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The cognitive stereotype *bitter* in Polish, English and Ukrainian speakers based on the results of associative tests

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The cognitive stereotype *bitter* in Polish, English and Ukrainian speakers based on the results of associative tests

Žodžio „kartus“ kognityvinis stereotipas pagal anglų, lenkų ir ukrainiečių kalbų vartotojų asociacijų testo rezultatus

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Abstract The article deals with the cognitive stereotype “N is bitter” in the minds of native speakers of Ukrainian, English, and Polish. To establish the range of objects that serve as typical markers of bitter taste, we can use data obtained directly from native speakers in association tests. A directed association test was recently conducted to identify the objects that respondents consider standards of bitter taste. Only grapefruit turned out to be such a standard, common to all respondents. Comparison with the data of free association experiments conducted during the 20th century showed that stereotypes of bitter taste have undergone significant changes. The tendency to change the stereotype 'N is bitter' is most clearly represented in American respondents. Instead, Ukrainian speakers were the most conservative in their ideas about bitter taste stereotypes.

KEYWORDS: associative test, bitter, cognitive stereotype, psycholinguistics, taste.

Introduction

We use the term “cognitive stereotype” to denote a verbalised connection between a certain feature and its bearers, which is well known in a certain society. Depending on the conditions in which a particular linguistic and cultural group is formed and exists, the collective experience of its members acquires unique features and characteristics, which necessarily affects both the conceptual structures and the contents of cognitive stereotypes.

A cognitive stereotype at the verbal level can be expressed through the predicative construction N is Adj or through other constructions in which a certain stable feature is attributed to an object (glass breaks, rose hips prick, a baby often cries, the table is for eating, oaks are taller than birches, etc.).

The aim of our study was to identify and compare those associative reactions to the stimulus *гіркий* / *bitter* / *gorzki* that have the nature of a cognitive stereotype and indicate the carriers of the trait "to be bitter" in Ukrainian, English, and Polish. Such reactions constitute only a part of the associative fields obtained in free association tests. In contrast, the association fields constructed on the basis of directed association tests may consist almost entirely of associates that point to carriers of the "being bitter" trait.

In our opinion, it is especially important for the analysis of the content and structuring of associative-verbal networks to compare the associative fields obtained in free and directed associative tests for the same stimulus word that serves as a means of denoting a certain concept. Such comparisons have received insufficient attention in psycholinguistic research, but they can provide interesting results for characterising the collective language consciousness. Our study is based on data from both free and directed association tests. We analyse experimental data obtained from native speakers of three languages (Ukrainian, English, and Polish), which allows us to analyse associative fields by different parameters. The selection of native speakers of Ukrainian, English and Polish was determined by both practical and theoretical considerations. First, associative experiments involving these language communities have already been conducted, which provides a solid empirical foundation and allows for the use of existing data. Second, the material for comparison was chosen with regard to generational change, making it possible to observe the dynamics of the *bitter* stereotype over time. The inclusion of these three languages also reflects the accessibility of respondents and enables a cross-cultural comparison between societies with markedly different socio-cultural conditions. The contrast between American and European contexts, particularly in dietary habits, makes it possible to trace how cultural and environmental factors influence the perception and conceptualisation of bitterness.

For the analysis, we chose the associative fields of the stimulus word *гіркий* / *bitter* / *gorzki*. The choice of this stimulus word is not accidental and is determined by the role played by tastes in the culture of all peoples since ancient times. This role was emphasised by Mitrenga (2014), who noted that "taste belongs to the so-called chemical senses, and that chemical senses were the first to develop in the world of animate beings and still perform an important function in human life today" (p. 228). Carriers of bitter taste are various objects suitable for food consumption or for other uses (household or magical). On the other hand, a bitter taste can be a signal that an object is inedible, poisonous, or dangerous: "A bitter taste often indicates that a dish is stale, spoiled, or even poisonous" (Mitrenga, 2014, p. 228).

The concept of bitter taste has undergone changes across historical periods. We assume that experimental studies of the consciousness of speakers of different languages conducted in different years may reveal dynamics in the perception of bitterness.

Theoretical Background

Researchers have repeatedly emphasized the role of collective consciousness in the creation of stereotypes. This was emphasised by the American Walter Lippman, who was the first to study social stereotypes and who introduced the term "stereotype" into scientific use, which he borrowed from the field of newspaper printing. He saw it as a cultural phenomenon: "We tend to perceive that which has been picked out in the form stereotyped for us by our culture" (Lippmann, 1922, p. 81). Contemporary psychologist Perry Hinton emphasises that any stereotype is generated by the culture and social life of the collective: "Implicit stereotypes, like other implicit associations, can be viewed as cultural knowledge or folk wisdom that a person acquires through their experience in a culture" (Hinton, 2017). Calling the established relations between lexemes "implicit semantic associations", Hinton is referring to exactly this kind of associative relationship, which is based on culturally determined collective knowledge about the world: "Implicit semantic associations of 'bread' and 'butter' or

'table' and 'chair' have developed through their repeated co-occurrence during our experience of the world. Clearly in ancient Japan (without bread and butter or Western-style tables and chairs) these specific implicit associations did not develop" (Hinton, 2017).

Polish linguist Wojciech Chlebda emphasises the difference between the two ways of understanding cognitive stereotypes studied by linguists: "The stereotype in linguistics is treated in a kind of bipolar way. Some linguists focus mainly on the superficial, 'visible', purely linguistic side of the stereotype, describing word associations reproduced from memory under its label, and contrast them with ad hoc constructed linguistic products; others, on the other hand, are interested in the deep layer of the stereotype, its mental side, i.e. specific sets of judgments about fragments of reality that reside in the consciousness of the speakers" (Chlebda, 1998, p. 32). In our opinion, it is the mental side of the stereotype, which is often not expressed in standard linguistic forms such as similes or metaphors, that requires new techniques and methods of analysis to reveal.

One of these techniques can be a comparison of an array of associative reactions obtained in association tests of different types. As a rule, psychologists and psycholinguists use free association tests to identify stereotypes. However, the central zone of associative fields may not always serve as a means of explicating cultural stereotypes. For example, in the Kent-Posanoff experiment (Kent & Rosanoff, 1910), in which 1000 respondents took part, the most frequent response to the stimulus *blue* was *colour* (25.6% of responses), while the reaction *sky*, which realises the stereotype "The sky is blue", was in the second place and occupied 23.9% of the field. For the stimulus *red* in the same experiment, 254 responses were related to *colour*, while only 71 responses referred to *blood*. The stimulus *white* elicited the response *black* (308 answers) much more frequently than *snow* (91 answers). The word *milk* was mentioned in response to the stimulus *white* by only 9 respondents out of 1000 test participants. At the same time, it is quite obvious that both snow and milk are typical carriers of the white colour, and this information does not require any special proof or explanation for people familiar with these realities.

The presented data indicate that stereotypical connections do not necessarily appear in the central zone of the associative field; they can often be found in its peripheral areas. Incorporating data obtained from directed associative tests, rather than free ones, may introduce significant adjustments to psycholinguists' understanding of cognitive stereotypes of the type N is Adj.

The free association test, which is considered one of the basic techniques of psycholinguistic research, serves to model both collective and individual linguistic and cultural consciousness. Despite the fact that the results of such experiments are often criticized for their lack of objectivity, such tests remain among the most important methods that allow us to address language consciousness directly, rather than through texts in which the consciousness of speakers manifests itself indirectly. The concept named after a stimulus word has many different semantic layers; the activation of certain fragments of the conceptual structure in respondents during a free association test is generally random, and thus the reaction of a particular respondent cannot be predicted. The associative field built as a result of processing the reactions in the free association test reveals certain frequency fragments that are extrapolated by researchers to all native speakers: "research on associative fields in a contrastive perspective can reveal numerous hidden aspects of the worldview of members of linguistic and cultural communities" (Zhuikova & Kotys, 2024, p. 47).

An equally important type of associative experimentation necessary for studying the consciousness of speakers is the so-called directed test. When conducting it, the experimenter deliberately limits the potential answers of the respondents and directs them in a given direction. Dolinsky (2022) states that "controlled association experiments limit the freedom of association in the direction desired by the experimenter" (p. 14). The researcher specifically highlights either some verbal or some conceptual feature associated with the stimulus word, thus setting more specific vectors in activating the associative-verbal network of the interviewees. A guided associative test can significantly reduce the proportion of randomness in respondents' answers.

Methods

The primary research method is the comparison of associative fields obtained through both free and directed associative tests with native speakers of the three languages. The first block consists of three associative fields obtained in response to the stimulus *гіркий* / *bitter* / *gorzki* from native speakers of Ukrainian, English, and Polish, as published in open sources. These fields are based on free associative experiments.

The second block includes data from our own experiments conducted with native speakers of the same languages (Ukrainian, English, and Polish) between 2020 and 2023. These experiments were specifically aimed at eliciting reactions that indicate the attribute of "being bitter." In our surveys, the stimulus word *гіркий* / *bitter* / *gorzki* was not presented to respondents in isolation but as a central (dominant) component of broader verbal constructions. A detailed description of our experiments is provided later in the article.

Another method used in the study to identify cognitive stereotypes involves quantitative calculations, which allow us to determine the most frequent responses. For the convenience of generalizing the results of all association tests, we accept the following quantitative estimates:

- central zone – reactions with a share of 10% of all responses;
- near periphery zone – reactions with a share of 2% to 9.5% of all responses,
- far periphery zone – reactions with a share of less than 2% of all responses, including single reactions.

Data from the First Set: Free Association Test

English language material

For the first time, a large-scale associative experiment was conducted in America by psychologists Grace Kent and Aaron Rosanoff (1910). Respondents were orally presented with a sequence of one hundred stimuli and were asked to respond with only one word (not a phrase or a sentence) that first came to mind. As a result of processing the responses based on their frequency (with some responses being partially filtered out), the first associative dictionary was created and published in 1910 (Kent, G. H. & Rosanoff, A. J.), in which each stimulus word was accompanied by 1000 reactions.

The associative field of the adjective *bitter*, according to Kent and Rosanoff's (1910) experiment, contains a clearly defined core, which includes two reactions: *sweet* (305 responses) and *sour* (222 responses). The next most frequent response, with a large margin, is *taste* (66 responses). Thus, no tokens indicating stereotyping relations (e.g., *quinine is bitter*) were included in the field core. Such responses appear only in the near and far periphery. We list them in descending order of absolute frequency:

> gall 42, medicine 37, quinine 23, aloe 10, lemon 9, pepper 9, herb(s) 7, almond(s) 7, beer 6, pickl(s) 4, strychnine 4, grapefruit 3, orange 3, tonic(s) 3, wormwood 2, chocolate 1, hops 1, horseradish 1, morphin 1, tea 1.

A group of nouns denoting such realities that are not eaten, but the respondents are aware of their bitter taste (*gall*, *aloe*, *wormwood*), is noteworthy. Some of these objects are used as strong medication (*quinine*, *strychnine*, *morphine*). In general, the share of responses indicating objects with a bitter taste is 17.5% of the associative field.

Another free association experiment with native English speakers was conducted at the University of Edinburgh (UK) in the 1970s by a group of scientists led by psychologist George Kiss. The respondents were students. They received 99 responses to the stimulus word *bitter*. Among them, the dominant response was *sweet*, which occupied 45% of the associative field. The next most frequent responses were *beer* and *lemon(s)*, which occurred 12 times each (Kiss, Armstrong, n.d.). There was one reaction pint in the near periphery zone. In Britain, this word is used not only to refer to a measure of liquid in general, but also to a certain amount of beer, i.e., pint is *0.568 litres of beer* (CED). Therefore, it is reasonable to assume that the reaction *beer* accounts for 15% of the associative field. In general, this survey presents a small number of reactions associated with bitter taste carriers. The nouns *gin*, *orange* and *drink* appeared in the field once each.

Polish language material

In 1964–1965, a large-scale free association experiment was conducted in Warsaw on the basis of Kent and Rozanoff's (1910) list of stimuli. It was initiated by the Polish linguist Ida Kurcz (Kurcz, 1967). The participants of the experiment were students of two higher education institutions aged 16 to 34 years; their native language was Polish. As a result of processing the results, exactly 1000 questionnaires were obtained.

The stimulus field *bitter*, presented in the grammatical form of masculine singular (this information is important for inflectional languages), includes 133 different responses. The field has a distinct core, which contains three responses. Their frequency exceeds 10%: *taste* (22.7 %), *sweet* (15.3 %), and *wormwood* (10.4 %). Only one of these reactions, wormwood, is the name of a plant (genus *Artemisia*) and realises the stereotyping relation between stimulus and reaction. The near periphery zone contains two responses: *almond* (35 responses) and *Turkish pepper* (26 responses).

In the far periphery area of the field, we found more than 25 different responses indicating the specific phenomena that respondents believed were characterised by bitter taste:

> nut 17, honey 14, medicine 12, salt 11, beverage 9, horseradish 5, cucumber 4, vodka 4, quinine 3, grapefruit 3, coffee 3, vinegar 3, cheese 3, mustard 3, yolk 3, chocolate 2, tea 2, pill 2, beer 2, herbs 2, onion 1, lemon 1, pear 1, root 1, pepper 1, spinach 1, wine 1.

A large part of these responses are nominations of edible fruits that people usually consume (like almond, horseradish, cucumber, spinach, grapefruit, onion) or common drinks (coffee, beer, vodka). Three responses are related to the field of medicine (pill, medicine, quinine). Those responses that indicate objects with a bitter taste occupy about 26% of the associative field obtained in Ida Kurcz's experiment (Kurcz, 1967, pp. 224–225).

Ukrainian language material

Two major projects stand out in Ukrainian psychological research: Nina Butenko's one-volume associative dictionary (1979) and Svitlana Martinek's four-volume associative dictionary (2007–2021).

The associative experiments for Butenko's dictionary were conducted in Lviv (western Ukraine) in 1974–1975. Almost the entire one-hundred-word list established by Kent and Rozanoff (1910) was used as stimuli, except for items that were unacceptable in the Soviet Union for ideological reasons. About 30 lexemes were also added to the stimulus list, which were not present in the Kent and Rozanoff's (1910) and Ida Kurcz's (1967) surveys. The number of responses to each stimulus word was close to a thousand. The stimulus *bitter* received 980 responses (Butenko, 1979, pp. 22–23).

The associative field of the adjective *bitter* (in the grammatical form of the masculine singular) in Butenko's dictionary has a clearly defined central zone, which includes two associates: *wormwood*, which is mentioned 147 times (15% of the field), and *pepper*, which is mentioned 145 times (15% of the field). Both responses refer to objects that have a bitter taste, so the constructions *wormwood is bitter* and *pepper is bitter* represent common stereotypical representations of Ukrainian speakers.

On the near and far periphery of the field, there are 25 different responses denoting bitter-tasting objects:

- cucumber 60 – 6% of the field
- horseradish 35 – 3.6% of the field
- almond 27 – 2.8% of the field
- nut 20 – 2% of the field

Other reactions make up only a small portion of the field, so we provide the number of mentions:

> mustard 15, vodka 14, radish 1, medicines 6, pills 6, garlic 6, lemon 5, blackthorn 5, wine 3, coffee 2, milkweed 2, beer 2, hops 2, tea 2, orange 1, aspirin 1, potion 1, novocaine 1, powder 1, onion 1.

In general, this set of associates (521 reactions) is very significant. The lexemes indicating bitter taste carriers make up 53% of the field.

The results of another survey of speakers to the bitter stimulus are published in Svitlana Martinek's Ukrainian Associative Dictionary (Martinek, 2021, p. 138). The surveys were conducted in a writing form during 2015–2020. The number of respondents was 200 people of both sexes; the respondents belonged to different age groups and represented different regions of Ukraine; all of them were native Ukrainian speakers. The dictionary presents separate calculations of reactions given by men and women.

The stimulus field *bitter* (in the masculine singular grammatical form) contains 61 different reactions. The most frequent among them is the lexeme *pepper* (14% of the field); 11.5% of the field is occupied by the reaction *taste*. Accordingly, these two reactions should be considered central. The near periphery of the field contains 8 nominations with a frequency of 2% to 7.5% of the total number of responses. The far periphery of the field contains only 6 single reactions indicating objects to which respondents attribute a bitter taste:

- lemon 15 – 7.5% of the field
- cucumber 8 – 4% of the field
- mustard 6 – 3% of the field
- wormwood 6 – 3% of the field
- horseradish 5 – 2.5%
- chocolate 5 – 2.5%
- tea 4 – 2%
- grapefruit 4 – 2%

Single reactions were also detected in the field: antibiotic, coffee, medicine, sauce, tablets, garlic.

In general, the share of reactions associated with bitter taste carriers is significant and amounts to about 48% of the entire associative field.

Summarising the data obtained in free association experiments where the stimulus was the independent word *гіркий* / *bitter* / *gorzki* / we note that in each of the associative fields a central zone is distinguished, which includes only two or three most frequent reactions. The associations of the central zone, which occupy at least 10% of the field, are presented in **Table 1**. Only seven reactions fall into this zone. Three of these lexemes are not names of realities with a bitter taste. The other four nominations – the nouns *beer*, *lemon*, *wormwood*, *pepper* – refer to objects to which speakers attribute a bitter taste. Interestingly, among them there is one name of a plant that people do not eat at all (*wormwood*).

Table 1 Integrated central zone of association fields obtained in free association tests (with a weight in the field of more than 10%)

Experiment / dictionary	sweet	sour	taste	beer	lemon(s)	wormwood	pepper
Grace Kent, Aaron Rozanoff	30.5	22.2					
George Kiss, Christine Armstrong	45			15	11		
Ida Kurch	15.3		22.7			10.4	
Nina Butenko						15	15
Svitlana Martinek			11.5				14

As can be seen from **Table 1**, the central zone includes responses with a share of 10.4% of the field (the lexeme *wormwood* in Ida Kurcz's experiment) to 45% (the English lexeme *sweet* in Kiss and Armstrong's survey).

The total proportion of reactions indicating bitter-tasting objects is shown in **Table 2**.

Table 2 Reactions realising the relation "N is bitter" in free association tests (percentage)

Experiment / dictionary	Share in the association field	Three most frequent associations, percentage in the field
Grace Kent, Aaron Rozanoff	17.5	gall 4.2 medicine 3.7 quinine 2.3
George Kiss, Christine Armstrong	29	beer 15 lemon(s) 11 -
Ida Kurch	26	wormwood 10.4 almond 3.5 pepper (Turkish) 2.6
Nina Butenko	53	pepper 15 wormwood 15 cucumber 6
Svitlana Martinek	48	pepper 14 lemon 7.5 cucumber 4

Data from the Second Set: A Directed Association Test

A directed experiment can be organised in different ways depending on the tasks set by the researcher. It was important for us to identify in memory those objects that, in the speakers' opinion, are carriers of bitter taste. Such objects can obviously be detected in a free association experiment, but they are mostly on the periphery of the fields. As seen in **Table 1**, the core of the associative fields often contains lexemes that indicate a specific taste (sweet or sour) or the noun *taste*. In a directed associative experiment, the respondents are tasked with completing (continuing) the verbal construction offered by the experimenter. Such a task does not activate any verbal-neural connections between the stimulus and other memory areas containing potential reactions, but only those connections that are directed to certain areas specified in the experiment.

We asked all respondents – native speakers of Ukrainian, English, and Polish – to take part in two types of directed association experiments: (A) and (B).

The task of the first experiment (A) was for respondents to complete comparative constructions *bitter like* / *gorzki jak* / *гіркий як* with a noun. The noun that the respondents had to recall and write down has the linguistic status of the so-called *the vehicle*, i.e. the benchmark, the standard of bitter taste. The adjective itself in such comparisons has the status of *tertium comparationis*, i.e., the unit that names a property common to both things. The first position in the comparative construction (its English nominalisation is *the tenor*) in our experiment A was left blank, i.e., it did not matter to us which object the respondents mentally compared with the verbalised carrier of the bitter taste.

Some of the nominations of bitter objects are part of fixed expressions, most often comparisons used in different languages. Such comparisons are recorded in dictionaries of idioms (phraseological units). For example, in the Ukrainian Dictionary of Stable Folk Comparisons by Oleksandr Yurchenko and Anatoliy Ivchenko, we find two comparisons: *bitter as wormwood* and *bitter as a radish* (Yurchenko & Ivchenko, 1993, pp. 119, 126). The dictionary edited by Julian Krzyżanowski, which collects Polish folk phraseology, includes five comparisons with the word *bitter*: *like wormwood, like hops, like bile, like chicory, like pepper* (Krzyżanowski, 1969, p. 707).

In English, comparative expressions with the lexemes *gall*, *wormwood*, *aloe* are used (Taylor, 1954, p. 17). Such constructions reflect the collective experience, usually formed over centuries, and a strong connec-

tion emerges between the trait and its bearer. As Levchenko writes, comparisons used in speech "signal to the speaker that a prototypical or stereotypical idea is being introduced, denoted at the verbal level by a word-symbol" (Levchenko, 2011, p. 11).

Fixed comparisons allow researchers to capture the stereotypes that existed in the minds of speakers in the past and track their dynamics within the linguistic and cultural community. By comparing the set of objects mentioned in experiment (A) with those used in established comparisons, one can obtain detailed information.

The second directed experiment (B) was organised as follows: the respondents were offered the predicative construction *Bitter, but healthy* and asked to name objects that could be characterised by both of these words. Thus, the participants of the experiment had to focus on the realities that, firstly, people usually consume (eat or drink), and secondly, when consumed, do not harm human health, but rather benefit it. This task required the use of more background knowledge and ideas about the objects. The first predicate (*bitter*) appeals to people's perceptual, concrete experience, their bodily knowledge of things, while the second predicate (healthy) largely refers to social stereotypes, which often depend on habits, fashion, or certain dietary trends (e.g., vegetarianism or healthy lifestyles).

We conducted both types of directed experiments using Google forms (with native Ukrainian and English speakers) and paper questionnaires (with native Polish speakers), so there was no time limit for answering. Google forms in English and Ukrainian and questionnaires in Polish had identical content. Respondents could name not one but several words. On average, respondents gave 1.55 answers in Experiment A and 1.34 answers in Experiment B.

The respondents of the survey in Poland were students of Polish philology, neophilology, and oriental studies, as well as several lecturers from Adam Mickiewicz University in Poznan. The age of the respondents was 18–54 years. The study group was characterised by a numerical majority of women (109 out of 150)

In the experiment with native English speakers, participants were residents from various states in the USA (at least 22 states). The age of the speakers ranged from 18 to 70 years. The majority were men –112, women – 31; however, 7 individuals did not specify their gender.

The participants of the experiment from Ukraine were residents of different regions and cities. The age range of the respondents was from 18 to 66 years old. The study group was characterised by a numerical majority of women: 113 out of 150.

At the end of the survey, we received 150 completed questionnaires for each language and for each type of experiment. Thus, we received a total of 900 questionnaires from respondents from different countries: 450 questionnaires with answers to guided experiment A and the same number of questionnaires with answers to guided experiment B.

By asking the respondents to complete the constructions *bitter like … / gorzki jak … / гіркий як …* with nouns, we assumed that speakers would recall from memory much more nominalisations that have a bitter taste than usually included in dictionaries of similes. In Experiment B (*Bitter, but healthy*), we expected to obtain the smallest number of nominations – names of bitter objects (less than recorded in free association experiments and less than we obtained for the stimulus *bitter like …*).

Results of directed experiments with native English speakers

In the first type of experiment (ENG A), after processing 150 questionnaires, 225 responses were obtained. Among them, we found 19 responses that were not related to the direct perceptual meaning of the adjective *bitter* (e.g., *loneliness*, *morning*, *failure*, *resentment*, *winter*….). Such nouns are usually not included in comparative phrases. Therefore, we reduced the quantitative data obtained in this survey, leaving only 206 responses in the association field. In total, there were 66 different responses in the field, 46 of which occurred only once (e.g., *canned beans, mustard greens, gin, whiskey, butterscotch, orange rind, arugula, gourd, crabapple*, etc., mostly names of plants that are eaten and alcoholic beverages). Single reactions occupy a 26% segment of the field. The central zone of the field contains only one response, namely *coffee*, which occupies 14%. The near periphery of the field is formed by the following reactions: chocolate 6% (*chocolate*

unsweetened and *dark chocolate* together), *lemon* 5.5%; *medicine* 5.5%; *tea* 4%; *grapefruit* 4%, *beer* 3.5%, *cranberries* 3.5%, *lime* 3%, *broccoli* 2.5%, *brussel sprouts* 2.5%.

In the second type of experiment (ENG B) (*Bitter, but healthy*), 204 responses were received from 150 respondents, of which 69 were non-repeated. A significant part of the field was occupied by reactions that occurred only once each (in particular, *raw veggies*, *jicama*, *bittergourd*, *bean brownie*, *vegan cheese*, *melon*, *citrus*, *Cerasee tea*, *Swiss chard*, *cacao*, *citrus peel*, *okra*). We received 42 single responses, which accounted for 20.5% of the field. The core of the associative field contained only one reaction: *kale* 11%. The near periphery of the field is formed by 12 associates with a frequency in the field of more than 2%. These are the reactions *coffee* 7%, *lemon* 6%, *broccoli* 6%, *grapefruit* 6%, *dark chocolate* 4.5%, *greens* 3.5%, *ginger* (+ *ginger root*) 3.5%, *Brussels sprouts* 3%, *medicine* 2.5%, *argula* 3%, *lime* 3%, *spinach* 3%.

In this survey, compared with ENG A, the number of responses naming alcoholic beverages decreased (in ENG A, these were lexemes *beer* 7, *alcohol* 1, *gin* 1, *whiskey* 1, *Black By Licorne* 1, *fernet* 1, and in ENG B only *beer* 1).

Results of directed experiments with native speakers of Polish

In the first type of experiment (POL A), after processing 150 questionnaires, we received 239 responses from respondents. Among this number, we found 10 responses that were not related to the perceptual sense of taste (in particular, the responses *failure*, *regret*, *sadness*, *love*, *ground under one's feet*, etc.). The 229 responses in the associative field contained 43 different reactions of the respondents. The core includes three names of objects to which speakers attribute a bitter taste: *chocolate* 17.5%, *grapefruit* 15%, *coffee* 15%. These reactions occupy 47.5% of the entire associative field. The near periphery of the field was formed by the associations *medicine* 9%, *mustard* 5.5%, *tea* 4%, *cocoa* 3%, *syrup* 2%, *nuts* 2%, *pepper* 2%, which occupied 27.5% of the field. They were followed by a group of 33 different reactions with a low frequency of mentions: from one to four responses. This segment of the field accounted for 25%.

In the second type of experiment (POL B) (*Bitter, but healthy*), we received 197 responses from 150 respondents, 34 of which were different. We found only 16 single reactions. The central zone of this field was represented by three reactions: *chocolate* 26%, *medicine* 21%, *grapefruit* 16%. Together they accounted for 63% of the field.

These associates were followed by reactions of the near periphery: *tea* 4.5%, *syrup* (referring to a type of liquid medicine) 4%, *herbs* 2%, *antibiotic* 2%, *ginger* 2%, *onion* 2%.

All other reactions obtained in this experiment had an absolute frequency of 1 to 4 responses and together made up 20% of the field. These reactions were mainly named after plants and their fruits, e.g., *Brussels sprouts*, *nuts*, *chokeberry*, *pomelo*, *fig*, *orange*, *lemon*, etc., and seasonings and spices, e.g., *parsley*, *turmeric*, *cinnamon*, *spice*. Only a small number of reactions relate to alcoholic beverages: *alcohol* 2, *vodka* 2.

Results of directed experiments with native Ukrainian speakers

In the first type of experiment (UKR A), after processing 150 questionnaires, we received 280 responses. From this number, we excluded 16 responses that were not related to the perceptual sense of taste. These were the reactions that semantically correlate with the secondary meaning of the adjective *bitter* ("hard, unpleasant"): *truth*, *fate*, *experience*, *resentment*, *disappointment*, etc. In current speech, such nouns are usually not included in comparative constructions *bitter as* ... . The remaining 264 responses, 58 of which were non-repeated, were distributed by number between three zones.

The central zone of the field contained 4 associations: *wormwood* 21, *pepper* 13, *radish* 10, *mustard* 10, a total of 143 responses or 54% of the field. On the near periphery, there were 8 reactions with a relative frequency between 2% to 5%: *horseradish* 5%, *grapefruit* 5%, *coffee* 3.8%, *ginger* 3%, *lemon* 2.3%, *dark chocolate* 2.3%, *cucumber* 2%, *onion* 2%, a total of 66 reactions representing 25% of the field.

The far periphery of the field was filled with 46 different reactions that occurred from one to four times. In this zone, we found the names of edible fruits: *garlic, walnut, lime, olives, quince, radish, viburnum, red currant, cranberry*, etc. There were few mentions of alcoholic beverages (*beer*, *vodka*). It is characteristic that respondents rarely mentioned medicines; there were three responses for *medicines*, one each for lexemes *aspirin* and *pill*.

In the second type of experiment (UKR B) (*Bitter, but healthy*), 150 respondents produced 201 answers, of which 62 were non-repeated. The centre of the associative field was represented by the responses *grapefruit* 12.5%, *medicine* 10%; 45 responses in total accounting for 22.5% of the field. On the near periphery, there were nominations with a relative frequency of 2% to 6% (*ginger* 6%, *chocolate* 5%, *radish* 4.5%, *garlic* 4.5%, *wormwood* 4%, *horseradish* 4%, *mustard* 3.5%, *onion* 3.5%, *lemon* 3%, *viburnum* 3%, *pepper* 2.5%, *bitter vegetables* 2.5%, *radish* 2%, *nut* 2%, *arugula* 2%). This part of the field contained 15 different names, accounting for 52% of the field.

The reactions with low frequency (from one to three mentions) represented the far periphery of the field (about 25%). Among them were the names of edible plants and fruits (*spinach, celery, parsley, cucumbers, cranberries, olives, sorrel*), and nominations of medicinal plants (*flax, calendula, Icelandic moss, yarrow*). It is worth noting that there were no answers in this survey that indicated specific medicinal products. Respondents mentioned lexemes such as *medicine*, *pills*, *vitamin*, which have no specific reference.

Table 3 summarises the data of all the directed association experiments and indicates the responses of the central zone.

Table 3 Quantitative results of directed associative texts with native speakers of Ukrainian, English and Polish

	Total number of reactions obtained in the experiment	Central zone, number of associates	Central zone, tokens (percentage in the field)	Number of different reactions	Number of single reactions
UKR A	264	4	Wormwood 21 Pepper 13 Radish 10 Mustard 10	58	40
UKR B	201	2	Grapefruit 12 Medicines 10	62	38
ENG A	206	1	Coffee 14	66	46
ENG B	204	1	Kale 11	69	42
POL A	229	3	Chocolate 17.5 Grapefruit 15 Coffee 15	43	22
POL B	197	3	Chocolate 26 Medicine 21 Grapefruit 16	34	16

Discussion

When distinguishing cultural stereotypes related to tastes, it is important to take into account that such stereotypes are dynamic and change over time. They depend not only on people's perceptual experience, but also on the linguistic and cultural tradition embodied in precedent texts (e.g., the Bible and folk tales), proverbs, and common expressions. Taste stereotypes may differ among speakers of different ages and social groups, as speakers of the same language have different food preferences and habits.

That is why there is an important question about the criteria that can be used to identify cultural stereotypes related to tastes. In our opinion, a directed associative test is the best source for identifying modern stereotypes that are relevant to the minds of the participants in the experiment.

We propose to use both objective and subjective criteria as a basis. The objective criterion for classifying a certain reality as a cognitive stereotype is independent information about its taste. The use of this criterion

is important in cases where respondents confuse tastes, for example, sour and bitter (in the case of vinegar), or call the burning, pungent taste of a plant (garlic) bitter.

The main subjective criterion is, in our opinion, the fact that a certain object was mentioned in both Experiment A and Experiment B, conducted with native speakers of the same language. For example, in Experiment B, American respondents mentioned kale, a type of cabbage that many respondents believed to be both bitter and healthy. However, this reality was not mentioned once in Experiment A. Therefore, it cannot serve as a standard of bitter taste that has been internalised by the mass consciousness.

In our opinion, it is also necessary that the nomination of an object with a bitter taste be recalled from memory by at least 3% of the respondents, i.e., that it takes place in the central zone of the associative field or on the near periphery of the field. We believe that such quantitative restrictions should be imposed so that rarely mentioned nominations do not receive the status of cognitive stereotypes generally recognised in the language community in our findings. For example, only 6 Ukrainian respondents named viburnum berries in Experiment B, while in Experiment A viburnum was mentioned only once. The average for viburnum in both experiments is 1.5% of the associative field. Therefore, we do not believe that viburnum berries are a stereotype of bitter taste for Ukrainians.

The application of these criteria allows us to identify stereotypical carriers of bitter taste in each group of respondents. English-speaking respondents (residents of the United States) consider coffee, chocolate, lemon, grapefruit, medicine (unspecified), and lime to be bitter taste stereotypes. For Polish participants, the stereotypes of bitter taste are chocolate, grapefruit, medicines, coffee, and tea. In the directed association tests, Ukrainian respondents most often named wormwood, pepper, grapefruit, radish, mustard, medicine, horseradish, and ginger.

Table 4 Cognitive stereotypes of bitter taste revealed in the directed association experiments (average number of mentions in percentage for both tests)

	Eng A + Eng B	Pol A + Pol B	Ukr A + Ukr B
Coffee	10	8,5	
Chocolate	5.5	21.5	
Lemon	6		
Grapefruit	11	15	8
Tea		4.5	
Broccoli	4		
Medicines	4	15	6
Wormwood			13.5
Pepper			8.5
Radish			8
Mustard			7
Horseradish			4.5
Ginger			4.5

Table 4 gives an idea which objects, in the opinion of modern English, Ukrainian and Polish speakers, can be considered bitter taste stereotypes. Only the reactions *grapefruit* and *medicine* turned out to be universal.

The question of the dynamics in the set of cultural stereotypes of bitter taste is interesting. It should be noted that due to the lack of experimental data and the non-equivalence of the groups of respondents, it is impossible to draw valid conclusions about changes in the set of stereotypes that have occurred in the perceptions of speakers of certain languages. However, by comparing the data from free and directed association tests,

certain trends can be identified.

Experiments conducted with native English speakers with an interval of more than 100 years show an almost complete change in bitter taste stereotypes. The Kent-Rozanoff survey found few mentions of *lemon* (9 responses), *beer* (6 responses), *grapefruit* (3 responses), and *chocolate* (1 response) among thousands of respondents, while these responses were frequent in our experiments (as is the response to beer in the Kiss-Armstrong surveys at the University of Edinburgh).

The three responses that were frequent in the Kent-Rozanoff experiment (*gall* 42, *quinine* 23, *aloe* 10) completely disappeared from our surveys, which indicates a low level of relevance of the respective items in the daily practice of modern Americans. The gall reaction, which accounted for 4.2% of the field, is directly related to the practice of cooking.

The response *medicine* to the stimulus *bitter* remains at approximately the same level (3.7% of the field in the past and between 2.5% and 5.5% of the field now). However, due to the undefined reference of the general term *medicine*, it cannot be considered a cultural stereotype preserved by English speakers in the USA over a significant period of time.

The specific nomination *quinine*, which had a frequency of 2.3% in the Kent-Rosanoff tests, did not appear even once in our surveys. It refers to an organic compound extracted from the bark of the cinchona tree (*cortex quinae*) and was widely used to treat a dangerous disease – tropical malaria. However, *quinine* ceased to be used in medicine around the mid-20th century, as synthetic drugs with the same effect were developed. As a result, the frequency of the term *quinine* in language began to decline, and, as our surveys of contemporary Americans show, this substance is no longer mentioned as a benchmark for bitter taste.

Polish tests conducted 60 years ago (the Kurcz experiment) and more recently also show a change in bitter taste stereotypes. Approximately one tenth of Polish respondents in the Kurcz's experiment identified wormwood as a bitter taste stereotype; in our surveys, wormwood was mentioned only once (POL B). Thus, we can state that the former cultural stereotype has disappeared from the minds of speakers. Instead, the number of mentions of grapefruit and chocolate has increased from a few mentions to a significant share of the association fields. In Kurcz's survey, only three respondents each mentioned such important past bitter taste stereotypes as bile and quinine. In our tests (POL A and POL B), there were no mentions of these objects.

Experiments with native Ukrainian speakers, conducted and processed by Butenko, yielded an interesting set of objects that have a bitter taste. As we already noted, wormwood and pepper were mentioned most often. Comparison with our tests conducted 50 years later (roughly two generations of native speakers) shows that both objects continue to be stored in the memory of Ukrainians as objects with a bitter taste. The UKR A experiment gave us a very high result for wormwood: 21% of the field. In the UKR B experiment, where speakers were asked to name objects that were both bitter and healthy, the percentage of mentions of wormwood decreased sharply (to 3% of the field). However, the average score for both experiments was quite high (see Table 4). Pepper also continues to be mentioned by respondents quite frequently, especially in the UKR A test (13% of the field). A consistently high percentage of pepper mentions was also recorded in Martinek's recent experiment (14% of the field).

The proportion of radish responses to the bitter stimulus was quite high. In Butenko's test, only 11 such reactions were obtained (1% of the field). In Martinek's survey, the reaction radish appeared in the field of the feminine adjective *bitter* (6.5% of the field). In our UKR A experiment, the number of references to radish increased dramatically and this reaction accounted for 10% of the field. However, in the UKR B test, this reaction was less frequent, only in 9 respondents (4.5% of the field). In general, the results obtained indicate a high stability of cultural stereotypes of wormwood, pepper and radish in the minds of Ukrainian speakers.

Conclusions

Any cognitive stereotypes are based primarily on the understanding of the world around us, as well as on the life practices and traditions of a particular linguistic and ethnic group. When it comes to the basic tastes (sour, salty, sweet, and bitter), it should be assumed that their source is natural objects that people have been eating for a long time or at least know their taste. Thus, in the minds of native speakers, the predicative relationship between an object and its taste feature (N is Adj) is fixed.

It is well known that various sources can be used to identify stereotypes. In our Experiment A and B, respondents' minds were directed to search for objects in their memory that have a bitter taste. The more respondents mentioned a particular bitter object, the higher the degree of its presence in the collective linguistic consciousness of the native speaker. We define cognitive stereotypes by a quantitative parameter, taking into account the place of a particular reaction in the associative field.

Test A (*bitter like* ...) was aimed at recalling those objects that have a bitter taste. We took into account 206 responses from American respondents, 264 responses from Ukrainian respondents, and 229 responses from Polish respondents. In Experiment B experiment (*Bitter*, *but healthy*), we also sought to activate those areas of memory that store information about objects that are beneficial to health. In these tests, respondents responded only to the direct meaning of the stimulus word. The wording of the task chosen in Experiment B resulted in an increase in responses from the group of medicines (*pills*, *syrup*, *antibiotics*) as well as in a decrease in the number of responses related to alcoholic beverages, as our respondents did not consider such beverages to be healthy.

Based on the quantitative data, we distinguished a central zone, a near-periphery zone, and a far-periphery zone in each of the fields obtained. In order to isolate those realities that can serve as cognitive stereotypes of bitter, we examined the reactions of the central zone and the near periphery zone. For analysis of the data from Experiments A and B, two criteria were chosen to classify realities as cognitive stereotypes: objective (presence of a bitter taste) and subjective (mentioning a reality in both experiments with a share in the field of more than 3%).

The application of these criteria led us to the conclusion that the set of bitter stereotypes of English, Ukrainian and Polish speakers is different. Two nominations turned out to be universal: *grapefruit* and *medicine*. However, since the latter word refers to an unspecified group of medicines, we do not consider this nomination to be a bitter taste stereotype. For American respondents, the stereotypes of bitter were coffee, chocolate, lemon, and lime, in addition to grapefruit. Polish respondents most often mentioned coffee, chocolate, and tea, in addition to grapefruit. For Ukrainian respondents, the standards of bitter taste were wormwood, pepper, radish, mustard, horseradish, and ginger. These are the realities that have been internalized by the mass consciousness and are reproduced from memory. All other answers of the respondents did not reach the percentage in the field that, in our opinion, may be the limit for the inclusion of reality in the stereotypes of the mass consciousness.

The fact that free association tests, which included the stimulus word bitter, were conducted in the past opens up opportunities for a diachronic comparison of bitter taste stereotypes. In our opinion, the best tests for comparison are those that were conducted more than 50 years ago. During this time, at least two generations of native speakers have changed, a set of typical consumption objects has been updated, as well as the eating habits of the ethno-cultural community. Our research shows that the stereotypes of bitter have undergone significant changes over the period of 50–120 years. These changes were most pronounced in the collective consciousness of English speakers (residents of the United States). Modern speakers no longer refer to *gall*, *quinine*, *aloe* as stereotypes of bitterness, as was the case in the Kent-Rosanoff experiments. Thus, it can be considered that fixed expressions with the components *bile*, *aloe*, *quinine* have lost their relevance and are perceived by speakers as certain archaisms. The perception of benchmarks for bitter taste has changed significantly among Polish respondents, who now rarely mention *wormwood* and *pepper* and have completely forgotten about *chicory*, *gall*, and *hops*, which are recorded in Polish dictionaries of comparisons as carriers of bitter taste. In contrast, a higher level of stability is maintained in the minds of Ukrainian respondents: over 60 years, such bitter taste stereotypes as wormwood, pepper, and radish have not been lost, and they are recorded in comparisons in paremic collections. Ukrainian speakers, as well as Polish speakers and residents of the United States, have acquired new stereotypes of bitter during this time, but their share is not dominant in the associative field.

Thus, our study shows that cognitive stereotypes of tastes, in particular bitter taste, do not remain unchanged over time. They depend not only on objective factors and cultural traditions of a particular society, but also on general trends in nutrition, which can be widespread across different continents.

Conflict of Interest

The authors declare no conflict of interest regarding the publication of this article.

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Santrauka

Marharyta Zhuikova, Alina Yodlovska.
Žodžio „kartus“ kognityvinis stereotipas pagal anglų, lenkų ir ukrainiečių kalbų vartotojų asociacijų testo rezultatus

Straipsnyje nagrinėjamas kognityvinis stereotipas „N is bitter“ anglakalbių, lenkakalbių ir ukrainiečiakalbių savimonėse. Norint nustatyti objektų, kurie yra tipiški kartaus skonio žymekliai, spektrą, galima naudoti duomenis, gautus asociatyviniuose testuose tiesiogiai iš gimtakalbių. Neseniai atlikome nukreiptą asociatyvųjį testą, kurio tikslas buvo nustatyti būtent tuos objektus, kuriuos respondentai laiko kartaus skonio etalonais. Tokiu etalonu, bendru visiems respondentams, pasirodė tik greipfrutas. Palyginus su XX amžiuje atliktų laisvųjų asociatyvinių eksperimentų duomenimis, paaiškėjo, kad kartaus skonio stereotipai smarkiai pasikeitė. „N is bitter“ stereotipo keitimosi tendencija ryškiausiai matoma amerikiečių respondentų apklausose. Kita vertus, ukrainiečiakalbiai pasirodė esantys konservatyviausi savo požiūriais į kartaus skonio stereotipus.

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