAS), we launched a nationwide representative survey of 1,000 people in 2021. During the sampling, representativeness was already ensured for each region, so its structure fully complied with the quota established in advance by the HCSO (quota sampling). The selection of settlements in each region was carried out by lot (simple random sampling). In the designated settlements, the principle of random walking was applied, which ensured complete randomness in selecting the right respondents. In the second step, we selected the right person for the interview from among the residents of the visited household using the so-called birthday key. The essence of the method is that from among persons of appropriate age (18 years of age or older), it is necessary to select the consumer whose date of birth (birthday) is closest to the day of the survey. Since random sampling did not ensure the representativeness of the sample (there were more women and older respondents compared to national proportions), the sample was corrected for multidimensional weighting factors according to gender ($\chi2(1)=0.760$; $p=0.383$) and age ($\chi2(5)=0.421$; $p=0.520$). After correction, the sample reflects the composition of the population based on four factors (region, type of settlement, gender, age).

The questionnaire examining eating attitudes contained two parts: 21 items of the TFEQ (Three-Factor Eating Questionnaire) and 9 socio-demographic questions (gender, age, highest completed education, marital status, legal status, net income, assessment of health awareness, height, weight). The 16 statements in the TFEQ-R21 questionnaire were rated by respondents on a Likert scale of 1 to 4 according to how true they considered them to be for themselves (1 – fully true; 2 – mostly true; 3 – mostly untrue; 4 – not true at all). Respondents could also give 0, which meant "don't know/don't answer". Of the 16 statements, 7 items related to uncontrolled eating, 6 items related to emotional eating, and the remaining 3 items related to various aspects of cognitive impairment. The remaining 5

questions related to avoiding stockpiling tempting foods, consciously consuming less, feeling hungry, and the degree of self-limiting behavior. Four of these items were 4-grade Likert-type scales and 1 item was an 8-grade Likert-type scale (CZEGLÉDI and URBÁN, 2010).

In the Health and Taste Attitude Scales (HTAS), we formulated 20 statements to measure healthiness related to food. The questionnaire contained 18 claims regarding pleasure value and taste. For both scales, consumers had to rate their degree of agreement with the statements on a scale of 1 to 7 (1 – strongly disagree; 7 – fully agree).

In order to achieve the research goals, I used descriptive and multivariate statistical tools. In the first round, I performed exploratory factor analysis (EFA) on the model, the purpose of which was to reveal whether the previously assumed factor structure appears on our sample and whether we are able to measure the desired attitudes (factors that can be defined as latent variables). The exploration of eating behavior was carried out by exploratory factor analysis. With the original model of 21 measurement variables, priori and statistical inconsistencies were observed during the EDA, which was confirmed by the CFA study. In the case of five measurement variables, I found too high cross-charges in ML procedure, while in PCA procedure the professional interpretation of the obtained latent variables caused difficulties. To solve this problem, I removed the five dissonant items from the model and continued the validation process on our measurement model, which was narrowed down to 16 statements. In doing so, I took into account the statements about the 16 eating attitudes included in the questionnaire, with their help we identified factors that characterize Hungarian consumers.

In the next step, I examined the reliability of the applied scales within the measurement model of the explored latent variables, for which I applied the Cronbach alpha indicator and the composite reliability indicator. The reliabilty test was followed by confirmatory factor analysis (CFA). The purpose of the CFA analysis was to prove the convergent validity of the model, i.e. whether our empirical model fits the hypothetical model. Discriminant validity was tested against the Fornell–Larcker criterion. For further studies, data reduction was performed by principal component analysis (PCA) performed separately on latent variables in order to obtain latent variables free of cross-loadings. Segmentation was

performed by cluster analysis, which consisted of two main steps: in the first step, I determined the number of clusters/segments using hierarchical cluster analysis, then I performed the cluster analysis using K-means method, leaving the determination of cluster centers to the applied program. Crosstab analysis and simple hypothesis tests were used to examine the clusters.

For CFA analysis, I used R Statistics version 3.5.0 in RStudio editor, all further studies were performed in IBM SPSS Statistics version 23.0.

2.2.2. Research methodology of the TEMS model

My primary research was based on a questionnaire representative of gender ($\chi2(1)=0.760$; $p=0.383$) and age group ($\chi2(5)=0.421$; $p=0.520$). The data collection took place at the end of 2019 with a personal question, the data recording took place in 2020. The presumptive nature was ensured by the method of random walking and the birthday key. The essence of the latter method is that during the interview the interviewer asked how many family members aged 18 and over live in the house. As a second step, the consumer whose date of birth (birthday) was closest to the day of the survey had to be selected from among persons of appropriate age (more simply: who last celebrated his birthday?). With this method, complete randomness was ensured in a second step. The purified sample contains 1000 elements, since the number of the examined age group in Hungary is 8000 thousand people (KSH, 2020), and with a 95% confidence level and a 5% margin of error, based on the work of GILL and JOHNSON (2010), the required sample size is 385 people, therefore the sample size is suitable for the examination of research goals.

The questionnaire consisted of two parts: the TEMS model containing 45 statements and 9 demographic questions (gender, age, completed education, marital status, legal status, net income, assessment of health awareness, height, weight). Dietary motivation claims were rated with Likert scores of 1-7 based on how motivating they felt about themselves (1 – never motivates; 7 – always motivates). Respondents could also mark the category "don't know/don't answer".

During the examination of the research goals, I used primarily multivariate statistical tools. In the first round, exploratory factor analysis was performed on the model, the aim of the EFA was to reveal whether the previously assumed factor structure appears on our

sample and whether we are able to measure the desired attitudes (factors that can be defined as latent variables). In the next step, the reliability of the applied scales has to be examined within the measurement model of the detected latent variables, for which the Cronbach alpha indicator was used. Segmentation was performed by cluster analysis, which consisted of two main steps: in the first step, I determined the number of clusters/segments using hierarchical clus-ter analysis, then I performed the cluster analysis using K-means method, leaving the determination of cluster centers to the applied program. To examine the clusters, cross-tabulation analysis and simple hypothesis tests were used. Data analysis was performed in IBM SPSS Statistics version 23.0.

3. THE MAIN FINDINGS OF THE THESIS

The main findings of the thesis are presented along the three models described in the first chapter.

3.1. Key findings about the TEMS model

During the study, we first determined the top 10 dietary motivations (Table 1). Table 1 illustrates the top 10 most important dietary motivations based on a (short) TEMS questionnaire of 45 statements. Of these, the first, second, and tenth highest average subscales related to the love of food/eating, while three (third, fifth, and sixth) related to habits. The statement "because I'm hungry," so the fourth statement embodies physiological needs, the statement "I enjoy eating" embodies pleasure, "because it can be prepared quickly" embodies comfort, and "because I think it's healthy" embodies health motivation. On the 7-step Likert scale, there is no average close to 7.0, the highest value is shown by the first statement about "Love of food" (6.01), followed by a steady gradual decrease until the fourth statement about physiological needs. There was a larger average jump between the latter and the fifth subscale (0.37), but from the sixth statement downwards even smaller cascading decreases can be seen until the last statement. In terms of skew, we can see that the values are all negative, which suggests that there are more people who care about it than those who do not care about the given value. This was most characteristic of the first four statements. Similarly, the first four statements showed the smallest standard deviations.

Table 1: Top 10 dietary motivations (N=1000)

"I eat what I eat...	Statistical indicator			
	Average	Standard deviation	Relative standard deviation (%)	Cant
1. … because I love it."	6,01	1,360	22,63	-1,409
2. … because it tastes good."	5,87	1,423	24,24	-1,260
3. … because I know that well."	5,82	1,348	23,16	-1,177
4. … because I'm hungry."	5,74	1,437	25,03	-1,130
5. … because that's what I'm used to."	5,37	1,562	29,09	-0,823
6. … because that's what I usually consume."	5,24	1,621	30,93	-0,822

7. … because I enjoy eating it."	5,21	1,684	32,32	-0,780
8. … because it's quick to make."	5,11	1,584	30,99	-0,643
9. … because I think it's healthy."	5,11	1,639	32,07	-0,700
10. … because the food is appetizing."	5,10	1,671	32,76	-0,672

Source *:* My Edit

Table 2 illustrates the 10 least important claims.

Table 2: The 10 least important dietary motivations (N=1000)

"I eat what I eat...	**Statistical indicator**			
	Average	**Standard deviation**	**Relative standard deviation**	**Skewness**
1. … because it attracts me spontaneously (e.g. at eye level on the shelves, attractive color composition on the packaging."	3,01	1,830	60,79	0,380
2. … Because I want to avoid disappointing someone who wanted to make me happy."	2,80	1,775	63,39	0,598
3. … for it would not be polite to others not to eat it."	2,67	1,751	65,58	0,667
4. … Because it's familiar from commercials and I've seen it on television."	2,65	1,748	65,96	0,654
5. ... because they expect me to eat it."	2,51	1,742	69,40	0,923
6. … because I want to appear good in front of others."	2,48	1,698	68,47	0,757
7. … Because this food is trendy."	2,47	1,730	70,04	0,898
8. … because I feel alone."	2,34	1,688	72,14	0,999
9. … because I'm sad."	2,28	1,631	71,53	0,976
10. … because I'm disappointed."	2,22	1,586	71,44	1,042

Source *:* My Edit

Based on the categories of claims, the first and fourth were related to the visual appeal of the food; second, third, fifth, sixth and seventh statements social norms, expression of

personal image; while the last three subscales embody some kind of internal frustration. Only the first Likert statement with a grade 7 achieved an average value higher than 3.0, the others also roughly decreased, while the average of the last statement stands at 2.22. The situation is similar for standard deviation, which also goes through a cascading decline, with the exception of the seventh statement "because this food is trendy", where there is a sudden jump back (from 1.698 to 1.730), while the last statement is the smallest statement with a standard deviation value of 1.586. In case of skew, the situation is exactly the opposite: the distribution here is skewed to the left, which means that there are more people for whom it is not important than those for whom the given value is important.

3.1.1. TEMS Results – Segmentation Based on Eating Motivations

During segmentation, segment-forming criteria were motivations (factors) previously defined on the basis of the TEMS model: social anxiety, comfortable enjoyment, health awareness and weight control, price sensitivity, social eating, self-reward, habit- and tradition-driven eating, and the seductive nature of food. After our data proved suitable for segmentation, we determined the number of clusters through hierarchical cluster analysis and examined whether we had any outliers. Since no outliers were found, and the number of segments was determined in 5 clusters, we ran the cluster analysis using K-means, during which we left the determination of cluster centers to the algorithm. The clusters formed differ significantly from each other ($p<0.001$), the result of the analysis of variance, i.e. segmentation, is valid. In the following, a detailed description of the individual clusters is presented according to the objectives of the research. Table 3 shows the share of clusters formed by cluster analysis in main and percentage terms.

Table 3: Number and proportion of clusters in the sample (N=1000)

Clusters	**Cluster size**	
	Main	**Percentage**
Traditional simpliers	175	17,9
Frugal social and emotional eaters	195	19,9
Balanced self-rewards	270	27,5
Health conscious	179	18,3
They are indifferent	160	16,4
Altogether	*979*	*100,0*

Source: My editing

A total of 21 people could not be categorized. The smallest cluster with a share of 16.4% was the Group of Indifferent (160 people). They are followed (17.9%; 175) by Traditional Simplified. The clusters of Balanced Self-Rewarders (27.5%; 270), Frugal Social and Emotional Eaters (19.9%; 195) and Health-Conscious (18.3%; 179) came to the podium.

Cluster 1 – Traditional simpliers

Based on the statements in the first cluster, the most characteristic motivations of the individuals included in this cluster are: convenience, habit and tradition, love of food and mild price sensitivity. Of these, habituation (which overlaps in content with one's own tradition) and comfort are the most characteristic of the group, since all three statements referring to customs ("because I know him well"; "because that's what I usually consume"; "because that's what I'm used to") characterizes them. The same goes for comfort, which also has all three statements typical of the cluster ("because it's the most convenient"; "because it's easy to make"; "because it can be made quickly"). Two of the statements referring to tradition ("because it belongs to my traditions"; "because I grew up with it") has a high average, but the third statement ("because it makes social gatherings more cozy") is also present in the cluster. It's the same with food love ("because I love it" and "because it tastes good"). Thus, after comfort and familiarity, they are characterized by respect for (their) traditions and love of eating/eating. In addition, statements "because I'm hungry" and "because it doesn't cost much" received high averages, suggesting that cluster members tend to eat out of necessity and have some price sensitivity (we have already seen what strong price sensitivity means when it forms a complete factor). So the first cluster, if we look at the individual statements referring to motivations (3-3 statements/motivations), shows really nice distributions and proportions.

Cluster 2 – Frugal social and emotional eaters

The interesting thing about the cluster is that if we look back at the two factors consisting of social factors (first and fifth), we can see that this cluster mixes the anxious and – perhaps this is the right word for it – proactive approach. After all, the compulsion to conform to other people, i.e. the social environment, plays a strong role (e.g. "because he would not be polite to others"; "because they expect me to eat it"; "Because I want to avoid disappointing

someone who wanted to make me happy), and inner anxiety ("because I'm disappointed"; " because I am sad"; "because I feel alone"). Oddly enough, however, there is also the other extreme, the basic social tendency ("because it allows me to spend time with other people"; "Because eating is a social event"; "because it makes social gatherings more cozy"; These characterized factor number five). For members, their social image is also important ("because I want to appear good in front of others"; "because this dish is trendy"; "because food works for others"), which is also a kind of defensive position, similar to one of the motivations of those in the first factor. Also, with strong price sensitivity ("because it doesn't cost too much"; "because it's discounted"; "because I don't want to spend any more money on it"), and they also pay close attention to the visual effect of the product ("because it attracts me spontaneously"; because it is familiar from commercials and I have seen it on television"; "because it has an aesthetic appearance"). Although with less weight, there were one or two other characteristics that at least partially characterized the cluster members, and that was the natural nature of the food. But based on the characteristics of the group, compared to the others, health awareness characterizes only minimally the individuals belonging to this group.

Cluster 3 – Balanced self-rewards

As the name implies, the strongest quality of members of the third cluster is self-reward ("because I want to pamper myself"; "because I reward myself with this"; "because I enjoy eating it"). All other characteristics, on the other hand, are represented by exactly the same proportion (15.38%) among high-average statements. In addition to self-reward, the group has five main traits/motivations, with two statements each referring to them. These are tradition ("because it belongs to my traditions"; "because it fits well on certain occasions"); need for naturalness ("because it does not contain ingredients harmful to health"; "because food is natural"); love of food for its own sake ("because food is appetizing"; "because it tastes good"); eating out of necessity ("because food fills you pleasantly"; "because I need energy") and health behavior ("because it means achieving a balanced diet"; "because it keeps you in shape").

Cluster 4 – Health conscious

The fourth cluster, as the name suggests, naturally includes health claims. In this respect, there is overlap with cluster number three, where health awareness accounted for 15.38% of high-average claims. Although the proportion of high-average health claims is still 15.38%, we refer to public opinion, as in the case of the third factor: in this cluster, all three weight control claims appear ("because it is low-calorie"; "because I pay attention to my weight"; "because food is low in fat"). And when it comes to health, two statements, "because I think it's healthy" and "because it keeps me in shape," got high averages. Which characteristics were less characteristic of the cluster were price sensitivity (6.66%); motivation for sociability (6.66%); anxiety (6.66%) or social image-motivated, social compliance (20.00%); self-reward (13.33%) and motivation stemming from visual attraction to food (6.66%).

Cluster 5 – Indifferent

In the fifth cluster, we did not encounter a single high-average statement. Thus, it should be stated right at the outset that due to the first of the two indicators expressing the weight of trait/motivation (mean and share), all characteristics of this cluster lose weight by default. In other words, there is no single characteristic of the cluster based on the averages of the statements, but the proportions of the statements do provide some reference point about the characteristic properties. It is noteworthy, for example, that habit and tradition – similarly to Traditional Simplifying – represented a high proportion here: the two motivations together represent 35.29%, i.e. more than a third of members, if they take something into account, they will almost certainly consider it. In addition, three statements of comfort ("because it is the most convenient"; "because it's easy to make"; "because it can be prepared quickly") also plays a major role (17.64%), as does necessity (17.64%) and love of food (17.64%). Moreover, price sensitivity also played a role (11.76%). Based on this, we can conclude that this cluster is characterized by many different motivations to eat at the same time, but they are not really interested in any of them, none of them are really important to them, so they are characterized by indifference.

3.2. Key findings on HTAS

In this subsection, as in the previous one, I will present the results of the second model (scale), HTAS.

3.2.1. HTAS Results – Evaluation of the Healthiness Scale

The factor analysis proved that the factors obtained are suitable for cluster analysis, so in the next step we performed the attitude-based segmentation of Hungarian consumers using the k-means clustering procedure. After conducting the grouping procedure, we were able to distinguish four groups along the 17 factors examined.

Cluster 1 – Misguided consumers

The proportion of the group is 30.39% (286 people) among all respondents. The segment is slightly overrepresented by men (33.8%) and strongly dominated by 30-39 year olds (46.1%). People over 60 years of age are underrepresented (25.5%). The group includes a higher proportion of primary school graduates (31.2%) and skilled workers (34.3%). On the other hand, graduates (25.9%) are fewer compared to the size of the cluster. Less health-conscious people (38.0%) dominate, as do mostly non-environmentally conscious consumers (44.6%). By settlement, people living in smaller towns and villages are overrepresented (34.2% and 39.6% respectively). People living in Central Hungary (37.2%) and South Transdanubia (40.4%) predominate.

They are most likely not to eat processed foods because they know what they contain, which seems to indicate conscious behavior. Their non-consumption may be more related to the fact that they live in smaller settlements, where the proportion of their own production is higher than that of those living in large cities. It is believed that the healthiness of foods has little effect on their food choices. Because of their moderately health-conscious thinking, they don't believe in artificial flavors harmful to health, but they don't worry about E-numbers either. They are also skeptical about organic food, not believing in its health-promoting effects.

Cluster 2 – Health-conscious metropolitan areas

The proportion of the group is 19.8% (186 people), making it the smallest cluster. Women are strongly overrepresented in the segment (27.0%), the proportions of the age groups are balanced, only the 30-39 age group is underrepresented (11.2%). Active white-collar workers (22.4%), those on GYES, GYED (47.6%), pensioners (23.9%) and students (30.6%) are overrepresented. The cluster is characterized by balanced financial conditions, those with higher incomes are slightly overrepresented. Mostly or very health-conscious people dominate the cluster (36% and 41%, respectively), and this also applies to environmental awareness to a lesser extent. Budapest residents are overrepresented by settlement type (24.2%).

Those in the cluster pay special attention to the health-promoting effects of foods. They strive for a balanced diet, including low-fat foods and foods, but a diet enriched in minerals and vitamins is equally important for them. They are the main consumers of organic food. If possible, avoid products containing food additives. They strongly believe in energy reduction, which maintains their body weight and blood cholesterol levels.

Cluster 3 – People with health-risk behaviour

The cluster includes 223 people, which is 23.7% of the total sample. The segment is dominated by men (27.0%), among the age groups over 60 years old (25.8%). Those with up to eight general education degrees are overrepresented (31.2%), but the proportion of those with tertiary education is also relatively high (27.8%). Pensioners are strongly overrepresented (29.1%). Their income is average, i.e. just enough to live on it, but they can no longer save (25.2%). Their health awareness is average or weaker, but their environmental awareness is stronger. Those living in the capital (28.6%) and cities with county rights (33.2%) are overrepresented. A higher proportion of them live in Northern Hungary (38.0%), North (31.9%) and South Great Plain (31.0%).

Of the clusters, they are most likely not to avoid foods just because they can raise blood cholesterol levels. Food healthiness has little impact on their food choices, they typically buy and consume what they like. They are not at all concerned about the health risks of food. They are also happy to choose snacks between main meals, in this case they do not choose based on healthiness either.

Cluster 4 – Indifferent

This group is the second largest cluster in the sample (246, 26.1%). In this case, too, men are slightly overrepresented (27.5%), and among the age groups, 50-59 years old (29.9%). Active manual workers dominate the segment (31.6%), their financial conditions are balanced. The proportion of consumers who are not at all health-conscious (53.4%) is outstanding, and only 12.8% are very health-conscious. The same trend characterizes their environmental awareness. In practically all types of settlements, their proportion is balanced, close to the size of the group. They are practically Transdanubian residents, those living in Central (38.6%), Western (38.4%) and South Transdanubia (40.4%) are strongly overrepresented.

There is no outlier for any health claim, the segment seems rather indifferent to the relationship between food consumption and health behaviour.

3.2.2. HTAS Results – Evaluation of Taste Scale

The factor analysis proved that the factors obtained are suitable for cluster analysis, so in the next step we performed the attitude-based segmentation of Hungarian consumers using the k-means clustering procedure. After conducting the grouping procedure, we were able to distinguish four groups along the 16 variables studied.

Cluster 1 – Conscious older people

The cluster consists of a total of 229 people, which is 23.8% of the sample. Within the group, people over 60 years of age are overrepresented (29.5%), while younger age groups have a lower than average proportion (18-29 years old – 19.4%; 30-39 years old – 16.6%). According to the elderly age group, widows dominate the cluster (38.1%). Their income is typically average, just enough to live on it, but they can no longer save (25.5%). Their health awareness is stronger than average, those who consider themselves very health-conscious (35.5%) are overrepresented. The same is less true of environmental awareness. A higher proportion of cluster members live in Budapest (31.9%) than in other settlements. By region, they are overrepresented in Central Hungary (27.1%), Central Transdanubia (32.0%) and Northern Great Plain (35.9%).

Members of the cluster do not believe that food should always be a source of joy. In their opinion, soothing themselves by eating seems like self-deception. When it comes to shopping, planning is also more important, they rarely pamper themselves with tempting

food. To relieve a bad mood, they rarely buy pampering foods, they rarely buy chocolate or ice cream. They claim they don't even want sweets.

Cluster 2 – Controversial middle-aged

The cluster includes 280 people, which is 29.0% of the total sample and thus the largest group. Among the age groups, 30-39 (38.9%) and 40-49 (31.6%) are overrepresented. The majority live with a partner (35.3%) or are married (30.8%), while divorced (22.9%) and widows (23.8%) are underrepresented. Active manual and white-collar workers make up a higher proportion of the cluster (31.7% and 31.6%, respectively), but pensioners are smaller than the sample average (24.8%). Their income is considered higher than average. Their health and environmental awareness tends to be weaker, many belong to less health- and environmentally-conscious groups. People living in Budapest are underrepresented, members of the segment are equally distributed among other settlement types. Many of them live in Central Hungary (33.5%) and Central Transdanubia (35.0%).

The members of the cluster find it strange that some people crave sweets so much, while many of them treat themselves to some delicacy in case of a bad mood. Meanwhile, they try to avoid eating tasty (pampering) foods when they are in a bad mood. It is clear that they are characterized by contradictory behavior, the reasons for which may be worth clarifying.

Cluster 3 – Indifferent

The third cluster consists of 197 people (20.4%). The segment is balanced by age groups, with older people slightly overrepresented. The group includes a relatively large number of widows (25.0%) and unmarried/unmarried (23.7%). Within the cluster, those who find it very difficult to make ends meet during the month are strongly overrepresented (sometimes not even enough to make ends meet – 33.9%). At the same time, a higher than average proportion of those who live very well on their income and are able to save (24.7%). People who are not health-conscious at all or not environmentally conscious at all are strongly overrepresented (35.0% and 41.9% respectively). A higher proportion of them live in Budapest (23.9%) than the average, while in other settlement types they live below average.

According to the results, they like to shop and eat, often calming themselves by eating, but less focused on enjoying the (taste) of food. No outstanding value was found for any other statement.

Cluster 4 – Taste-oriented

This is the second largest group among clusters (259 people, 26.9%). Young people aged 18-29 (38.8%) and 50-59 (33.6%) are strongly overrepresented. Due to their young age, many of them are unmarried/unmarried (30.3%), but married people are also slightly overrepresented (28.3%). Many of them are students (37.8%), persons on GYES, GYED and GYED (33.3%). The group has a balanced income situation. Their health awareness is not very strong, but they mostly consider themselves (32.1%) or very environmentally conscious (36.0%). They typically live in Budapest (28.8%) or in larger cities with county rights (32.6%).

The group is specifically looking for and liking various tasty dishes and sweets. They often crave chocolate and ice cream, they like to pamper themselves with delicious food. When they eat, they focus on enjoying the (taste) of food. This is probably why health awareness is less important to them.

3.3. Key findings about TFEQ-R21

During the research, eating attitudes were examined by including 16 statements from the Three-Factor Eating Questionnaire. The descriptive statistical characteristics are illustrated in Table 4.

Table 4: Development of eating attitudes in 2021 (N=1000)

Attitude statements	Statistical indicator			
	Average1	Standard deviation	Relative standard deviation, %	Skewness
When I'm depressed, I want to eat.	3,21	0,970	30,22	-0,977
When I'm lonely, I comfort myself by eating.	3,18	1,015	31,92	-0,971
When I'm nervous, I try to calm myself down by eating.	3,18	0,991	31,16	-0,931
When I feel anxious, I start eating.	3,15	1,024	32,51	-0,827
When I'm sad, I often eat too much.	3,12	1,049	33,62	-0,866
When I'm tense or pulled up, I often feel like I need to eat.	3,12	1,003	32,15	-0,840
When I start eating, sometimes I feel like I can't stop.	3,04	1,022	33,62	-0,646
I'm always so hungry that I find it hard to stop eating until I've completely eaten the food on my plate.	3,03	0,998	32,94	-0,688
Often I am so hungry that I feel a bottomless void in the place of my stomach.	3,03	1,021	33,69	-0,706
I'm always hungry enough to eat at any time.	2,90	1,003	34,59	-0,456
I don't eat certain foods because they're fattening.	2,88	1,095	38,02	-0,504
When I see something delicious, I often get so hungry that I have to eat immediately.	2,81	0,986	35,09	-0,366
I deliberately eat little at a time to keep my weight in check.	2,78	1,053	37,88	-0,387
When I'm with someone who eats, it often makes me want to eat.	2,75	1,024	37,24	-0,298
I consciously limit how much I eat during meals to avoid gaining weight.	2,75	1,051	38,22	-0,301
When I see or smell an appetizing food, I find it very difficult not to eat, even if I have just finished eating.	2,71	0,970	35,79	-0,171

Source: My editing

[1] Results are rated on a scale of 1 to 4, with a value of 1 indicating "Absolutely true" and a value of 4 indicating "Not true at all".

According to the results, respondents feel that eating due to the current emotional state (nervousness, lethargy, loneliness, sadness, tension, anxiety) is true only at a low level. These factors have the lowest standard deviation and relative standard deviation, but they are still highly variable. The results are around values above 3.00, which is confirmed by the negative skew value (they prefer not to feel these statements are true for themselves). This is followed by statements related to hunger and excess, each rated around 3.00, meaning that respondents mostly do not feel these are true for themselves. The most true claims are those that are related to conscious limitation, balancing body weight and the appetizing effect of food.

3.3.1. TFEQ Results – Factor Analysis

The mindset of Hungarian consumers is divided into three main groups (factors) in terms of eating attitudes. During the analysis, a relatively high explanatory power of 57.157% was obtained. The first, strongest factor is Emotional Eating, which explains 42.931% of the variance. The high factor weights suggest that the value dimension largely shapes the eating attitude of Hungarian consumers and is sharply separated from the rest. Examining the skewness of the factor (Skewness indicator), it can be concluded that the distribution is skewed to the left (Skewness = -0.622), i.e. Hungarian consumers do not consider this way of thinking true for themselves. The second factor is Uncontrolled Eating, which is associated with excessive appetite and eating. Relatively high factor weights indicate that factors of uncontrolled eating are significantly separated from other factors and factors. Among them, the loss of control and excesses due to the sight of appetizing and delicious food stand out. The factor is skewed to the left (Skewness = -0.403), i.e. uncontrolled eating is less typical for Hungarian consumers. The last factor is Cognitive Restriction, which includes characteristics of self-regulating behavior. Here, too, the high factor weights suggest that dimension greatly shapes the eating attitude of Hungarian consumers. The left-leaning of the factor is also pronounced here (Skewness = -0.385), meaning that respondents do not feel this is true for themselves either, but this dimension is still the most accepted of the three factors.

3.3.2. TFEQ Results – Segmentation based on eating attitudes

During segmentation, the segment-forming criteria were attitudes (factors) previously defined on the basis of the eating attitudes model: emotional eating, uncontrolled eating, cognitive limitation. After our data proved suitable for segmentation, we determined the number of clusters through hierarchical cluster analysis and examined whether we had any outliers. Since no outliers were found and the number of segments was determined in 5 clusters, we ran the cluster analysis using K-means, during which we left the determination of cluster centers to the algorithm. The clusters formed differ significantly from each other ($p<0.01$) based on analysis of variance, i.e. the result of segmentation is valid. In the following, a detailed description of the individual clusters is presented according to the objectives of the research.

Cluster 1 – Indifferent

The proportion of the group is 22.4% (219 people) among all respondents. Women are slightly overrepresented (22.9%), dominated by those aged 30-39 (35.3%) and 50-59 (26.7%). Typically, 24.5% have a vocational worker certificate (25.4%) and a high school diploma, but those with a maximum of 8 general education degrees (11.7%) are underrepresented. The cluster is more likely to be married (24.2%) and live with a partner (28.1%), with a lower than average proportion of unmarried people (15.6%). Those engaged in intellectual activities are significantly overrepresented (31.5%). Typically, people who are not at all or mostly not health-conscious form a cluster (26.6% and 29.9%, respectively), which also applies to environmental awareness. Typically, residents of smaller cities make up the cluster (27.8%), while those living in Budapest are significantly underrepresented (16.9%). Budapest residents dominate.

The group's eating attitudes are considered average, with no outliers in any statements. This can also be interpreted as being indifferent to eating.

Cluster 2 – Uncontrolled emotionless eaters

The proportion of the group in the total sample population is 16.2%, i.e. 158 people. Men are strongly overrepresented in the segment (23.2%), while the proportion of women is very low (9.9%). Younger age groups tend to dominate the cluster, with 18-29 year olds being the most present (19.5%). Conversely, the proportion of people aged 60 or over is only 10.6%. Those with tertiary education (19.6%) and skilled workers (18.4%) are overrepresented. The cluster consists mostly of active manual workers (19.5%). They live in balanced financial conditions, their health awareness is low, but their environmental awareness is stronger. More people live than average in the capital (17.5%) and smaller provincial towns (16.8%).

Of all the clusters, here are the most people who don't come to eat when they're anxious or when they're sad. The cluster is also characterized by a general rejection of emotional eating. In contrast, they tend to eat uncontrollably, but this is not as pronounced as in cluster 5. They least agree that they don't eat certain foods because they're fattening. They also tend not to stop eating even when they feel full. The sight of appetizing food is hard for them to resist, even when they've just finished eating. The outlined behavioral characteristics lead to overweight and obesity

Cluster 3 – Controlled dieters

Based on its size, it is the third largest cluster (20.6%, 201 people) out of five. Women strongly dominate by gender (28.5%), while men are underrepresented (14.8%). Among the age groups, people over 60 years of age are overrepresented (24.4%), while a slightly smaller proportion of 30-39 year olds appear than the cluster size (10.3%). In the segment, high school graduates and mainly graduates predominate (22.5% and 25.8%, respectively), while those with up to 8 general education degrees (17.5%) and skilled workers (16.4%) are underrepresented. Within this group, the proportion of widows (25.0%) and divorcees (24.7%) is relatively high. In connection with what has been described, there are many pensioners (26.6%). The group is highly health-conscious: the proportion of those who consider themselves mostly or very health-conscious is significantly higher compared to the size of the group (33.1% and 36.3% respectively). In contrast, people who are not at all and mostly not health-conscious are underrepresented (15.6% and 10.3% respectively). At the same time, their environmental awareness is particularly strong. They typically live in

Northern Hungary (37.2%), Northern and Southern Great Plain (25.7% and 29.1%, respectively).

They deliberately eat little to control their weight, emotional eating is not typical at all, for example in cases of anxiety or sadness. They skip certain foods because they believe they lead to obesity. They don't necessarily eat the food on the plate, so they still take care to balance their body weight. All this means consciously limiting the amount of food consumed. Because of what has been described, they often feel hungry.

Cluster 4 – Elderly uncontrolled eaters

The cluster forms the largest group in the sample (26.5%, 259 people). Within the cluster, there is a balance between men and women (26.5% and 26.6% respectively). Among the age groups, people over 60 years of age clearly dominate (31.5%), their proportion is significantly higher than that of other age groups. The proportion of those with a maximum of 8 general education degrees is extremely high (39.8%), while those with tertiary education are underrepresented (22.7%). According to their income position, their salary is sometimes not even enough to live on it. Their health and environmental awareness can be considered medium. They typically live in villages (32.2%), the proportion of urban population is smaller. Many of them live in Western and Southern Transdanubia (38.6% and 40.7% respectively) and in Northern Great Plain (35.7%).

Emotional eating is not typical of the group, and conscious, self-regulating behavior is even less so. They are not interested in balancing their body weight, they typically eat as much as they like. Most of them find it difficult to stop eating while they have food on their plate.

Cluster 5 – Uncontrolled emotional eaters

The cluster has the smallest size out of the 5 segments (14.2%, 139 people). Within the group, women slightly dominate (14.8%), among the age groups 50-59 years old (16.4%) and older people over 60 years of age (15.4%) predominate. The presence of primary school graduates (17.5%), skilled workers (15.4%) is more prevalent in the cluster, while high school graduates and graduates are underrepresented (13.2% and 12.9% respectively). Due to the predominance of older people, the proportion of pensioners is high (17.6%), while active white-collar workers are significantly underrepresented (8.8%). Most of them live in

Budapest (23.7%) and cities with county rights (18.2%). Smaller towns and villages are underrepresented (10.1% and 9.5% respectively). Many of them live in Central Hungary (17.4%) and South Transdanubia (20.9%).

The members of the cluster gave mostly true or completely true answers to almost all statements, especially in the field of emotional eating. They are the most likely to agree with trying to compensate for anxiety, sadness, tension, loneliness or nervousness by eating. In parallel, uncontrolled eating appears. When they start eating, they can't really stop eating, and they are motivated to overeat by eating with someone. Based on this, it can be stated that most of them are characterized by eating without control.

3.3.3. Effects of clusters on perceived palatability and healthiness of functional foods

We also examined how each cluster judges the palatability and healthiness of different functional food categories. A scale of 1-5 was used to measure perceived palatability, where a value of 1 meant not tasty at all, and a value of 5 meant very tasty. An obvious trend is emerging regarding perceived palatability. The Controlled Eaters group almost always overvalues the enjoyment value of functional foods, while the other segments, especially the Indifferent and Uncontrolled Emotionless Eaters, undervalue it compared to them. This means that conscious eaters have a more positive attitude towards functional foods than other clusters.

The same study was performed for perceived healthiness. A scale of 1-5 was also used to measure perceived healthiness, where a value of 1 meant not healthy at all, while a value of 5 meant a very healthy category. In this case, too, the tendency that we experienced with perceived palatability prevails. The conscious eating group overrates almost all categories in terms of perceived healthiness. In contrast, Indifferent and Uncontrolled Emotionless Eaters underestimate this characteristic. According to the results, we must use different marketing communication strategies in each segment to increase the consumption of functional foods.

4. NEW OR NOVEL RESULTS OF THE THESIS

The new and novel results of my dissertation are summarized below.

(1) Detailed evaluation of the TEMS eating motivations model using factor and cluster analysis. With the help of cluster analysis, the following segments were explored: Traditional simpliers; Frugal social and emotional eaters; Balanced self-rewarders; Balanced self-rewarders; They are indifferent.

(2) Detailed evaluation of the HTAS model using factor and cluster analysis. I explored the following segments of the healthiness scale: Misguided consumers with misconceptions; Health-conscious metropolitans; People with health-risk behaviors; They are indifferent. Regarding the taste scale: Conscious elderly; Controversial middle-aged people; They are indifferent; They are taste-oriented.

(3) Detailed evaluation of the TFEQ-R21 model using factor and cluster analysis. I managed to identify the following clusters: They are indifferent; Uncontrolled emotionless eaters; Controlled dieters; Elderly uncontrolled eaters; Uncontrolled emotional eaters.

(4) Application of the TFEQ-R21 model to the perceived healthiness and palatability of functional foods.

5. PRACTICAL APPLICABILITY OF RESULTS

The practical usefulness of the three eating behavior models lies in the fact that the resulting factors and clusters can help to compile social and corporate marketing strategies. Given the critical health status of the Hungarian population, which is primarily due to poor nutrition, the findings of the models can improve the health status of consumers to a noticeable extent. All this can mean noticeable cost savings at the level of the national economy.

Consumer confidence in functional foods can also be strengthened by the results obtained. The analysis of the segments developed in the Three-Factor Eating Attitude Model can help develop marketing strategies that can be used to influence consumers, increase consumer confidence and improve health awareness. The survey also confirmed that the proportion of health-conscious consumers in Hungary does not exceed 20%, the remaining 80% do not pay attention to their health, the end result of which is an increase in the number of years of life spent with illness and premature death. This wrong ratio needs to be changed, in this the results of the thesis can effectively help.

6. LITERATURE USED FOR THESIS BOOKLET

1. Biró Gy. (2004): New functional food components – Malignant tumours and oxidative degradation. Confectionery 50 (4): 137–146.
2. Biró Gy., Dworschák E., Zajkás G. (1997): Food in health preservation. Budapest, Béres Plc.
3. Czeglédi, E., & Urbán, R. (2010). Hungarian adaptation of Three-Factor Eating Questionnaire Revised 21-item. Magyar Pszichológiai Szemle, 65(3), 463–494. doi: 10.1556/mpszle.65.2010.3.2
4. Gill, J.; Johnson, P. Research Methods for Managers, 4th ed.; SAGE Publications Ltd.: London, UK, 2010.
5. ILSI Europe (2018): ILSI Europe Annual Report 2017. International Life Sciences Institute, Brussels, 1–48. Institute of Medicine, Food and Nutrition Board: Dietary Reference Intakes for calcium and vitamin D. Washington, DC: The National Academies Press, 2008.
6. HCSO (2020): "Number of Hungary population by gender and age, 1 January". URL: https://www.ksh.hu/interaktiv/korfak/orszag.html, Retrieved 2020.03.29.
7. Z. Szakály (2011): Nutrition marketing. Farmer Publishing House, Budapest, 1–216.
8. Westerterp, K. R., Speakman, J. R. (2008): Physical activity expenditure has not decline since the 1980s and matches energy expenditures of wild animals. International Journal of Obesity 32 (8) 1256–1263. doi: 10.1038/ijo.2008.74
9. WHO. (2004). *The World Health Report 2004 - Changing history.* Geneva: World Health Organization.

7. PUBLICATIONS ON THE TOPIC OF THE THESIS

Foreign language scientific journal

1. FEHÉR A. – GAZDECKI M. – VÉHA M. – SZAKÁLY M. – SZAKÁLY Z. (2020): A Comprehensive Review of the Benefits of and the Barriers to the Switch to a Plant-Based Diet. Sustainability. 12(10): 4136
2. SZAKÁLY Z. – KOVÁCS B. – SZAKÁLY M. – NAGY-PETŐ D. T. – GÁL T. – SOÓS M. (2020): Examination of the eating behavior of the Hungarian population based on the TFEQ-R21 model. Nutrients. 12(11): 3514

Hungarian-language scientific journal with a foreign language summary

3. SZAKÁLY M. – SOÓS M. (2019): Investigation of eating attitudes of consumers predominantly of animal origin. International Journal of Engineering and Management Sciences 4(4), pp. 232-241.
4. SZAKÁLY M. – SOÓS M. (2019): Consumer motivations among those following predominantly plant-based diets – Literature review. Food, nutrition and marketing. 15(1) pp. 11-18.
5. SZAKÁLY Z. – SOÓS M. – SZAKÁLY M. – KONTOR E. (2020): Eating with or without reason. How do environmental signals affect consumers? New diet. 29(1) pp. 2-5.
6. SZAKÁLY M. – SOÓS M. (2021): Analysis of consumer preferences related to plant-based nutrition. Nutrition marketing. 8:(1) pp. 3-20.
7. SZAKÁLY M. – SOÓS M. (2022): Analysis of the dietary motivations of the Hungarian population based on the TEMS model. Nutrition marketing. 9:(2) pp. 81-93.

UNIVERSITY AND NATIONAL LIBRARY
UNIVERSITY OF DEBRECEN
H-4002 Egyetem tér 1, Debrecen
Phone: +3652/410-443, email: publikaciok@lib.unideb.hu

Registry number: DEENK/590/2024.PL
Subject: PhD Publication List

Candidate: Márk Szakály
Doctoral School: Doctoral School of Management and Business
MTMT ID: 10073245

List of publications related to the dissertation

Articles, studies (7)

1. **Szakály, M.**, Soós, M.: A magyar lakosság étkezési motivációinak vizsgálata a TEMS-modell alapján.
   Táplálkozásmarketing. 9 (2), 81-93, 2022. ISSN: 2064-8839.
   DOI: http://dx.doi.org/10.20494/TM/9/2/6

2. **Szakály, M.**, Soós, M.: Fogyasztói preferenciák vizsgálata a növényi alapú táplálkozással kapcsolatban.
   Táplálkozásmarketing. 8 (1), 3-20, 2021. ISSN: 2064-8839.
   DOI: http://dx.doi.org/10.20494/TM/8/1/1

3. Fehér, A., Gazdecki, M., Véha, M., **Szakály, M.**, Szakály, Z.: A Comprehensive Review of the Benefits of and the Barriers to the Switch to a Plant-Based Diet.
   Sustainability. 12 (10), 1-18, 2020. ISSN: 2071-1050.
   DOI: http://dx.doi.org/10.3390/su12104136
   IF: 3.251

4. Szakály, Z., Soós, M., **Szakály, M.**, Kontor, E.: Evés ésszel, vagy ész nélkül. Hogyan befolyásolják a környezeti jelek a fogyasztókat?
   Új Diéta. 29 (1), 2-5, 2020. ISSN: 1587-169X.

5. Szakály, Z., Kovács, B., **Szakály, M.**, Nagy-Pető, D. T., Gál, T., Soós, M.: Examination of the Eating Behavior of the Hungarian Population Based on the TFEQ-R21 Model.
   Nutrients. 12 (11), 1-19, 2020. EISSN: 2072-6643.
   DOI: http://dx.doi.org/10.3390/nu12113514
   IF: 5.717

6. **Szakály, M.**, Soós, M.: A döntően állati eredetű étrendet fogyasztók evési attitűdjeinek vizsgálata: Analysis of Consumers` Eating Attitudes Having Animal-Origin Diet.
   International Journal of Engineering and Management Sciences. 4 (3), 232-241, 2019.
   EISSN: 2498-700X.
   DOI: http://dx.doi.org/10.21791/IJEMS.2019.3.22.

DEBRECENI EGYETEM Egyetemi és Nemzeti Könyvtár

7. **Szakály, M.**, Soós, M.: Fogyasztói motivációk a döntően növényi étrendet folytatók körében - szakirodalmi áttekintés = Consumer motivations among those following mainly a plant-based diet - literature review.
Élelmiszer, Táplálkozás és Marketing. 15 (1), 11-18, 2019. ISSN: 1786-3422.
DOI: http://dx.doi.org/10.33567/etm.2414

List of other publications

Articles, studies (2)

8. Szakály, Z., Kovács, B., **Szakály, M.**, Nagy-Pető, D. T., Popovics, P. A., Kiss, M.: Consumer acceptance of genetic-based personalized nutrition in Hungary.
Genes and Nutrition. 16 (3), 1-12, 2021. ISSN: 1555-8932.
DOI: http://dx.doi.org/10.1186/s12263-021-00683-7
IF: 4.423

9. Szakály, Z., Popovics, P. A., **Szakály, M.**, Kontor, E.: A vásárlói magatartás elemzése az élelmiszer- és üzletválasztást befolyásoló tényezők alapján.
Marketing & Menedzsment. 54 (Klsz.), 7-17, 2020. ISSN: 1219-0349.
DOI: http://dx.doi.org/10.15170/MM.2020.54.KSZ.II.01

Total IF of journals (all publications): 13,391
Total IF of journals (publications related to the dissertation): 8,968

The Candidate's publication data submitted to the iDEa Tudóstér have been validated by DEENK on the basis of the Journal Citation Report (Impact Factor) database.

13 December, 2024