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# RESEARCH OF RELATIONSHIPS BETWEEN IMPLICIT AND EXPLICIT HEALTHY OR UNHEALTHY FOOD RELATED COGNITIONS

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***Abstract.*** *The research aim is to study the relationships between implicit and explicit healthy or unhealthy food related cognitions. Research questions: (1) Is there a relationship between the results of measurements of healthy or unhealthy food related cognitions by implicit and self-assessment procedures? (2) How are healthy or unhealthy food related implicit and explicit cognitions and somatic properties (weight, height, body mass index (BMI), age, sex) related? (3) What common factors underlie the relationship between implicit and explicit healthy or unhealthy food related cognitions and somatic properties? (4) What contribution to food related implicit cognitions is made by explicit attitudes (preference of healthy or unhealthy food, the recentness of consumption, awareness of healthy or unhealthy food, sensations of taste) and somatic properties? (5) What contribution to each food related explicit cognition is made by food related implicit cognitions, the other food related explicit cognitions and somatic properties? Method. Participants – 83 students, aged 19-35, M = 25.75, SD = 4.63 years. Measurements: the specially designed IAT and corresponding self-assessment procedures. Results. There is a relationship between the results of implicit and explicit measurements. The main contribution to implicit preference for food is made by the weight, sex and explicit preference, based on recentness of its consumption.*
***Keywords:*** *attitudes towards healthy/unhealthy food, implicit association test (IAT), implicit associations with healthy (or unhealthy) food, self-assessment procedures, food related cognitions.*

## Introduction

The rapidly advancing field of psychology - implicit social cognition (implicit cognition in health psychology) and health-related issues require the creation of new theories, approaches, models of implicit constructs and their


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assessment tools. (Wiers, Houben, Roefs, De Jong, Hofmann, & Stacy, 2010). Notwithstanding that in social cognition there are generally accepted models of dual processes based on qualitatively different ways of information processing - associative and propositional (Fazio, Jackson, Dunton, & Williams, 1995; Fazio, 2007; Olson & Fazio, 2009; Petty & Brinol, 2006; Petty, Brinol, & DeMarree, 2007; Gawronski & Bodenhausen, 2006; Wilson, Lindsey, & Schooler, 2000), an integrative model of dual processes is popular in the study of health-related issues (Wiers et al., 2010), which includes associative or impulsive and reflexive or "reasoned", as well as personal and situational variables (general dual -process model of health behaviors (Wiers et al., 2010). Numerous reviews of researches dealing with overeating and dieting in the field of implicit social cognition are rather controversial.

Traditionally it is believed that obesity is caused by an energy imbalance between a large amount of food consumed and insufficient energy expenditure (Ravussin & Bogardus, 2000). The hypothesis formulated in the context of implicit social cognition states that overweight people have positive spontaneous associations to high-fat food, leading to excessive consumption of it. However, there is not much empirical evidence to support this hypothesis (Schrauwen & Westerterp, 2000). In a study carried out on a sample of adults having obese and healthy weight, automatic associations were evaluated for high fat versus low fat food using the Implicit Association Test. The results showed that all participants had more positive associations with low-fat food, rather than with high-fat food. This effect was more pronounced in the group of participants with obese weight. (Roefs & Jansen, 2002). In another study conducted on a sample of lean and obese children, the personalized IAT was used to assess associations with healthy food and unhealthy food. It was found that both obese and lean children had a relative preference for healthy over unhealthy food (Craeynest, Crombez, Haerens, & De Bourdeaudhuij, 2007).

Similar effects were found using the affective priming paradigm (Roefs, Stapert, Isabella, Wolters, Wojciechowski, & Jansen 2005), as well as using semantic priming, it was found that people with obesity and people with normal weight automatically associate tasty high-fat food with processes of restraint, rather than with disinhibition (Werrij, Roefs, Janssen, Stapert, Wolters, Mulkens et al., 2008).

There is evidence that when participants undergo the affective priming procedure, participants prefer tasty food more than tasteless, regardless of the status of the diet and the amount of fat in food. However, if high-fat and low-fat foods were used as food incentives, people on the diet preferred high-fat foods compared to non-dieters (Hoefling & Strack, 2008).

It is known that inhibitory control is a moderator of the automatic association with behavior, therefore it is highly relevant to assess the degree of inhibitory

control and impulsivity in obese people. It was found that obese people are more impulsive than healthy-weight people (Nederkoorn, Smulders, Havermans, Roefs, & Jansen, 2006). The influence of contextual factors on the change of automatic associations with high-fat foods was studied by researchers using the affective priming procedure in people of normal weight. (Roefs et al., 2006). The results showed that when attention was focused on the eating enjoyment (restaurant condition), participants showed relative preference for tasty, high-fat foods, and when the healthy lifestyle was emphasized – they preferred low-fat foods, regardless of participants' weight.

Initially, numerous research studied attitudes towards food, treating them as an important factor contributing to the progress of obesity and, essentially, were measured explicitly (Lissner & Heitmann, 1995; Calpaldi, 1996; Drewnowski, 1997; Reed, Bachmanov, Beauchamp, Tordoff, & Price, 1997; Lechner & DeVries, 1995; DeBourdeaudhuij, Lefevere, Deforche, Wijndaele, Matton, & Philippaerts, 2005). By using explicit measures, it was found that young people with obesity show less positive attitudes towards unhealthy food than people with normal weight (Perl, Mandic, Primorac, Klapec, & Perl, 1998).

Presumably, such conclusions can be the result of responding to a socially desirable image that is idealized in society (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). In other words, stigmatization associated with obesity prevents overweight people from admission that they like and consume large amounts of unhealthy food (Puhl & Brownell, 2003; Teachmann & Brownell, 2001). Thus, explicit measures preclude researchers from full analysis and explanation of the relationship between attitudes towards food and the behaviour of people who are overweight.

The shortage of a variety of implicit measures necessary to detect implicit cognitions (such as attitudes) to healthy and unhealthy foods is relevant. Implicit measures, such as the Implicit Association Test (IAT) and various versions of subliminal priming, are mainly used in research. One the tasks of our research was to develop an IAT for measuring automatic associations with healthy and unhealthy foods. The IAT is the most known method for measuring implicit attitudes. "The IAT procedure seeks to measure implicit attitudes by measuring their underlying automatic evaluation" (Greenwald, McGhee, & Schwartz, 1998, p. 1464). The basis for the development of the IAT became a principle, according to which the often used cognitive associations contribute to more relevant and faster cognitive processing of information, which is linked with them. The competition of stimuli manifests itself in conflict of automatisms – if for a person is more common to associate a specific category with positive adjectives, in order to link it with the negative one, it is necessary to overcome the existing "positive" automatism.

Implicit cognitions are understood as attitudes and motivations that an individual possesses, being not aware of it. A particular cognition may exist as implicit cognition at some times and explicit cognition at others, however, some implicit cognitions may never become explicit cognitions (Moors, Spruyt, & De Houwer, 2010; Snowden & Gray, 2010).

The studies conducted with the help of the IAT showed that experiment participants prefer tasty, but unhealthy food more than tasteless, but healthy. It was proved that in the consumer's view, "unhealthy" is equal to "tasty" at the implicit level (Raghunathan, Walker, Naylor, & Hoyer, 2006). It was also found that consumers do not want to sacrifice taste criteria even for the sake of improving health (Urala & Lahteenmaki, 2004; Verbeke, 2006), while the health criterion is secondary to taste when choosing many food products (Tepper & Trail, 1998).

**The Aim of the Research** is to study the relationships between implicit and explicit healthy or unhealthy food related cognitions.

**Research Questions:** (1) Is there a relationship between the results of measurements of healthy or unhealthy food related cognitions by the implicit and self-assessment procedures? (2) How are healthy or unhealthy food related implicit and explicit cognitions and somatic properties (weight, height, body mass index (BMI), age, sex) related? (3) What common factors underlie the relationship between the implicit and explicit healthy or unhealthy food related cognitions and somatic properties? (4) What contribution to food related implicit cognitions is made by explicit attitudes (preference of healthy or unhealthy food, the recentness of consumption, awareness of healthy or unhealthy food, sensations of taste) and somatic properties? (5) What contribution to each food related explicit cognition is made by food related implicit cognitions, the other food related explicit cognitions and somatic properties?

## Method

**Participants:** 83 students of Riga high schools, age 19-35, $M$ = 25.8, $SD$ = 4.63 years old (50 females, 33 males). The median of the body mass index for females was 21.6, for males - 23.8, which is the norm for people of this age.

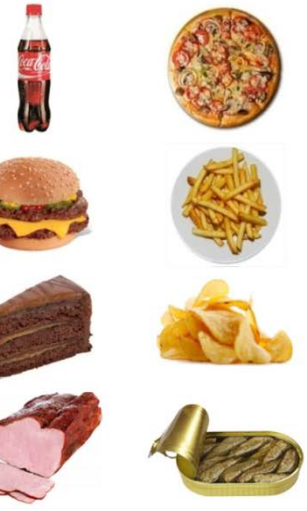
**Measurements.** The experimental procedure of the IAT designed to measure the healthy or unhealthy food related implicit cognitions; self-reporting procedures to measure various preferences for healthy or unhealthy food, which were based on the period of its use, on the knowledge about the food, on the taste of food and on the frequency of its use.

**Research methods:** (1) Two-category IAT in modification developed on the basis of (Mai, Hoffman, Hoppert, Schwarz, & Rohm, 2015); (2) Explicit methods

of measuring attitudes towards healthy and unhealthy food developed by the authors on the basis of (Mai et al., 2015; Uimonen, 2011).

**The IAT experimental procedure:** a modification of the IAT on the basis of the study "The spirit is willing, but the flesh is weak: The moderating effect of implicit associations on healthy eating behaviors" (Mai et al., 2015). The target categories are visual stimuli - pictures depicting healthy and unhealthy food (Table 1). The category of healthy food (8 images): water, cereal, vegetable soup, fresh vegetable salad, dried bananas, apple, boiled poultry, baked fish, and to the category of unhealthy food (8 images): cola, pizza, cheeseburger, French potato, cake, chips, sprats, smoked meat. When selecting images with a picture of healthy and unhealthy food, their similarity in size, visual complexity and clarity of the image were taken into account (Rothermund & Wentura, 2004). Evaluative attributes were verbal stimuli with a pronounced affective meaning, related to the concepts of "Tasty" (positive): tasty, delicious, attractive, fragrant, inviting, pleasant, appetizing, good; and "Tasteless" (negative): unwanted, unpleasant, unattractive, banal, tasteless, unappetizing, disgusting, nasty (Raghunathan et al., 2006). The stages of carrying out the IAT procedure are presented in Table 2.

*Table 1* ***IAT's Target Categories and Attributes***

| **Categories** | | **Attributes** | |
|---|---|---|---|
| **"Healthy food"** | **"Unhealthy food"** | **Positive "Tasty"** | **Negative "Tasteless"** |
|  |  | Tasty<br>Delicious<br>Attractive<br>Fragrant<br>Inviting<br>Pleasant<br>Appetizing<br>Good | Unwanted<br>Unpleasant<br>Unattractive<br>Banal<br>Tasteless<br>Unappetizing<br>Disgusting<br>Nasty |

To calculate the effect of healthy or unhealthy food related implicit cognitions *D* - scores (Rudman, 2011) were used. Only those response times (*RT*) were selected for which the following condition is satisfied: 300 ms ≤ *RT* ≤ 10000 ms. The following assessments are used in this research: *D* ≤ -0.15 – the effect of

the unhealthy food related implicit cognitions, -0.15 < *D* <0.15 - the effect of implicit cognitions is not revealed, $D \geq 0.15$ - the effect of the healthy food related implicit cognitions.

*Table 2* ***Procedures of IAT***

| Block | Trials | Function | Left-key response "I" | Right-key response "E" |
|---|---|---|---|---|
| 1 | 20 | Practice | Healthy food | Unhealthy food |
| 2 | 20 | Practice | Tasty | Tasteless |
| 3 | 20 | Test | Healthy food + Tasty | Unhealthy food + Tasteless |
| 4 | 40 | Test | Healthy food + Tasty | Unhealthy food + Tasteless |
| 5 | 20 | Practice | Unhealthy food | Healthy food |
| 6 | 20 | Test | Unhealthy food + Tasty | Healthy food + Tasteless |
| 7 | 40 | Test | Unhealthy food + Tasty | Healthy food + Tasteless |

**Self-reporting procedures.** To measure attitudes towards healthy and unhealthy foods, four explicit questionnaires were designed.

Three questionnaires ("*On recentness of consumption", "Awareness of healthy or unhealthy food*", "Taste") contained 16 product images, which were also specified verbally. The images were exactly the same as the visual attributes in the IAT (Figure 1). In each questionnaire there was only one question that applied to each of the images. The Likert scale was used.

The questionnaire "*On recentness of consumption*" was aimed at determining recentness of consumption of healthy or unhealthy foods. It was necessary to evaluate when the participant last used this product (today - 1, yesterday - 2, a week ago - 3, a month ago - 4, more than a month ago - 5). When processing the data, the researchers used the same scores for healthy products, and inverted for unhealthy products: (today - 5, yesterday - 4, a week ago - 3, a month ago - 2, more than a month ago - 1). Low scores indicate that healthy food was consumed recently, and unhealthy food was consumed long time ago - "proper nutrition". High scores: healthy food has been consumed long time ago, and unhealthy food has been consumed recently - "improper nutrition". Cronbach's Alpha is $\alpha = .74$.

The questionnaire "*Awareness of healthy or unhealthy food*" was aimed at revealing the awareness of participants in the healthy or unhealthy food. The participant was required to assign a score to each of the products depicted: 1 - definitely healthy; 2 - rather healthy; 3 - difficult to answer; 4 - rather unhealthy; 5 - definitely unhealthy). In the processing of data for unhealthy food, score inversion was performed. Low scores on this scale indicate good awareness, high scores - poor awareness. Cronbach's Alpha is $\alpha = .81$.

The questionnaire "*Taste*" was aimed at revealing attitudes towards taste of the healthy or unhealthy food. It was necessary to evaluate the taste of the product

depicted in the picture (1 - definitely tasty; 2 - more likely tasty; 3 - difficult to answer; 4 - rather tasteless; 5 - definitely tasteless). When processing data for unhealthy products, the inverse of scores was performed. Low scores are tasty healthy and tasteless unhealthy foods (good taste). High scores are tasteless healthy and tasty unhealthy foods (bad taste). Cronbach's Alpha is $\alpha = .77$.

The fourth questionnaire "*Preference for healthy or unhealthy food*" was a modification of the Finnish questionnaire based on the FRL (food-related lifestyle) method and aimed at identifying the preferences for healthy or unhealthy food (Grunert, Brunsø, & Bisp, 1993; Uimonen, 2011). The FRL questionnaire collects information on explicit attitudes and behavior of consumers towards the purchase, preparation and consumption of food products. Based on the profile of Latvian consumers, items about the consumption of canned products, sweet flour products, smoked products, soft drinks, fruits and vegetables - products that are produced and consumed in Latvia were added. The questionnaire consists of 24 items, evaluated on a 5-level Likert scale where 1 is "very often" and 5 – "never". 14 questions are direct, and 10 questions are reversed. Low scores indicate the explicit attitude towards healthy food. High scores indicate the explicit attitude towards unhealthy food. Cronbach's Alpha is $\alpha = .88$.

**Apparatus:** E-Prime 2.0 Professional ®.

**Procedure.** Participation in the research was voluntary. Participants underwent the IAT procedure and then filled in the explicit questionnaires. They indicated their sex, age, height, weight, marital status and the amount (in EUR) which is spent on average per family member for food purchases per month. An important criterion for the experiment was the satiety of the participants in the experiment. Therefore, the research was conducted after meals.

**Statistical methods.** The analysis of Descriptive Statistics, the tests for Normality of Distribution (D'Agostino-Pearson Omnibus Test, One Sample Kolmogorov-Smirnov and Shapiro-Wilks Tests), the analysis of diagrams with normal curve, the analysis of boxplots, the analysis of extremes, the analysis of frequencies, the Correlation Analysis (Spearman correlation coefficients, the bivariate and partial Pearson's correlation coefficients, the control of third variables), the analysis of correlation graph and correlation diagrams, the Factor Analysis, the Multiple Regression Analysis, the analysis of Effect Sizes and Confidence Intervals (CI) for them.

## Results

**Variables**. *D* is the variable of the effects of the healthy or unhealthy food related implicit cognitions. The variable *Usage* ("On recentness of consumption") indicates a correct or incorrect diet, based on information about the recentness of consumption of healthy or unhealthy food. The variable *Awareness* indicates

awareness of healthy or unhealthy food. The variable *Taste* indicates sensations of taste of healthy or unhealthy food. The variable *Preference* indicates the explicit attitude towards healthy or unhealthy food. Also *Height*, *Weight*, *BMI* (body mass index), *Sex* and *Age* were under consideration.

The analysis of the initial data showed that for the study it is possible to apply both parametric and nonparametric statistics. The Pearson's ($r$) and Spearman's ($r_S$) correlation coefficients were used. These correlation coefficients are indexes of the effect size. At their values effect sizes are: .1 – small, .3 – medium, .5 – large (Ellis, 2010, p.41). 95% confidence intervals (CI) for them were calculated.

Only one participant showed implicit preference for unhealthy food - a male of 32 years old, height 186 cm, weight 81 kg, BMI = 23, with poor food awareness, using an improper diet, for whom healthy food seems tasteless and unhealthy food - tasty (bad taste), the explicit attitude is towards unhealthy food. 11 participants (13%) showed no implicit preferences, 71 participants (86%) have an implicit preference for healthy food.

*Table 3* ***Descriptive Statistics: M, SD, Mdn, $Q_1$, $Q_3$ (N = 83)***

| | *Age* | *Height, cm* | *Weight, kg* | *BMI* | *D(IAT)* | *Preference* | *Usage* | *Awareness* | *Taste* |
|---|---|---|---|---|---|---|---|---|---|
| *M* | 25.3 | 173 | 67.2 | 22.5 | 0.54 | 68.6 | 42.7 | 28.3 | 44.1 |
| *SD* | 4.34 | 8.31 | 11.8 | 3.06 | 0.33 | 13.9 | 8.73 | 7.69 | 9.35 |
| $Q_1$ | 22.0 | 167 | 57.0 | 20.1 | 0.31 | 59.0 | 37.0 | 24.0 | 38.0 |
| *Mdn* | 25.0 | 171 | 65.0 | 22.3 | 0.61 | 67.0 | 43.0 | 27.0 | 46.0 |
| $Q_3$ | 28.0 | 179 | 75.0 | 24.2 | 0.81 | 78.0 | 48.0 | 31.0 | 51.0 |

Descriptive statistics shown in Table 3. The distributions of most variables differ from the normal distribution.

**To answer the first research question**, the Spearman's and Pearson's correlation coefficients were calculated (Table 4). The correlation diagrams are shown in Fig.1. Correlation graph is shown in Fig.2. A statistically significant negative relationship was found between *D(IAT)* and *Preference, D(IAT)* and *Usage*, *D(IAT)* and *Taste*, *D(IAT)* and *Awareness.* The negative relationships show the correspondence between the results of measurements of food related cognitions by the implicit and self-assessment procedures and self-assessment procedures.

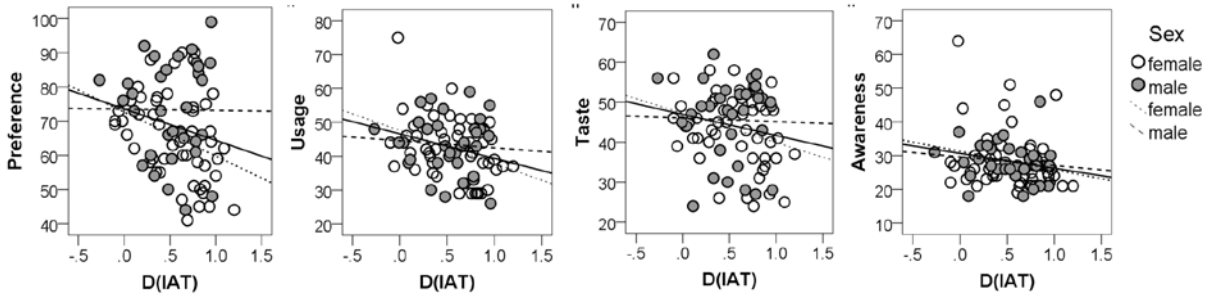



*Figure 1* ***Correlation diagrams with linear regression lines for the total sample (the continuous line) and for the men and women***

*Table 4* ***The Spearman's and Pearson's Correlation Coefficients between D(IAT) and Explicit Healthy and Unhealthy Food Related Cognitions and 95% CI***

| *Variables* | Spearmen's and Pearson's correlation coefficient | 95%CI | Effect size |
|---|---|---|---|
| *Preference* | $r_S(83) = -.22$, $p = .044$ | (-.42; .00) | small, near to medium |
| women | $r_S(50) = -.37$, $p = .009$ | (-.59; -.10) | medium |
| men | $r_S(33) = .072$, $p = .69$ | (-.28; .41) | no effect |
| *Usage* | $r(83) = -.27$, $p = .012$ | (-.46; -.06) | near to medium |
| women | $r(50) = -.38$, $p = .007$ | (-.60; -.11) | medium |
| men | $r_S(33) = -.040$, $p = .82$ | (-.31; .38) | no effect |
| *Taste* | $r(83) = -.19$, $p = .090$ | (-.39; .03) | small |
| women | $r(50) = -.29$, $p = .044$ | (-.53; -.01) | medium |
| men | $r_S(33) = .049$, $p = .78$ | (-.30; .39) | no effect |
| *Awareness* | $r(83) = -.19$, $p = .085$ | (-.39; .03) | small |
| women | $r(50) = -.21$, $p = .14$ | (-.46; .07) | small, near to medium |
| men | $r_S(33) = -.22$, $p = .22$ | (-.52; .13) | small, near to medium |

**To answer the second research question**, the Spearman's and Pearson's correlation coefficients were calculated (Table 5). The correlation graph is shown in Fig.2.

The partial correlation coefficients were calculated too. With the help of the partial correlation coefficients it was found that the variable *Usage* effects the relationships between *D(IAT)* and *Awareness*, *D(IAT)* and *Preference*, *Preference* and Awareness (Table 6, Fig.3).

In Table 6 it is seen that the variable Usage effects the relationships between variables:

- *D(IAT) – Preference*: the statistically significant relationship disappears;
- *D(IAT) – Awareness*: the tendency to a statistically significant relationship disappears;

- *Preference – Awareness*: a statistically significant association with the average size of the effect appears.

*Table 5* ***The Spearman's and Pearson's Correlation Coefficients and 95% CI***

| *Variables* | | Correlation coefficients | 95%CI | Effect size |
|---|---|---|---|---|
| *Age* | *D(IAT)* | $r_S(83) = .13$, $p = .24$ | (-.09; .34) | small |
| | *Preference* | $r(83) = -.26$, $p = .017$ | (-.45; -.05) | medium |
| | *Usage* | $r(83) = -.31$, $p = .004$ | (-.49; -.10) | medium |
| | *Taste* | $r(83) = -.29$, $p = .008$ | (-.48; -.08) | medium |
| | *Awareness* | $r_S(83) = -.13$, $p = .23$ | (-.34;.09) | small |
| *Height* | *D(IAT)* | $r(83) = -.14$, $p = .20$ | (-.35;.08) | small |
| | *Preference* | $r(83) = .18$, $p = .11$ | (-.04; .38) | small |
| | *Usage* | $r(83) = .13$, $p = .25$ | (-.09; .34) | small |
| | *Taste* | $r(83) = .10$, $p = .35$ | (-.12; .31) | small |
| | *Awareness* | $r_S(83) = .010$, $p = .36$ | (-.21; .23) | no effect |
| *Weight* | *D(IAT)* | $r(83) = -.27$, $p = .013$ | (-.46; -.06) | medium |
| | *Preference* | $r_S(83) = .20$, $p = .065$ | (-.02; .40) | between small - medium |
| | *Usage* | $r(83) = .18$, $p = .10$ | (-.04; .38) | small |
| | *Taste* | $r_S(83) = .066$, $p = .56$ | (-.15; .28) | no effect |
| | *Awareness* | $r_S(83) = .16$, $p = .16$ | (-.06; .36) | small |
| *BMI* | *D(IAT)* | $r(83) = -.24$, $p = .027$ | (-.43; -.03) | near to medium |
| | *Preference* | $r_S(83) = .15$, $p = .18$ | (-.07; .35) | small |
| | *Usage* | $r(83) = .15$, $p = .18$ | (-.07; .35) | small |
| | *Taste* | $r(83) = -.031$, $p = .78$ | (-.25; .19) | no effect |
| | *Awareness* | $r(83) = .20$, $p = .078$ | (-.02; .40) | small |
| *Preference* | *Usage* | $r(83) = .66$, $p < .001$ | (.52;.77) | large |
| | *Taste* | $r(83) = .63$, $p < .001$ | (.42; .77) | large |
| | *Awareness* | $r(83) = .076$, $p = .50$ | (-.14; .29) | no effect |
| *Usage* | *Taste* | $r(83) = .68$, $p < .001$ | (.54; .78) | large |
| | *Awareness* | $r_S(83) = .43$, $p < .001$ | (-.11; .32) | near to large |
| *Taste* | *Awareness* | $r(83) = .18$, $p = .10$ | (-.04; .38) | small |
| *Sex* | *D(IAT)* | $r(83) = -.061$, $p = .58$ | (-.27; .16) | no effect |
| | *Preference* | $r(83) = .28$, $p = .011$ | (.07; .27) | medium |
| | *Usage* | $r_S(83) = .11$, $p = .33$ | (-.15; .28) | small |
| | *Taste* | $r_S(83) = .17$, $p = .12$ | (-.22; .21) | small |
| | *Awareness* | $r_S(83) = .16$, $p = .15$ | (-.11; .32) | small |

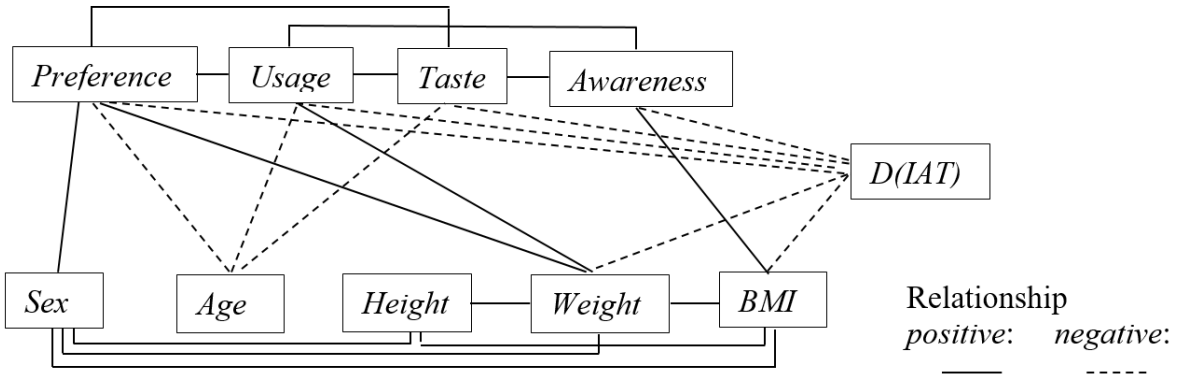



*Figure 2* ***Correlation graph***

*Table 6* ***The Bivariate and Partial Pearson's Correlation Coefficients and 95% Confidence Intervals (CI). Controlled Variable: "Usage"***

| *r* | Variables | *r* | *p* | 95%CI | Effect Size |
|---|---|---|---|---|---|
| Bivariate, *N* = 83 | *D(IAT) - Preference* | -.22 | .046 | (-.42; .00) | near to medium |
| | *D(IAT) - Awareness* | -.19 | .085 | (-.39; .03) | between small and medium |
| | *Preference - Awareness* | .076 | .50 | (-.14; .29) | no effect |
| Partial, *df* = 80 | *D(IAT) - Preference* | -.055 | .62 | (-.27; .16) | no effect |
| | *D(IAT) - Awareness* | -.084 | .46 | (-.14; .30) | no effect |
| | *Preference - Awareness* | -.30 | .006 | (-.49;-.09) | medium |

For a more detailed study of the relationship, the variable *Usage* was broken down into low, medium, and high scores. Low scores of the variable *Usage* (lower Q1) correspond to "*proper nutrition*" (or diet), and high scores (large Q3) - to "*improper nutrition*", scores between quartiles Q1 and Q3 were conventionally marked "no preference". For each level of the variable Usage, Pearson's Correlation Coefficients were calculated (Table 7).

*D (IAT) - Preference*. This relationship in its essence expresses the consistency of the results of measurements of implicit and explicit food related cognitions.

- ✓ "*proper nutrition*" - negative statistically significant relationship of a large effect size;
- ✓ "*no preference*" - no relationship detected;
- ✓ "*improper nutrition*" - positive statistically insignificant relationship of small effect size.

Relationship throughout the sample is based on input from participants with proper nutrition. These are those that have eaten healthy food recently, and

unhealthy foods a long time ago. Healthy food for these participants is a contextual factor in which the results of measurements of explicit preferences for healthy or unhealthy food and implicit healthy or unhealthy food related cognitions are agreed.

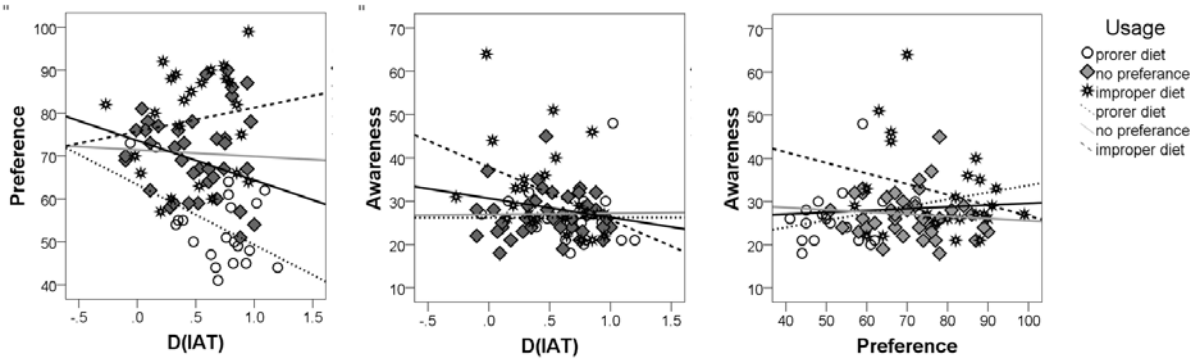



*Figure 3* ***Correlation diagrams for the relationships between the variables "D(IAT)" and "Preference", "D(IAT)" and "Awareness", "Preference" and "Awareness", with the linear regression lines, corresponding the "proper nutrition (diet)", to the diet without preference "no preference" and "improper nutrition (diet)". Total sample - the black continuous line***

*Table 7* ***Pearson's Correlation Coefficients and 95% Confidence Intervals (CI). Variable's "Usage" levels: "Proper Diet", "No Preference", "Improper Diet"***

| Variable's "*Usage*" Levels | Variables | *r* | *p* | 95%CI | Effect Size |
|---|---|---|---|---|---|
| "*Proper diet*" | *D(IAT) - Preference* | -.49 | .024 | (-.77; -.07) | large |
| | *D(IAT) - Awareness* | .001 | 1.00 | (-.43; .43) | no effect |
| | *Preference - Awareness* | .23 | .31 | (-.22; .60) | small, near to medium |
| *"No preference"* | *D(IAT) - Preference* | -.049 | .77 | (-.36; .27) | no effect |
| | *D(IAT) - Awareness* | -.017 | .92 | (-.33; .30) | no effect |
| | *Preference - Awareness* | -.093 | .58 | (-.40;.23) | no effect |
| *"Improper diet"* | *D(IAT) - Preference* | .15 | .48 | (-.27; .52) | small |
| | *D(IAT) - Awareness* | -.39 | .061 | (-.69; .02) | between medium and large |
| | *Preference - Awareness* | -.29 | .18 | (-.62; .13) | medium |

*D(IAT) – Awareness*:

- "proper nutrition" - no relationship detected;
- "no preference" – no relationship detected;
- "improper nutrition" – a tendency to a negative statistically significant relationship with the size of the effect between medium and large.

*Preference – Awareness*:

- "*proper nutrition*" - negative statistically significant relationship with a small, closer to average effect size;
- "*no preference*" – no relationship detected;
- "*improper nutrition*" – negative, statistically insignificant relationship of the average effect size.

**To answer the third research question**, the factor analysis (Principal Component Method, Rotation Varimax, KMO = .67, Bartlett's Test of Sphericity: $\chi 2$ (28, N = 83) = 175, p < .001, total variance explained 66%, three factors) was applied to the set of somatic-psychological variables, selected at the research: *D(IAT)*, *Preference*, *Usage*, *Awareness*, *Taste*, *Age*, *BMI*, *Sex*. Rotation of the reduced matrix led to the identification of three factors (Table 8, Fig.4) named "*Explicit Age-Based Taste Preference of Food*" and "*Awareness Based Implicit Preference*" and "*Body Constitution*".

*Table 8* ***Rotated Component Matrix***

| | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Taste | .860 | | |
| Preference | .827 | | |
| Usage | .785 | | |
| Age | -.550 | | |
| Awareness | | .816 | |
| D(IAT) | | -.597 | |
| Sex | | | .844 |
| BMI | | | .700 |
| Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 4 iterations | | | |

**To answer the fourth and the fifth research questions**, the multiple regression analysis was applied. Method "Backward." Criterion of the method: probability of F to remove ≥ .100. Effect sizes: $R^2$ (.02 – small, .13 – medium, .26 – large) (Ellis, 2010, p.41) and Cohen's $f^2$ (.02 – small, .15 – medium, .35 – large) (Cohen, 1988). To calculate the confidence intervals (CI) the on-line "Free Statistics Calculators", version 4.0 were used.

***The fourth research question***. Dependent variable: *D(IAT)*. Independent variables: *Preference*, *Usage*, *Awareness*, *Taste*, *Height*, *Weight*, *Age*, *BMI*, *Sex*. The regression equation:

$$D(IAT)\ (\text{estimate}) = 1.565 + 0.169*Sex - 0.011*Weight - 0.005*Preference. \quad (1)$$

The effect of each independent variable is determined by "Beta-coefficients" (β), which represent the regression coefficients for standardized variables.

The largest contribution to the dependent variable *D(IAT)* is made by the variable *Weight* ($\beta_1$ = -.39, $t(79)$ = -2.87, $p$ = .005), then - *Sex* ($\beta_2$ = .25, $t(79)$ = 1.80, $p$ = .051), then - *Preference* ($\beta_3$ = -.22, $t(78)$ = -1.98, $p$ = .051). The remaining variables are not included in the regression equation.

The coefficient of determination $R^2$ = .138 shows that 13.8% of the variability of the dependent variable *D(IAT)* is due to the influence of independent variables *Preference, Weight* and *Sex*. The effect size is medium, 95% CI = (.007; .27). *Adjusted* $R^2$ = .106. The standard error of estimate is 0.31. The significance of the model (ANOVA result): $F(3, 79) = 4.23$, $p$ = .008. The effect size Cohen's $f^2$ = 0.16 is medium, 95% CI = (0.007; 0.37).

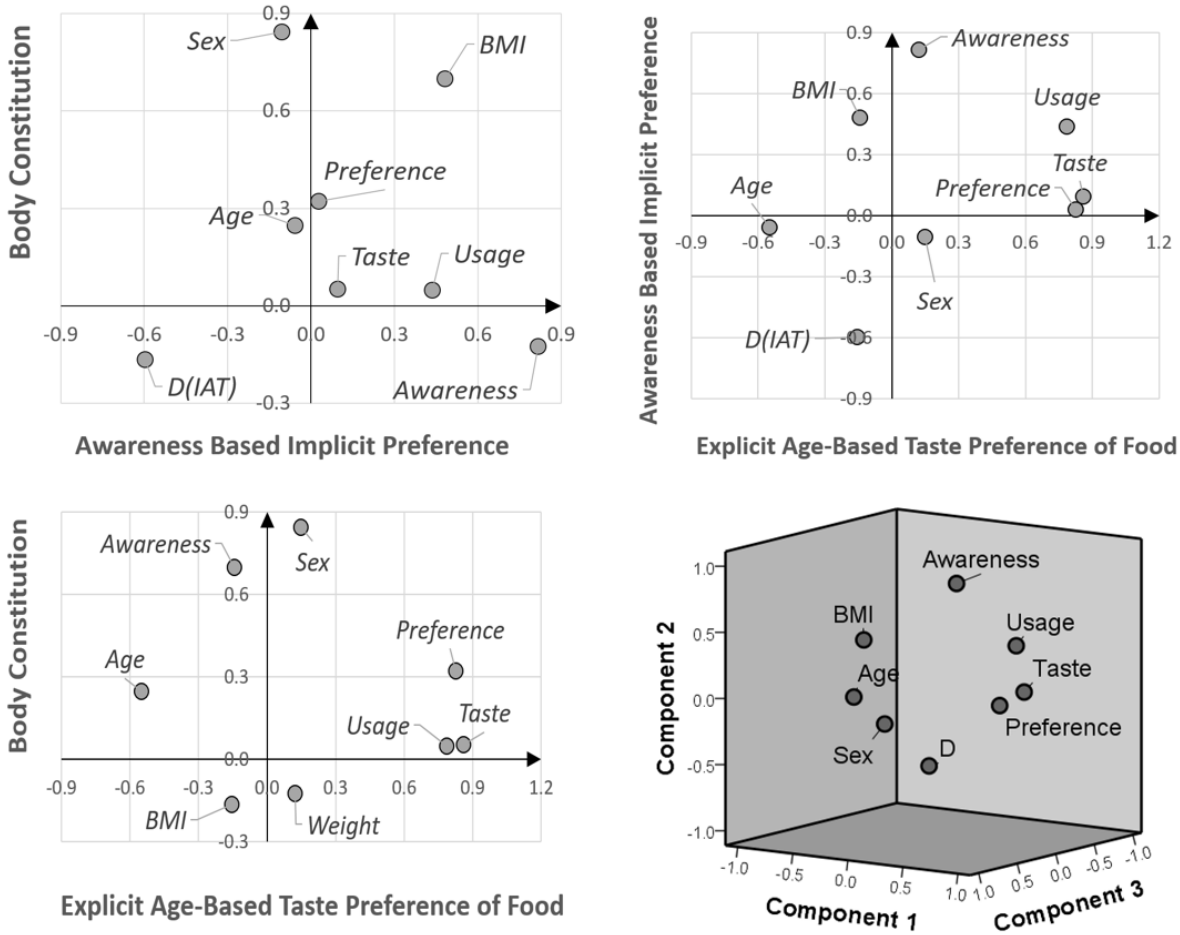



*Figure 4* ***Component Plot in Rotated Space. Component 1 "Explicit Age-Based Preference of Food", Component 2 "Awareness Based Implicit Preference", Component 3 "Body Constitution"***

***The fifth research question***. Consider four regression models.

**Model 1.** Dependent variable: *Preference*. Independent variables: *D(IAT), Usage, Awareness, Taste, Height, Weight, Age, BMI, Sex*. The regression equation:

*Preference* (estimate) = 22.128 + 5.688**Sex* +

$$+ 0.866*Usage - 0.375*Awareness + 0.405*\text{Taste}. \quad (2)$$

The largest contribution to the dependent variable *Preference* is made by the variable *Usage* ($\beta_1$ = .55, $t(78) = 4.87$, $p < .001$), then - *Taste* ($\beta_2$ = .27, $t(78)$ = 2.65, $p$ = .010), then - *Awareness* ($\beta_3$ = -.21, $t(78)$ = -2.51, $p$ = .014), then - *Sex* ($\beta_4$ = .20, $t(78)$ = 2.71, $p$ = .008). The remaining variables are not included in the regression equation.

The $R^2$ = .572 shows that 57.2% of the variability of the dependent variable *Preference* is due to the influence of independent variables *Usage, Taste, Awareness* and *Sex*. The effect size is large, 95% CI = (.44; .70). *Adjusted* $R^2$ = .550. The standard error of estimate is 9.30. The significance of the model (ANOVA result): $F(4, 78) = 26.1$, $p < .001$. The effect size Cohen's $f^2$ = 1.34 is large, 95% CI = (0.78; 2.34).

**Model 2.** Dependent variable: *Usage*. Independent variables: *D(IAT), Preference, Awareness, Taste, Height, Weight, Age, BMI, Sex*. The regression equation:

*Usage* (estimate) = -8.267 - 3.633**Sex* + 0.260* *Preference* +

$$+ 0.343*Awareness + 0.133*Weight + 0.362*Taste. \quad (3)$$

The largest contribution to the dependent variable *Usage* is made by the variable *Preference* ($\beta_1$ = .41, $t(77) = 4.78$, $p < .001$), then - *Taste* ($\beta_2$ = .39, $t(77)$ = 4.54, $p < .001$), then - *Awareness* ($\beta_3$ = .30, $t(77) = 4.53$, $p < .001$), then - *Sex* ($\beta_4$ = -.21, $t(77)$ = -2.37, $p$ = .021), then - *Weight* ($\beta_5$ = .18, $t(77) = 2.08$, $p$ = .041). The remaining variables are not included in the regression equation.

The $R^2$ = .682 shows that 68.2% of the variability of the dependent variable *Usage* is due to the influence of independent variables *Preference, Taste, Awareness, Weight* and *Sex*. The effect size is large, 95% CI = (.58; .79). *Adjusted* $R^2$ = .662. The standard error of estimate is 5.08. The significance of the model (ANOVA result): $F(5, 77) = 33.1$, $p < .001$. The effect size Cohen's $f^2$ = 2.14 is large, 95% CI = (1.37; 3.69).

**Model 3.** Dependent variable: *Taste*. Independent variables: *D(IAT), Preference, Awareness, Usage, Height, Weight, Age, BMI, Sex*. The regression equation:

*Taste* (estimate) = 7.640 + 0.220* *Preference* + 0.501**Usage*. (4)

The largest contribution to the dependent variable *Taste* is made by the variable *Usage* ($\beta_1$ = .47, *t*(80) = 4.58, *p* < .001), then - *Preference* ($\beta_2$ = .33, *t*(80) = 3.19, *p* = .002). The remaining variables are not included in the regression equation.

The $R^2$ = .526 shows that 52.6% of the variability of the dependent variable *Taste* is due to the influence of independent variables *Preference* and *Usage*. The effect size is large, 95% CI = (.38; .67). *Adjusted* $R^2$ = .514. The standard error of estimate is 6.52. The significance of the model (ANOVA result): *F*(2, 80) = 44.4, *p* < .001. The effect size Cohen's $f^2$ = 1.11 is large, 95% CI = (0.62; 2.01).

**Model 4.** Dependent variable: *Awareness*. Independent variables: *D(IAT)*, *Preference*, *Usage*, *Taste*, *Height*, *Weight*, *Age*, *BMI*, *Sex*. The regression equation:

*Awareness* (estimate) = 17.008 - 0.202* *Preference* + 0.589**Usage*. (5)

The largest contribution to the dependent variable *Awareness* is made by the variable *Usage* ($\beta_1$ = .67, *t*(80) = 5.23, *p* < .001), then - *Preference* ($\beta_2$ = -.36, *t*(80) = -2.85, *p* = .006). The remaining variables are not included in the regression equation.

The $R^2$ = .259 shows that 25.9% of the variability of the dependent variable *Awareness* is due to the influence of independent variables *Preference* and *Usage*. The effect size is large, 95% CI = (.10; .42). *Adjusted R-square* = .241. The standard error of estimate is 6.70. The significance of the model (ANOVA result): *F*(2, 80) = 14.0, *p* < .001. The effect size Cohen's $f^2$ = 0.35 is large, 95% CI = (0.12; 0.71).

## Discussion

In the present research, using the classic two-category IAT, the authors found that 86% of participants with healthy weight have implicit healthy food related cognitions. In a sense, this result is consistent with the results of the study in which the personalized IAT was used. (Craeynest, Crombez, Haerens, & De Bourdeaudhuij, 2007).

The healthy or unhealthy food related explicit cognitions are:

- "Explicit preference of healthy or unhealthy food";
- "Recentness of consumption of healthy or unhealthy food";
- "Taste of healthy or unhealthy food";
- "Awareness about the healthy or unhealthy food".

**The first research question was** about the relationship between the results of measurements of healthy or unhealthy food related cognitions by the IAT and self-assessment procedures is as follows.

*Explicit preference of healthy or unhealthy food - implicit healthy or unhealthy food related cognitions*. The consistency of the measurement results means that implicit healthy food related cognitions and explicit preference of healthy food correspond to each other. As well as implicit unhealthy food related cognitions and explicit preference of unhealthy food correspond to each other.

The consistency of the measurement results was found in the entire sample. The effect size is small, closer to the average. In females, consistency is stronger than in the entire sample, where the effect size is medium. In males, both consistency and inconsistency of measurement results were not revealed.

In the subgroup of participants who consumed healthy food recently and unhealthy food - long ago ("proper nutrition"), there was also consistency in the measurement results. The effect size was large. In the subgroup of participants who consumed healthy food long ago and unhealthy - recently ("improper nutrition") there was inconsistency in the measurement results. The effect size was small. That is, they are consistent with each other. As well as implicit unhealthy food related cognitions and explicit preference of healthy food are in consistency with each other. It is possible that memories of the recent "improper nutrition" can be viewed as a contextual factor that could affect the results of self-reported evaluations.

These results confirmed the assumption of Fazio and Olson (Fazio & Olson, 2003) about the existence of experimental conditions under which the consistency of the results of implicit and explicit measurements can exist. Similar results were obtained in researches (Plotka, Simane-Vigante, & Blumenau, 2018; Vinogradova, Plotka, Smirnova, Blumenau, & Igonin, 2018), where consistency in the results of implicit and explicit measurements was observed only in individual subgroups of participants.

*Recentness of consumption of healthy or unhealthy food - implicit healthy or unhealthy food related cognitions*. The consistency of measurement results was found only in the female sample – the effect size is medium. In males, both consistency and inconsistency of measurement results were not identified. In females, explicit preference for healthy foods and proper nutrition correspond to each other, as well as explicit preference for unhealthy foods and improper nutrition match are in consistency with each other.

*Taste of healthy or unhealthy food - implicit healthy or unhealthy food related cognitions*. The consistency of measurement results was found only in the female sample – the effect size is medium. In males, both consistency and inconsistency of measurement results were not identified. In females, explicit preference for healthy foods and "good" taste (the tasty healthy and tasteless

unhealthy foods) correspond to each other, as well as explicit preference for unhealthy foods and "bad" taste (tasteless healthy and tasty unhealthy foods) are in consistency with each other.

*Awareness about the healthy or unhealthy food - implicit healthy or unhealthy food related cognitions*. There is a tendency to consistency of measurement results for the subgroup of participants "*improper nutrition*" (healthy food was consumed long ago and unhealthy food - recently). The effect size is between medium and large. In the entire sample, the effect size is small, near to medium. The healthy food related implicit cognition and a good awareness of what is healthy food or unhealthy food are in consistency with each other, as well as unhealthy food related implicit cognition and poor awareness.

Brazil and colleagues (2016) showed that knowledge about the nutritional aspects of food interferes with food choices explicitly and implicitly (Brazil et al, 2016).

**The second research question was** about the relationship between healthy or unhealthy food related implicit and explicit cognitions and somatic properties (weight, height, body mass index (BMI), age, sex).

Explicit healthy related cognitions increase with age. Preference is given to healthy food, proper nutrition (when healthy food was consumed recently, and unhealthy - long ago), good taste (healthy food seems tasty, and unhealthy food is tasteless).

The growth is not related to explicit and implicit food related cognitions. The weight of both explicit and implicit unhealthy food related cognitions increases consistently. Large BMI and implicit unhealthy food related cognitions are in consistency with each other.

Explicit preference and awareness of healthy or unhealthy foods throughout the sample are not related. The relationship is influenced by the duration of consuming healthy or unhealthy foods.

If healthy food has been consumed recently, and unhealthy - long ago ("proper nutrition"), then explicit preference for healthy food and good awareness of healthy or unhealthy food correspond to each other. As well as the explicit preference of unhealthy food and poor awareness of healthy or unhealthy food are in consistency with each other. The size of the effect is small, closer to the average.

If healthy food was consumed long ago, and unhealthy - recently ("improper nutrition"), then the explicit preference for healthy food and poor awareness of healthy or unhealthy food correspond to each other. As well as the explicit preference of unhealthy foods and the good awareness of healthy or unhealthy foods are in consistency with each other. The effect size is average. This result seems illogical. Perhaps, there are several explanations for this.

This may be due to both situational and personal factors, consideration of which is beyond the scope of this research. This, too, can be considered as an example of the impact of a context event (unhealthy diet) on an explicit food attitude. At the same time, the less time has passed since the impact of the context event on the food attitude, the greater the context influence. And vice versa, due to attenuation in the memory of information about the event with an increase in its duration.

The influence of individual characteristics of memory processes in participants is also possible. Those who rarely consume unhealthy food and are well aware of how healthy it is, remember the recent instances of its appearance in their diet. On the contrary, participants whose diet is dominated by unhealthy food less often consume healthy food and are more accurate in evaluating the limitations of recent cases of its use. According to the procedure of explicit measurements, they also had to estimate the prescription of consumption of healthy and unhealthy foods from the proposed limited set without taking into account their actual diet. This set does not have to match their unhealthy diet. For example, they do not drink sweet carbonated drinks and do not visit fast food restaurants, do not eat chips, and also do not often eat cakes and pastries due to their relative high cost. Their unhealthy diet includes other foods. All this could have an impact on the fixed relationship of the variables under consideration and gives an indication of the improvement of the used explicit measurement procedure.

**The third research question was** about common factors which underlie the relationship between the healthy or unhealthy food implicit and explicit cognitions and the somatic properties.

The study examined the healthy or unhealthy food related implicit and explicit cognitions - the results of IAT and self-reporting procedures for measuring recentness of consumption, preference of healthy or unhealthy food, the awareness and the taste of healthy or unhealthy foods and also somatic properties: body mass index, sex and age of participants. The set of these variables could be reduced to three latent variables called "Explicit Age-Based Taste Preference of Food", "Awareness Based Implicit Preference" and “Body Constitution”.

*The "Explicit Age-Based Taste Preference of Food"* is a latent variable that is associated with the explicit preference for healthy or unhealthy food, with "good" food (healthy food has been consumed recently, and unhealthy food - long ago) or with "improper" nutrition (healthy food was consumed long ago, and unhealthy food - recently), with the “good” taste (healthy food is tasty, and unhealthy food is tasteless) and the “bad” taste (unhealthy food is tasty, and healthy food is tasteless) and with age. High scores of this variable correspond to young participants who explicitly prefer unhealthy foods, who have unhealthy

food - they consumed healthy food long ago, and unhealthy food - recently, who have a "bad" taste for food - they consider healthy food tasteless and unhealthy - tasty. Low scores of this variable correspond to older participants who explicitly prefer healthy food, who have a healthy diet — they consumed unhealthy food long ago, and healthy food – recently, who have the “good” taste for food — they consider unhealthy food tasteless and healthy food - tasty.

Evaluation of taste can be determined by food family traditions, individual characteristics of taste perception, age and gender differences in the activity of metabolic processes, as well as a number of other factors. So more active metabolic processes of people at a young age require more high-calorie food, i.e. sweet, fatty, with animal proteins. When choosing it, preference will be given to unhealthy foods containing a large number of the mentioned ingredients. Such food can be assessed as tastier. At an older age due to a slowdown in metabolism, the body ceases to systematically need food with a high calorie content. This creates the prerequisites for the transition to the consumption of healthier foods that contain more trace elements, fewer “fast” carbohydrates, fats and animal proteins. The taste of such food may be more attractive, especially given the age-related decrease in taste sensitivity in people. The latent variable in question probably reflects these processes. The relatively lower weighing on this component of the variable "Age" indicates that there are other factors that influence the preference for unhealthy foods by older people. Preference based on the taste of unhealthy foods (the main weighing on this factor) retains its value at a later age.

*The second component* is based on the "*Awareness of Healthy or Unhealthy Food Based Implicit Preference*" Low scores of this latent variable correspond to participants with good awareness about healthy and unhealthy food and with the implicit preference for healthy food. The high scores of this latent variable correspond to participants with poor awareness about healthy and unhealthy food and with the implicit preference for unhealthy food.

*The third component* was called "Body Constitution", as it characterizes the bodily structure (body mass index and sex). In men, weight and body mass index are higher than in women. This is a kind of a variable that has the property that its low values correspond to women and small BMI, and high values to men and large BMI.

**The fourth research question was** about the contribution to healthy or unhealthy food related implicitly measured cognitions, that was made by healthy or unhealthy food related explicit cognitions and somatic properties (weight, height, BMI, age, sex).

The greatest contribution to the healthy or unhealthy food related implicit cognitions is the weight of the body. The higher is the weight, the higher are unhealthy food related implicit cognitions. The next most important influence is

sex. Men have greater healthy food related implicit cognitions than women. The explicit preference of eating healthy or unhealthy food also influences on the healthy or unhealthy food related implicit cognitions. The explicit attitude towards healthy food corresponds to healthy food related implicit cognitions, and the explicit preference of unhealthy food corresponds to unhealthy food related implicit cognitions.

**The fifth research question was** about the contribution to each healthy or unhealthy food related explicit cognition that was made by food related implicit cognitions, the other healthy or unhealthy food related explicit cognitions and somatic properties.

*The explicit preference of healthy or unhealthy food*. The largest contribution made by the recentness of consumption of healthy or unhealthy food. The "proper nutrition" corresponds to the explicit attitude towards the healthy food. The next most important influence is the taste. The good taste corresponds to the explicit attitude towards the healthy food. The next important influence is awareness about healthy and unhealthy foods. The good awareness about healthy and unhealthy food and the explicit attitude towards the unhealthy food corresponds to each other. The bad awareness about healthy and unhealthy food and the explicit attitude towards the healthy food corresponds to each other. In general, awareness is not related to the explicit preference for healthy or unhealthy foods. But when we take into account the influence of the "correct" or "wrong" diet, the relationship appears. It is possible that this relationship is influenced by the contextual factor - recently consumed unhealthy food.

*The recentness of consumption of healthy or unhealthy food.* The largest contribution is made by the explicit preference of healthy or unhealthy food. The explicit attitude towards the healthy food corresponds to the "proper nutrition". The next most important influence is the taste. The good taste corresponds the "proper nutrition". The next most important influence is the awareness. The good awareness corresponds to the "proper nutrition". The next important influence is by the sex. The men correspond to the "proper nutrition". The next influence is by the weight. The large weight corresponds to the "improper nutrition".

*The taste of healthy or unhealthy food.* The largest contribution is made by the recentness of consumption of healthy or unhealthy food. The "proper nutrition" corresponds to the good taste. The next most important influence is the explicit preference of healthy or unhealthy food. The explicit attitude towards the healthy food corresponds to the good taste.

*The awareness about the healthy or unhealthy food.* The largest contribution is made by the recentness of consumption of healthy or unhealthy food. The "proper nutrition" corresponds to the good awareness. The next most important influence is the explicit preference of healthy or unhealthy food. The explicit attitude towards the healthy food corresponds to the bad awareness.

This research revealed the implicit preference for healthy food in almost the whole participants. This was due to the fact that the weight of the participants was within the norm. And the participants were only students. Nevertheless, we believe that the results obtained are realistic, which indirectly indicates the validity of the constructed implicit association test and three explicit methods.

**Limitations of the research.** The limitation of the research is that the participants were only young people.

**In further researches** to understand the nature of attitudes towards healthy or unhealthy food, it is necessary to study the context factors (situational and personal) and the application of various subliminal priming procedures.

## Conclusions

As a result of the research, its aim was achieved and realistic answers were obtained to all research questions.

In the course of the research, the variant of the implicit association test was constructed, with the help of which the implicit healthy or unhealthy food related cognitions were measured. The questionnaires have also been designed to reveal explicit attitudes towards healthy or unhealthy foods on the basis of recentness of consumption, taste and awareness of which food is healthy and which is unhealthy. Linguistic adaptation and modification of the Finnish questionnaire "Preference of healthy or unhealthy food" based on the FRL method (food-related lifestyle) (Grunert et al., 2004; Uimonen, 2011) was also carried out.

It has been shown that implicit healthy food related cognitions and good awareness of healthy and unhealthy foods are consistent. For the entire sample, the relationship between explicit preference for healthy or unhealthy foods and awareness has not been established. Relationship is manifested when taking into account the influence of the "correct" diet (healthy food was consumed recently, and unhealthy - long ago) or "wrong" diet (healthy food was used long ago, and unhealthy - recently). With the “right” diet, good awareness and explicit preference for healthy foods can be consistent to each other. With a “wrong” diet, good awareness and explicit preference for unhealthy food can also be consistent to each other.

The consistency of the results of implicit and explicit measurements of healthy or unhealthy food related cognitions was observed throughout the sample. It turned out to be most characteristic for females, as well as for participants who consume healthy foods.

It was found that healthy or unhealthy food related cognitions and the somatic properties can be described with three latent variables: "Explicit Age-Based Taste Preference of Food", "Awareness of Healthy or Unhealthy Food Based Implicit Preference" and "Body Constitution".

The accuracy of the results could have been affected by the fact that the context factors (situational and personal) were not considered, as well as the fact that the implicit food related cognitions study was limited only to the use of the IAT procedure, although the use of various subliminal priming procedures could significantly refine them. It is obvious that the elimination of these deficiencies may be carried out in future studies.

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