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Sensual Taste—Color Associations and Their Link to Temperament

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Abstract

The following taste – color associations were found as statistically significant at the 0.05 level: sweetness – red + orange, saltiness – blue + violet; sourness – yellow, bitterness – violet + blue and umami – violet + greenish – blue + blue. Six types of temperament were elucidated by analysis of the EAS temperamental questionnaire. They are: F1 persons with unstable, short psyche susceptible to be thrown off his balance; F2 persons busy, bursting with energy, impetuous but relatively easy to get into panic; F3 persons reclusive, susceptible to irritation and frustration; F4 persons social, difficult to throw of his balance, dislike to be in hurry; F5 persons preferring to stay and work in a team, impulsive and F6 persons feeling unsafe, susceptible to stress. Temperament of so classified respondents did not correlate with establish color – taste associations.

Key words: Bitterness; Saltiness; Sourness; Sweetness; Umami

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INTRODUCTION

Senses are the common means of contacting with surrounding and its interpretation. A personal safety, satisfaction, and intellectual development are among benefits of that interpretation (Laming, 1995; Geschreider, 1997). Particular sensory impressions that are hearing sounds, seeing colors, feeling taste and aromas, facing tactile impressions of warm/cold, smoothness/ coarseness and softness/hardness are common means of non-handicapped human contact with surrounding. Healthy people that are people with properly functioning receptors of senses interpret qualitatively sensual impressions in the same manner although intensity of these impressions in particular subjects may be different. As a matter of fact, only senses of seeing, hearing and touch can be evaluated in terms of the units of a physical meaning. In our recent papers (Tomasik-Krótki & Strojny, 2008; Krawczyk, Tomasik, & Strojny, 2013) scaling of the impressions of taste and odor and an alternative scaling of tactile sense were presented, respectively.

McCandless (2012) meaning of colors and their role in inducing some emotions is dependent on the localization of the subjects in the Globe. However, it does not mean that associations between sensory impressions and colors, which belong to a common phenomenon guiding human reactions to the signals from the surrounding, would specifically depend on the same factor. Formerly collected results showed that color – taste, color – odor and color sound – associations (Tomasik-Krótki & Strojny, 2008) as well as color – touch (Krawczyk, Strojny, & Tomasik, 2012, 2013) are common for people independently on their customs, tradition, cuisine and so on.

In this project possible link between given associations and temperament were studied. In the broadest terms, temperament should be understood as a combination of certain permanent personality traits characteristic of the given subject. They manifest the subject behavior and cognitive processes, particularly in emotional and incentive processes. Usually meaning of temperament is constructed based on impulsiveness, sociability, activity, excitemenet, preservance and mobility of the subjects. Since Hipokrates and Gallen (Kagan, 1994) meaning of temperament was modified and redefined by several

scientists [see, for instance, Strelau (1983, 1988, 2008), Buss and Plomin (1984), Stelmack, Kruidenier and Anthony (1985), Ruch, Angleitner and Strelau (1991), Augleitner and Ostendorf (1994), Newberry *et al*., (1997), Oniszczenko (1997), Strelau, Angleitner and Newberry (1999) and references therein]. In approach applied in this study, 40 persons were first asked for associations of their taste impressions with 7 colors of rainbow followed by recognition of their temperament based on the answers to 20 questions included into EAS Bus and Plomin (1984) questionnaire modified by Oniszczenko (1997). Analysis of the answers provided classification of the respondent to a given type of temperament determined in terms of disappointment, activity, fear, anger and sociability.

1. RESULTS

Table 1 collects color – taste associations indicated by the respondents.

Table 1
Summary of Frequency (N) of the Respondent Selections of Colors

Color	N	% of Total
Violet	51	25.5
Blue	32	16.0
Greenish-blue	19	9.5
Green	18	9.0
Yellow	39	19.5
Orange	22	11.0
Red	19	9.5
Total	200	100.0

All respondents considered all 5 tastes, so the frequency of the selection of all tastes was the same (Table 2).

Table 2
Summary of Frequency (N) of the Respondent Selections of Tastes

Taste	N	% of Total
Umami	40	20.0
Bitter	40	20.0
Sour	40	20.0
Sweet	40	20.0
Salty	40	20.0
Total	200	100.0

The quality of the correspondence analysis solution (the associations for colors and tastes in two dimensional spaces) is characterized in Tables 3 and 4 for variables: color and taste, respectively. Figure 1 shows the color – taste relationship based on the correspondence analysis. Figure 2 illustrates frequency of particular color – taste associations reported by respondents.

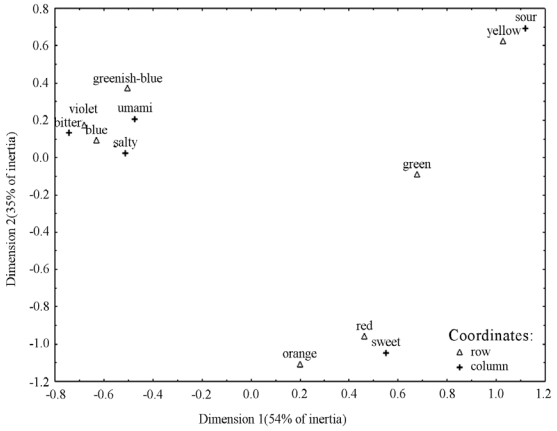

Figure 1
The Color – Taste Relationship Based on the Correspondence Analysis

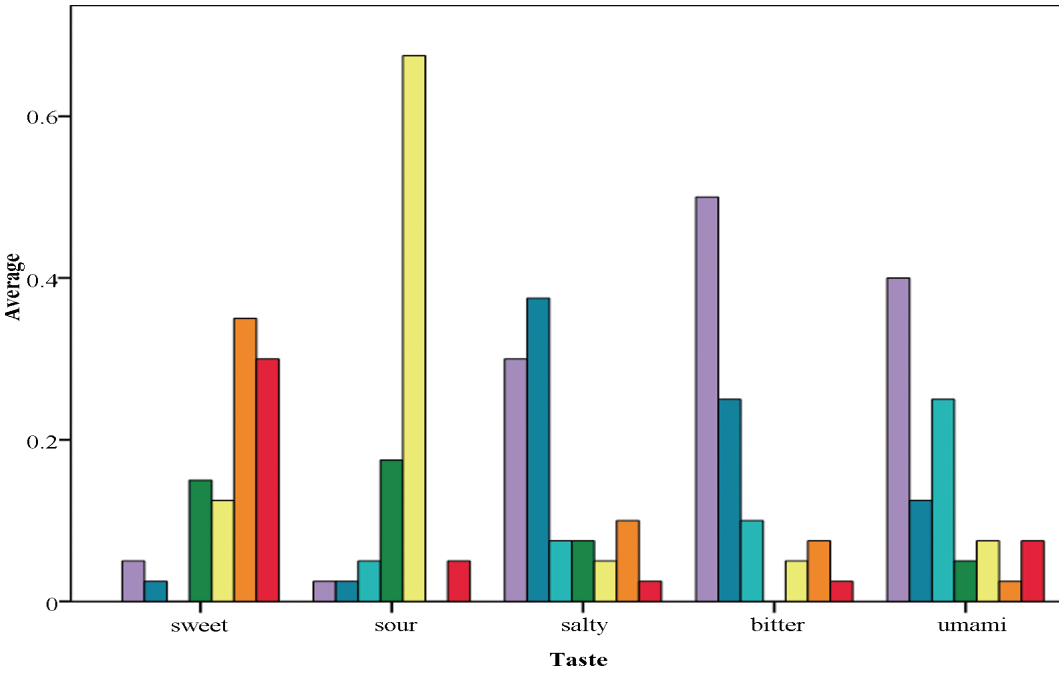

Figure 2
Relative Frequency of Particular Color – Taste Associations Among the Respondents

Table 3
Color Variable Coordinates to Dimensions and Variable's Categories Contributions to Inertia

Color variable categories	Coordinates		Mass	Quality	Relative inertia	Dimension 1		Dimension 2	
	Dimension 1	Dimension 2				inertia	cosine^2	inertia	cosine^2
Violet	-0.697	0.162	0.255	0.936	0.150	0.246	0.888	0.020	0.048
Blue	-0.671	0.126	0.160	0.649	0.124	0.143	0.627	0.008	0.022
Greenish-blue	-0.503	0.368	0.095	0.494	0.080	0.048	0.321	0.039	0.173
Green	0.679	-0.094	0.090	0.917	0.050	0.082	0.900	0.002	0.017
Yellow	1.055	0.644	0.195	0.995	0.321	0.431	0.725	0.247	0.270
Orange	0.202	-1.112	0.110	0.987	0.153	0.009	0.031	0.415	0.955
Red	0.463	-0.960	0.095	0.944	0.123	0.041	0.179	0.267	0.766

Table 4
Taste Variable Coordinates to Dimensions and Variable's Categories Contributions to Inertia

Taste variable categories	Coordinates		Mass	Quality	Relative inertia	Dimension 1		Dimension 2	
	Dimension 1	Dimension 2				inertia	cosine^2	inertia	cosine^2
Umami	-0.473	0.203	0.200	0.526	0.108	0.089	0.444	0.025	0.082
Bitter	-0.687	0.129	0.200	0.893	0.117	0.187	0.863	0.010	0.031
Sour	1.120	0.692	0.200	0.999	0.373	0.498	0.723	0.293	0.276
Sweet	0.552	-1.048	0.200	0.998	0.302	0.121	0.217	0.671	0.782
Salty	-0.512	0.023	0.200	0.566	0.100	0.104	0.565	0.000	0.001

Table 5 contains the factor correlation matrix. Table 6 displays coefficients that relate to the questionnaire variables to the six rotated factors.

Table 5
Factor Correlation Matrix

	F1	F2	F3	F4	F5	F6
F1	1	.002	.112	-.069	.105	.237
F2	.002	1	.017	-.151	.096	.139
F3	.112	.017	1	-.093	-.057	.190
F4	-.069	-.151	-.093	1	-.110	-.071
F5	.105	.096	-.057	-.110	1	.129
F6	.237	.139	.190	-.071	.129	1

Table 6
Relations of Questionnaire Variables With the Temperament Types (Artificial Factors)*

Question in EAS	Components (factors)					
	F1	F2	F3	F4	F5	F6
Q1	-0.090	0.284	-0.700	0.248	0.147	0.492
Q2	0.051	-0.041	-0.108	-0.870	-0.128	0.021
Q3	0.369	0.020	-0.072	0.168	0.101	0.635
Q4	0.538	0.198	0.274	-0.176	0.108	0.095
Q5	0.142	0.124	0.121	-0.719	0.191	0.032
Q6	0.151	-0.105	0.776	0.160	-0.123	0.171
Q7	0.047	0.846	0.162	0.037	-0.293	-0.180
Q8	-0.199	0.620	0.114	-0.116	0.539	0.009
Q9	0.233	0.330	0.598	0.210	0.072	0.249
Q10	-0.178	0.401	0.246	-0.470	-0.176	0.307
Q11	0.344	0.065	0.316	-0.121	-0.047	0.523
Q12	-0.138	-0.265	0.117	-0.192	-0.069	0.755
Q13	-0.224	0.084	0.793	-0.153	0.266	0.130
Q14	0.264	0.536	-0.105	-0.080	0.150	0.222
Q15	0.117	0.035	-0.307	-0.131	0.578	0.044
Q16	0.596	-0.029	-0.049	-0.409	0.206	0.060
Q17	-0.168	0.765	-0.268	-0.089	-0.001	-0.151
Q18	-0.848	0.117	0.065	0.162	-0.012	0.165
Q19	-0.697	0.005	-0.058	-0.224	0.112	-0.130
Q20	-0.009	-0.200	0.211	0.147	0.899	-0.076

Note. *Based on rotated component matrix

In Table 7 tastes and indicated associations with perceived color-standards are specified. Evaluations of the linkage between impression and temperaments for sweet, sour, salty bitter and umami tastes are presented in Tables 8-12, respectively.

Table 7
Tastes and Associations With a Perceived Color-Standard (%)

Taste	Standards of impression[a]					Total
	Violet - bitter	Blue +greenish blue - salty	Green	Yellow - sour	Orange + red - sweet	
sweet	5.0%	2.5%	15.0%	12.5%	65.0%	100.0%
sour	2.5%	7.5%	17.5%	67.5%	5.0%	100.0%
salty	30.0%	45.0%	7.5%	5.0%	12.5%	100.0%
bitter	50.0%	35.0%	0.0%	5.0%	10.0%	100.0%
umami	40.0%	37.5%	5.0%	7.5%	10.0%	100.0%
Total	25.5%	25.5%	9.0%	19.5%	20.5%	100.0%

Note. [a]Standard is constituted by combination of vicinal colors, for instance, red + orange, violet + blue, etc..

Table 8
Standard of Impression Against Temperament for Sweet Taste[a]

Model term	B	Standard error	Wald	*df*	Significance	Exp (B)	95.0% confidence interval for Exp(B)	
							Lower	Upper
F3	-1.272	.453	7.878	1	.005	.280	.115	.681
Constant	.720	.389	3.419	1	.064	2.054		

Note. [a] Variables introduced in step 1: F1, F2, F3, F4, F5, F6.

Table 9
Standard of Impression Against Temperament for Sour Taste[a, b]

	B	Standard error	Wald	*df*	Significance	Exp (B)	95.0% confidence interval for Exp(B)	
							Lower	Upper
F3	-.783	.432	3.292	1	.070	.457	.196	1.065
F4	1.019	.458	4.962	1	.026	2.771	1.130	6.792
Constant	.859	.397	4.669	1	.031	2.361		

Note. [a]Variables introduced in step 1: F1, F2, F3, F4, F5, F6; [b]Meaning of symbols is identical as in Table 7.

Table 10
Standard of Impression Against Temperament for Salty Taste[a, b]

	B	Standard error	Wald	*df*	Significance	Exp (B)	95.0% confidence interval for Exp(B)	
							Lower	Upper
F6	.730	.380	3.687	1	.055	2.076	.985	.375
Constant	-.225	.336	.448	1	.503	.799		

Note. [a]Variables introduced in step 1: F1, F2, F3, F4, F5, F6; [b]Meaning of symbols is identical as in Table 7.

Table 11
Standard of Impression Against Temperament for Bitter Taste[a, b]

	B	Standard error	Wald	*df*	Significance	Exp (B)	95.0% confidence interval for Exp(B)	
							Lower	Upper
F1	-.033	.363	.008	1	.929	.968	.476	1.971
F2	.487	.390	1.559	1	.212	1.627	.758	3.491
F3	.577	.378	2.330	1	.127	1.781	.849	3.737
F4	.594	.357	2.773	1	.096	1.812	.900	3.647
F5	.335	.383	.766	1	.381	1.398	.660	2.963
F6	-.123	.364	.113	1	.736	.885	.433	1.805
Constant	.007	.343	.000	1	.983	1.007		

Note [a]Variables introduced in step 1: F1, F2, F3, F4, F5, F6; [b]Meaning of symbols is identical as in Table 7.

Table 12
Standard of Impression Against Temperament for Umami Taste[a, b]

	B	Standard error	Wald	*df*	Significance	Exp (B)	95.0% confidence interval for Exp(B)	
							Lower	Upper
F5	-.960	.496	3.741	1	.053	.383	.145	1.013
Constant	1.456	.451	10.411	1	.001	4.290		

Note. [a]Variables introduced in step 1: F1, F2, F3, F4, F5, F6; [b]Meaning of symbols is identical as in Table 7.

2. DISCUSSION

In their associations of the 5 tastes with 7 colors respondents most frequently selected violet color followed by yellow, blue and orange (Table 1).

The result of the verification of the hypothesis of the linkage between variables (color and taste) is given by x^2 –test. Since $x^2 = 186.234$; $df = 24$; $p = 0.000$, the variables are considered to be mutually not independent.

Categories located in Figure. 1 closely one to each another remain in some relations. Thus, yellow color is closely associated with sour taste, the sweet taste is in relation to red and orange colors but the relationship with the first color is closer, salty taste is related to blue color, and umami taste is related to greenish-blue, violet and blue colors. According to the study results, only the green color could not be related to any taste.

The general concern from the quality of correspondence analysis (Tables 3 and 4) is that most categories are properly represented by the solution, that their distances each to other on the perceptual map can be approximated to a satisfactory degree (Figure 1). Statistics reported for the row and column coordinates for the table of frequencies of color and taste categories are based on two-dimensional solution because two dimensions was used to reconstruct the patterns of relative frequencies across the cross-tabulation under investigation.

The goal of the correspondence analysis is to represent the distances between variables categories in a low-dimensional space. The maximum number of dimensions in the cross-tabulation considered is equal to the minimum of the number of rows (color variable) and the number of columns (taste variable), minus 1, where all distances between categories could be reconstructed exactly. Quality measures reported in Tables 3 and 4 allow assessing degree of representation of point in two dimensional solution. The higher the quality coefficient value the better the representation of row or column variable categories in chosen number of dimensions. According to the quality indicators presented in both tables most points are very good mapped in two-dimensional space (quality above 0.900). Relatively, lower performance of the representation could be pointed out to greenish-blue color (0.494) and umami (0.526) and salty (0.566) tastes.

The term cosine² may be interpreted as the measure of association of a particular category with the respective dimension (Greenacre, 2007). This measure may be helpful to name emerged dimensions.

According to the correspondence analysis yellow color was unequivocally identified with sour taste. Sweet taste is strongly associated with red and slightly less with orange colors. The bitter taste was associated chiefly with violet color with some shift towards blue. The latter color with some shift towards violet was associated with salty taste. Associations with violet color followed by greenish-blue color dominated for umami taste. Such association for the umami taste could likely result from a poor identification of that taste.

Thus, majority of respondents associated sweetness and sourness with long wavelength colors commonly considered warm and remained tastes were associated with short wavelength colors commonly considered cold. The effect of taste upon associated color shift arranged

from the longest wavelength towards shortest wavelength in the order sweet > sour > salty > umami > bitter.

Analysis of the link between associations and temperament involved the EAS questionnaire of Buss and Plomin (1984) modified by Oniszczenko (1997). The questionnaire contained 20 subsequent questions (statements): Q1 - Do you like to stay among people?; Q2-Usually I am making impression of being in hurry; Q3-It is easy to frighten me; Q4- Frequently I am uptight; Q5-When I am disappointed I am expressing it to the others; Q6-Sometimes I am recluse; Q7-I like to be continuously busy; Q8-I am seen as impetuous and irritable person; Q-Frequently I feel frustrated; Q10-My life passes fast; Q11-Everyday problems make me solicitous and jittery; Q12-Frequently I feel unsafe; Q13-Many things make me angry; Q14-When I am frighten I panic; Q15-I prefer to work in a team rather than single; Q16-It is easy to throw me off my balance; Q17-Frequently I feel bursting with energy; Q18-It takes a lot to make me angry; Q19-I feel less apprehensions than my contemporaries; Q20-I think that people are more intriguing than interesting than something else. The respondents are anticipated to select between one of five possible answers: 1–definitely no; 2-rather no; 3–I do not know; 4–rather yes; 5-definitely yes.

Based on the answers to these questions (statements), by means of the Principal Component Analysis (PCA) (Joliffe, 2002) 20 variables of the questionnaire were reduced (Khattree & Naik, 2000) to 6 dimensions characterizing the temperament of the respondents. Involving the Oblimin rotation method with the Kaiser normalization the principal components (factors) were extracted. Oblimin rotation tends to produce varimax-looking factors which are oblique. However, very low correlations between components showed in Table 5 mean that the factors (representing respondents' personality types) were properly identified. Oblique solutions are helpful to reduce artificiality and simplifications—the issues which are strongly criticized in orthogonal rotations. Most relationships that are a subject of study in the area of psychology are at least somewhat related.

The survey questions that load onto the same factor are helpful to identify common abstract dimensions that could be associated with respondents temperament types. Factors are latent variables that underlay the scores in observed data – respondent answers.

The interpretation of each extracted factor is based on the content of the feedback form of respondents. Each factor is inferred as whatever the questionnaire characteristics with high loadings for this particular factor have in common.

Loadings in Table 6 indicate a degree of the conjunction between a particular variable with emerged factors. Such panel of rotated scores is useful in identifying patters underlying components and in naming the factors.

The analysis revealed the six subareas circumscribing respondents' personalities. The components (factors) could be characterized as follows:

F1 – persons with unstable, short psyche susceptible to be thrown off his balance

F2 – persons busy, bursting with energy, impetuous but relatively easy to get into panic

F3 – person reclusive, susceptible to irritation and frustration

F4 – person social, difficult to throw of their balance, which dislike to be in a hurry

F5 – persons preferring to stay and work in a team, impulsive.

F6 – persons feeling unsafe, susceptible to stress.

For matching tastes and indicated associations with perceived color-standards (Table 7) sour and sweet tastes were the closest to the standard (67.5 and 65%, respectively). Impression of the bitter taste was frequently identified with the salty taste (35% of indications) and, in return, the salty taste was fairly similarly identified with the bitter taste (40% indications). Impression of the umami taste was almost equally identified with bitter (40% indications) and salty (37.5% indications) tastes.

Further data analysis concerned the research of the relationships between standards of impressions with personal temperament. It was performed using logistic regression (stepwise regression, backward elimination method, criterion of variables removal: Log Likelihood). As the dependent variable was assumed a perceived color-standard for a given taste, each time. The independent variables were components obtained in factors analysis, which represented respondent personality categories.

The logistic regression model estimating the scope of matching the sweet taste standard (orange + red colors) negatively relates this conformity to factor F3 (Table 8). In the subgroup of respondents which did not fit to the standard the probability of possessing temperament of the F3 type exceeded 72%. This result is statistically significant at the 0.05 level.

Relationship between the standard of perception of sour taste (yellow color) and personality types is described in the logistic regression model presented in Table 9. In the subgroup connecting the taste with its standard, probability of possessing of temperament described as F4 is higher by 1.7 times (that is by 177%). Sour taste also correlated negatively with temperament of type F3. In the group associating color with taste in the manner which did not fit the standard, the probability of occurring temperament of the F3 type is higher by 54%. That relationship was statistically significant at the 0.05 level.

For the salty taste the standard color were defined blue with greenish-blue. Fitting to the standard of perception by the respondents positively correlated with F6 (Table 10). That relationship is on the limit of the statistical significance. In the group matching the taste-color standard probability of harmonization of respondents' character with the F6 temperament type was by 107% higher.

Violet was assumed the standard color for the bitter taste. Based on the logistic regression model (stepwise regression—step 1) presented in Table 11 on the 0.05 significance level that association did not relate with any

type of the temperament identified in factor analysis but on the 0.1 level it positively tied with component F4 .

The standard of the color perception for the umami taste involves violet, blue and greenish-blue combination. Such association is negatively related to temperament type defined by the component F5. This relationship is on nearly statistically significant at the level of $p = 0.05$. The probability of matching this perception standard is lower by 62% in the respondents' subgroup which is characterizing by factor F5 (Table 12).

3. METHODS

3.1 Selection, Characteristics and Introductory Preparation of the Respondents

40 persons for the survey were selected by chance regardless their gender and age, however, because of the specificity of the temperamental form individuals below 12 were not involved. The gender and age characteristics of the respondents are given in Table 13.

Table 13
Age and Gender Characterisitcs of the Respondents

Age	Gender and number[a]	% of total
12	2F	5.0
15	1M	2.5
21	1 M	2.5
22	2 F	5.0
23	5 F	11.5
24	2 F	5.0
25	2 F	5.0
26	2F 2 M	10.0
27	1 F	2.5
29	1 F	2.5
30	1F 1M	5.0
31	2F 1M	7.5
35	2F	5.0
46	1 F	2.5
48	2 M	5.0
49	1 M	2.5
51	2 F	5.0
53	1F 2M	7.5
54	1 F	2.5
57	1 F	2.5
60	1 F	2.5

Note. [a]F – female, M – male

Prior to the experiment, the respondents were informed about the purpose of this anonymous and voluntary character of the participation in that study. The plan of the action was presented to them together with the information that according to the Polish Food Law, one of the most restrictive all over the World, the samples for testing taste impressions are as non-hazardous and they are legally used in food production.

3.2 Preparation of the Standards

3.2.1 Color Standards

Each of squares (5*5 cm) of white cardboard were covered with one of red, orange, yellow, green greenish-blue, blue and violet distemper dyes. A similar surface facture of the each square was maintained.

3.2.2 Taste Standards

The subsequent compounds were taken as the standards of particular tastes: sucrose - sweet, citric acid – sour, sodium chloride – salty, caffeine – bitter and sodium glutamate – umami. These standards were diluted with distilled water. The solutions were prepared by placing either 1.0 g of one of sucrose, sodium chloride or sodium glutamate or 0.5 g of citric acid or caffeine in 100 mL measuring cylinder and filled with distilled water up to 100 mL. In case of the preparation of the caffeine solution an agitation for a while was required. The solutions were stored in closed vessels.

3.2.3 Tests

The respondents were identified by number they received prior to the test and the subsequent temperamental questionnaire of that person was labeled with the same number. Prior to the experiments each person washed the mouth with 100 mL freshly distilled water. Then that person received arbitrarily selected 1 mL taste standard labeled with A to E distributed it on the tong, then spit it into spittoon, washed mouths with 100 mL distilled water and selected one of colored test square among all seven squares freely distributed on the table. The faced impression was then reported in the corresponding questionnaire. The respondents marked selected color with one of characters: r = red, o = orange; y = yellow, g = green; g-b = greenish-blue; b = blue; v = violet. After at least 2 minutes the same person received another arbitrarily selected taste solution for subsequent testing. The procedure was repeated up to completing seventh test in the line. After that the respondent was asked to fill the temperamental questionnaire.

3.2.4 Questionnaires

Table 14 presents the system of the questionnaire. Temperamental questionnaire used in this study was the Polish version of Bus and Plomin (1984) EAS questionnaire for adults adapted by Oniszczenko (1997).

Table 14
Questionnaire for Taste–Color Associations

Respondent number	Taste[a]	Selected color
	A	
	B	
	C	
	D	
	E	

Note. [a]A-E mean subsequently sweet, sour, salty, bitter and umami, respectively.

3.2.5 Statistics

The inference relating the color – taste relationship is based on Correspondence Analysis (CA) (Clausen, 1998). This technique is especially useful when attempting to reveal proximal relationships among categorical variables (nominal, ordinal, or discredited interval/ratio variables) (Murtagh, 2005). This descriptive technique

was developed to analyze cross-tabulations containing some measure of correspondence between the rows and columns variables. The output of the analysis provides the research with an insight as to the relationships among variables under investigation and related dimensions (van Rickevorsel & de Leeuw, 1998). As the graphical result of the analysis, the multi-dimensional map is produced. The map allows visualizing the relationships among variable categories spatially using empirically derived dimensional axes. However, correspondence analysis does not offer a statistical significance test because it is not based on a distributional assumption (Greenacre, 1984). Thus, CA should be perceived as an exploratory technique. For that reason the analysis could be replenished by the model evaluation with, for example, logistic regression.

CONCLUSION

Contemporary ways of receiving information on temperament of particular objects is based on including under consideration subsequent descriptors of elements of human behaviors and reactions to surrounding factors. Actually, possibility of links of temperament with human choices, preferences and tendencies were ignored. These descriptors are formulated as a scope of questions to which tested respondent is obliged to select one of several suggested routine answers. For instance, the Buss and Plomin questionnaire contains 20 questions and a choice is left to the respondents between 5 answers to each question. Reaction of the respondent to each questioned situation seems to be dependent on several external stimuli and personal attitude at the moment of the test. Moreover, proposed answers to such question, for instance, definitely yes, yes, I do not know, no, definitely not may readily overlap with one another as the limits between them are not strictly defined. Therefore, selection of a type of temperament which by definition should be constant property of the respondent is suspicious. In turn, sensory impressions and their associations seem to be generated more independently of external stimuli and, therefore, they seem to be relatively constant. Moreover, sensory impressions can be discussed in terms of well defined units. Hence, the results presented in this paper suggest the redefining of the temperament based on associations between the sensory impressions.

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