Research Article

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# Describing smell: A comparative analysis of active smell lexicon in Estonian and German

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**Abstract:** This article reports on smell lexicon in two genetically unrelated languages, Estonian and German with the primary aim to compare cognitively salient and actively used smell terms and preferred lexical strategies. Two consecutive field experiments were carried out by interviewing 43 native speakers of both languages. The results are discussed against the background of anthropologically and cognitively oriented linguistics, where both languages can be told to share the typical features of WEIRD languages. The results of comparisons demonstrate that despite the genetic unrelatedness of Estonian and German, the active and cognitively salient smell vocabulary of the speakers of the two languages occurred as structured by the same principles of evaluative connotations and multisensoriality of odour lexicon.

**Keywords:** olfaction, field methods, active vocabulary, comparative analysis, odour naming strategies, cultural factors

## 1 Introduction

Human olfaction is sensitive, but not particularly codable in many languages. In the Western hemisphere, the sense of smell has been considered underdeveloped and the least significant of all senses (Köster 2002, Le Guèrer 2002, Barlösius 1987, Classen 2019, Jütte 2012). In the field of perception, smells as a topic of cognitive linguistics have been gaining more interest in the last decade. Many recent studies have confirmed that for people in Western societies, the experience of a smell is difficult, if not impossible, to put into words (Yeshurun and Sobel 2010, Levinson and Majid 2014, Olofsson and Gottfried 2015, Majid et al. 2018, Winter 2016; see also Lawless and Engen 1977). The situation is different in non-western cultures. For instance, seminal studies with modern hunter-gatherer communities have shown that subsistence seems to play a distinct role when it comes to smell expressions: the need to find edible food has considerably expanded their smell vocabulary. Several tribes can name smells with ease and have an abstract smell lexicon (Majid and Burenhult 2014, Majid and Kruspe 2018).

That odours are uncodable is not innate in Western cultures, however, since professionals like wine experts, baristas, and other flavour experts can be trained to differentiate and describe the finest odour nuances and to communicate them in their professional field (Croijmans and Majid 2016, Croijmans et al. 2021). Within a single linguistic community, a description of a smell (such as *freshly cut lawn* or *coffee*) is usually unanimously understood and used when talking about common odour experiences.

People evaluate their odour experiences on the basis of a variety of aspects, such as the quality or valence of a smell (pleasant or unpleasant) and its intensity (strong or weak), or based on experience-dependent factors such as familiarity (known or unknown), associations, and memories (Ayabe-Kanamura et al. 1998). In the majority of cases, on the basis of the abovementioned parameters, speakers of a WEIRD language (*Western,*

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*Educated, Industrialized, Rich, Democratic*, Wnuk and Majid 2012) tend to use certain lexical strategies (Majid and Burenhult 2014, 266) so as to put specific odour experiences into words.

Regarding the naming strategies and characterisation of odours, people tend to rely on several characteristics of perception, and in this regard, the following have been mentioned in literature: intensity and hedonic value (Sutrop 2002, Zucco 2003, Yeshurun and Sobel 2010, Staniewski 2014, 2016), source-basedness, and familiarity (Majid and Burenhult 2014, Wnuk and Majid 2014, Majid 2015, Majid and Kruspe 2018, Majid et al. 2018). The hedonic nature of olfaction has been claimed to be culturally universal (Arshamian et al. 2021), while source-based and comparison-like descriptions have been found to mainly characterise the WEIRD languages (Majid and Levinson 2011, Wnuk and Majid 2012, Majid and Burenhult 2014).

An alternative strategy for naming odours is to use terms of other sensory modalities which are polysemous and cross-modal in their nature (Winter 2016, 2019; Bagli 2021; Tuulik 2022). This may stem from the fact that smell is a multisensorial perception, meaning that taste and smell sensations are intrinsic experiences of the object in the mouth 'including touch, temperature, chemical irritation, taste and odour' (Rozin 1982, 399). Similarly, Classen (2019, 21) claims that sensory terms have a strongly tactile component of gustation, for example, that 'the sensations of taste and touch are experienced so intensely that they tend to "colour" other sensations'. Thus, odour-naming strategies and active smell vocabulary seem to bear traces of the interaction of smell and taste as well as of the sensations of taste and touch.

This article analyses how the domain of olfaction is lexicalised in two genetically unrelated but culturally related languages: Estonian (Finno-Ugric) and German (Germanic). German played an important role in the development of the Estonian literary language in the seventeenth and eighteenth centuries. Translations of ecclesiastical literature (e.g. biblical texts, church manuals and hymns, catechisms, etc.) from German had strong impact on word order and vocabulary of the emerging Estonian written language (Ross 2002, 2016, 2019). The vocabulary of sense perception is no exception. The largest group of German loanwords in the Estonian written language originates from the Baltic dialect of Low German, which developed in the Estonian regions during the thirteenth century and was supplanted in the second-half of the sixteenth century by Upper German (Eesti etümoloogiasõnaraamat 2012, Tafenau et al. 2023). Linguistic and cultural borrowing inevitably went hand in hand. It is most likely that German played a significant role as an intermediary language in the formation of the various designations which were taken into use in Estonian (e.g. *vürts* 'spice', *suhkur* 'sugar'). The main focus of this article, however, is on the comparison of active olfactory vocabulary, which is why the work does not concentrate on the etymological study of sense words.

The objective of this article is to provide a detailed study of active and cognitively salient smell lexicon in Estonian and German. The main research question of this study is: What are the similarities and differences between the active smell lexicon, of its range and of the naming strategies in the two unrelated, but culturally linked languages? The hypothesis is that the active vocabulary of Estonian and German is similar in terms of the approximate size of the active smell lexicon, as well as the naming strategies.

## 2 Background to study

This empirical study has its roots in the tradition of anthropologically oriented cognitive linguistics, using the field method of interviewing native speakers (*cf*. Sutrop 2002, Levinson and Majid 2014, De Sousa 2011, Majid and Burenhult 2014, Majid and Kruspe 2018, Majid et al. 2018). The article by Majid and Burenhult (2014) serves here as an important theoretical source by reason of classifying odour-naming strategies as follows: 1) basic; 2) evaluative; and 3) source-based words. Majid and Burenhult (2014) also coded English adjectives with the suffix *-y* (*musty, etc.*) as abstract terms. In their approach, they relied on the definition of *basic term*, which followed the analogy of Berlin and Kay's (1969) colour term studies.

By the analysis of the results in terms of their cross-modal use and hedonic value, Sensory Linguistics by Winter (2019) serves as an informative statistical analysis of the factors that organise sense perception lexicon. As the focus of his article is on the linguistic and cultural expressions of smell, the five senses folk-model (cf. Winter 2019, Bagli 2021), which has been established since antiquity, is taken as a comparative basis.

We use the term active vocabulary here to designate the cognitively salient words available for person's active use in language production tasks. The term is coined in contrast with the passive vocabulary as the set of terms that can be understood or used in context but are not available, yet, as decontextualised items. Passive vocabulary is a collection of words that are understood when read or heard, but not used in everyday active communication (Laufer 2001). Active vocabulary primarily contains basic terms from a distinct language domain.

The empirical field methods and the list and description tasks used in this study not only reveal the frequency of the named lexical items but also identify the recalled order of words and the mean position of every item. Thus, the cognitive salience index (Sutrop 2002), which encompasses the frequency and mean position, is an applicable index for the purposes of the study.

In this study, the term *basic term* has been adopted based on the analogy of colour terms proposed by Berlin and Kay (1969). Sutrop defines *basic term* as "a psychologically salient, in most cases morphologically simple and native word, which belongs to the same word class and has the same grammatical potential as the prototypical member(s) of its semantic field. It is a term which generally denotes an object, a quality or a phenomenon at the basic level and which is applicable in all relevant domains." (Sutrop 2002, 40) One of the significant determinants of a basic term is the cognitive salience index (S), which is also used as a determinant in this study. Words in active use show a higher salience than rarely used words. The cognitive salience index, which was created by Sutrop, 'combines the tendency of a basic term to occur at the beginning of the elicited lists (mean position) and its occurrence in the idiolects of all informants (term frequency) into one integral parameter.' (Sutrop 2002, 35). The salience index does not depend on how long the list is, therefore allowing us to compare the results of different empirical studies (Sutrop 2011, 51).

We aim to use the tasks of free listing of odour names and descriptions for the purpose of identifying active vocabularies and determining the main distinctions therein made by the speakers of the two languages in regard to the following aspects: 1) how extensive and comprehensive the range of the active olfactory lexicon is; 2) which items are recalled first, 3) how many designations belong to an active smell lexicon, and 4) how smell words are cognitively categorised.

The comparative approach enables the relevant cognitive and cultural aspects of the active smell vocabulary of Estonian and German to be identified and discussed. A detailed analysis of the salient olfactory terms in the results makes it possible to determine whether the active olfactory lexicons of the two languages contain any basic smell terms and what the most prevalent naming strategies are that the participants of the study preferred to use. The focus of every experiment is presented in the 'Results' section of this article.

# 3 Methods and materials

## 3.1 Participants

For the comparative purpose of the empirical study, there were two groups of participants: native speakers of Estonian and native speakers of German. A total of 86 participants were involved in the field experiments (Table 1). The data were collected from 2017 to 2020.

**Table 1:** Overview of participants

| Participants | Number | Age range | Age average | Age median |
|---|---|---|---|---|
| Men ET | 12 | 16–54 | 34.8 | 29.5 |
| Women ET | 31 | 18–75 | 43.6 | |
| Men DE | 20 | 20–89 | 42.8 | 35.0 |
| Women DE | 23 | 19–84 | 43.7 | |

Participant characteristics by gender and age with range, average, and median.

A total of 43 Estonians were interviewed, of whom 31 had higher education, six had secondary or secondary vocational education, and four had upper-secondary education; the remaining two were primary school pupils. The participants had very different professional backgrounds: from those in finance, accounting and business to social workers, police officers, theatre researchers, interior designers, music managers, engineers, special educators, lawyers, translators, and flight attendants. Only one participant, an aromatherapist, was professionally involved with smell. The majority of the participants (37) were from Tallinn or surrounding municipalities, while six came from other parts of Estonia. All of the participants speak up to three foreign languages, the main one being English and, in some cases, among older participants, also Russian. Two participants were fluent in German; one spoke the language quite well.

The second group of participants consisted of 43 native speakers of German, 23 from Switzerland, and 18 from Germany and two from Austria. In order to cover different regions of Germany (in the three countries mentioned), some of the participants were interviewed in Tallinn, Estonia and others in Switzerland. The participants from Germany and Austria were mainly ERASMUS students who were temporarily studying at either Tallinn University or Tallinn University of Technology (TalTech). As such, there were 13 with higher education and seven other students. Their background varied from social, political, and economic sciences and pedagogy to law, IT, and public administration. All of the participants could speak from two to four foreign languages, with English as their first foreign language. Only one participant with German as his mother tongue was fluent in Estonian; another had only taken a few lessons in the language. The participants from Germany and Austria were interviewed in Tallinn.

The professional background of the Swiss participants was very different, ranging from farmers, school teachers and directors, hoteliers, business people and university lecturers to interior designers, housewives, bailiffs and computer scientists. The majority of these participants (14) had vocational education, while seven had professional higher or university education and two had secondary education. All of the Swiss participants live in the German-speaking part of Switzerland, mostly in different parts of the Oberland region in the Bern canton, and speak Standard German. The Swiss participants speak one to three additional languages, mostly with French or English as their first foreign language. The participants were interviewed in Thun, 30 km southeast of Bern.

In summary, based on educational background, the respondent group is homogeneous but differs somewhat in terms of median age (ET = 29.5, DE = 35.0).

## 3.2 Procedure

The participants were interviewed in their native language, i.e. Estonian or German. To maintain spontaneity, the participants were not informed of the specific nature of the field experiments, of which there were two subsequent free-listing tasks similar in their structure: a list task and a description task (according to Sutrop 2002). The first task was explained by presenting an example analogous to the actual task. It was important to avoid mentioning the word *odour* or *smell* in order to prevent priming. The smell words were collected as part of a series of experiments addressing different modalities (smell, taste, and vision) and word classes (nouns, adjectives, and verbs).

In the list task, the participants had to name as many words as they knew that referred to the domain of odour; more precisely, that which can be perceived by the nose (the questionnaire in Appendix II). In the description task, the participants were asked to think about the answers they had given in the list task and to name as many descriptive words as they could for what could be perceived by the nose. All of the responses were protocolled in the order in which they were elicited. There was no time pressure. Both tasks were considered completed when a hesitation occurred, when the participant stated that they could not recall any more words, or when they had nothing more to say.

After the interview, every participant was asked to provide some personal information regarding their gender, age, education, profession, place of birth, place of living, etc.

### 3.3 Data analysis

The listed responses were stored in MS Excel (separately from the personal information) and the tokens were summed up as types of responses. In addition to pure frequency data, the cognitive salience index for each word was calculated as follows: $S = F/(N \times \text{mP})$ where $S$ is the index, $F$ is the frequency of naming the particular term, $N$ is the number of participants, and mP is the mean position, e.g. the average of a word's rankings in the individual lists (Sutrop 2002, 2011). The salience index ($S$) is a useful instrument which helps to rank vocabulary according to its relative prominence and to tell basic terms apart from other active vocabulary.

## 4 Results

### 4.1 List task results

The aim of the free listing task was to determine the active smell lexicon in Estonian and German. The task is designed to gather the material for deciding the range of terms and to reveal the preferred strategies.

#### 4.1.1 Quantitative results of list task

Despite the fact that the overall number of responses in both languages is similar, analyses of the results revealed greater variability in the vocabulary of the participants with German as their native language – in terms of both different and unique responses offered (Table 2), wherein the types of responses offered incorporate all of the answers collected in the task, while a unique response, in contrast, stands for a word that was mentioned only once, and only by one participant. The results of the free listing task are presented in Table 3.

As Table 3 shows, after the first terms in both languages (*lõhn*/*Geruch* 'smell'), cognitive salience shows a distinctive fall, and all other words have a noticeably lower S. Therefore, only the one word *lõhn* or *Geruch* ('smell') can be considered a basic term in both languages (according to Berlin and Kay 1969, *cf*. Sutrop 2002) for the odour category. The most salient word at the top of the listings (*lõhn/Geruch* 'smell') denotes olfactory perception in general; i.e. this is a generic term for that which can be perceived by the nose as a smell.

During the interviews, many respondents admitted difficulties in listing sensations other than smell in relation to the question 'What can be perceived by the nose'. At this point, the interviewer asked the participant what else could be perceived by the nose. Many speakers then paused at greater length, and some of them needed more explanation. Despite the language used by the group in question, it was evident that the participants had obvious difficulties in finding suitable words. Several people gave the excuse that they had never thought about what could be perceived by the nose. During the list task interview, some participants expressed a need to explain that the word *lõhn* 'smell' is a generic or umbrella term and that all other responses are subordinations, including the word *hais* 'stink'. As one participant put it, 'A stink is an unpleasant smell'.

**Table 2:** Overview of list task results

| L1 | Participants | Total responses | Different responses offered | Average responses per person | Unique responses |
|---|---|---|---|---|---|
| Estonian | 43 | 406 | 258 | 6.1 | 90 |
| German | 43 | 397 | 297 | 6.4 | 127 |

**Table 3:** List task results in Estonian and German

| No. | Smell word ET | Translation | *F* | *S* | Smell word DE | Translation | *F* | *S* |
|---|---|---|---|---|---|---|---|---|
| 1. | *lõhn* | smell | 42 | 0.912 | *Geruch* | smell | 40 | 0.846 |
| 2. | *hais* | stench | 22 | 0.182 | *Duft* | scent | 15 | 0.122 |
| 3. | *temperatuur* | temperature | 17 | 0.124 | *Gestank* | stench | 17 | 0.108 |
| 4. | *aroom* | aroma | 13 | 0.096 | *Geschmack* | taste | 11 | 0.065 |
| 5. | *maitse* | taste | 7 | 0.057 | *Luft* | air | 6 | 0.042 |
| 6. | *lehk* | reek | 8 | 0.053 | *Rauch* | smoke | 7 | 0.039 |
| 7. | *niiskus* | humidity | 8 | 0.051 | *Temperatur* | temperature | 8 | 0.035 |
| 8. | *kuivus* | dryness | 4 | 0.027 | *Sauerstoff* | oxygen | 4 | 0.034 |
| 9. | *oht* | danger | 5 | 0.026 | *Luftfeuchtigkeit* | humidity | 4 | 0.025 |
| 10. | *parfüüm* | perfume | 5 | 0.025 | *Gefahr* | danger | 5 | 0.020 |
| 11. | *hõng* | fragrance | 3 | 0.014 | *Parfüm* | perfume | 7 | 0.020 |
| 12. | *valu* | pain | 3 | 0.014 | *Kälte* | cold | 3 | 0.019 |
| 13. | *lillelõhn* | scent of flowers | 3 | 0.013 | *Blumen* | flowers | 5 | 0.016 |
| 14. | *mälestused* | memories | 4 | 0.013 | *Tiere* | animals | 5 | 0.014 |
| 15. | | | | | *Aroma* | aroma | 3 | 0.012 |
| 16. | | | | | *Frische* | freshness | 3 | 0.011 |
| 17. | | | | | *Erinnerungen* | memories | 4 | 0,011 |
| 18. | | | | | *Schweiß* | sweat | 3 | 0.010 |

Note: *S*, cognitive salience index; *F*, frequency. Data listed according to *S*. Only words with a cognitive salience index (*S*) of at least 0.01 were considered.

### 4.1.2 Naming strategies of list task results

A closer examination of the data in Table 3 shows that on the basis of denotation, the results can largely be divided into four groups in which the words refer to (Figure 1):

#### Words that refer to odours

First, there are six Estonian and five German words that refer directly to odour perception: *lõhn* 'smell', *hais* 'stench', *aroom* 'aroma', *lehk* 'reek', *parfüüm* 'perfume' and *hõng* 'scent' in Estonian, and *Geruch* 'smell', *Duft* 'scent', *Gestank* 'stench', *Parfüm* 'perfume', and *Aroma* 'aroma' in German. In Estonian, the words *lõhn* 'smell', *aroom* 'aroma', *parfüüm* 'perfume' and *hõng* 'scent', and in German *Geruch* 'smell', *Duft* 'scent', *Parfüm* 'perfume', and *Aroma* 'aroma' stand generally for a pleasant smell. The Estonian *hais* 'stench' and the German *Gestank* 'stench' are equivalents and denominate an unpleasant smell, likewise the Estonian word *lehk* 'reek' (*S* = 0.053) which is an obsolete word and also signifies an 'unpleasant, bad smell' (EKI ühendsõnastik 2022). The word *lillelõhn* 'scent of flowers' likewise designates an olfactory perception and is discussed below under source-based words.

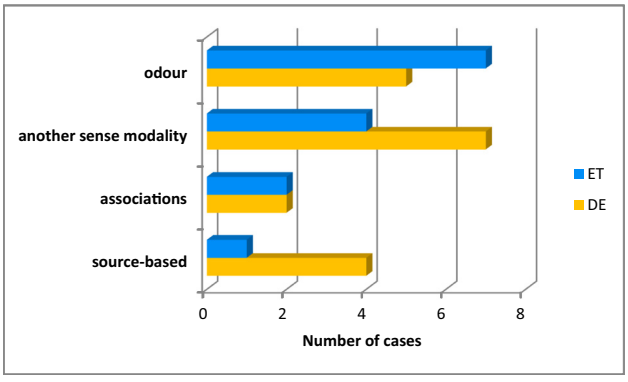


**Figure 1:** A comparative distribution of the naming strategies among the salient responses (Table 3).

#### Words that refer to another sense modality

The second relevant group of results from the list task is related to other perception modalities: taste and touch. With a similar high ranking and cognitive salience index in both listings is the word *maitse* 'taste' (fifth; $S$ = 0.057)/*Geschmack* 'taste' (fourth; $S$ = 0.065).

The rest of the words in this group are related to touch sensation and refer to weather, climate, ambiance and pain. Here, the sense of touch is understood in a broader meaning that comprises all tactile and haptic adjectives which refer to 'sensory systems that retrieve input from the skin, muscles, ligaments, and joints' (cf. Winter 2019, 17, Bagli 2021, 19).

The Estonian participants produced three words (*temperatuur* 'temperature', *niiskus* 'humidity', and *kuivus* 'dryness') while the German-speaking participants provided twice as many, and more differentiated, responses (*Luft* 'air', *Temperatur* 'temperature', *Sauerstoff* 'oxygen', *Luftfeuchtigkeit* 'humidity', *Kälte* 'cold' and *Frische* 'freshness'). Presumably, the results were influenced to some extent by the phrasing of the task questions.

Responses referring to taste and touch are a logical outcome when one considers that people perceive other tactile sensations with the nose besides olfactory ones. In a word, the perception of smell is a cross-modal experience (*cf.* Rozin 1982, Classen 2019, Winter 2016, 2019).

#### Words that refer to associations connected with a smell perception

The third group includes abstract concepts that can be considered as associative. Interestingly, the associative and indirect connections made by the speakers of the two languages are coinciding: *oht/Gefahr* 'danger', and *mälestused/Erinnerungen* 'memories'. It is plausible that the abstract associations in both Estonian and German explicitly stress the link between odour memory and language. Associations with memories can be seen in cases where specific smells awaken emotions and recollections (cf. Herz 2002). Since odour perception is highly individual, the experiences are lexicalised differently from person to person. Surprisingly, some of these associations coincide cross-linguistically.

#### Words that refer to a source-based odour

Among the listed responses, there is only one word that refers to a source-based odour: the Estonian word *lillelõhn* 'the scent of flowers' ($S$ = 0.013). The German words *Rauch* 'smoke', *Blumen* 'flowers', *Tiere* 'animals' and *Schweiß* 'sweat' indicate the distinct object that carries a specific odour for the speaker (Figure 1). Thus, in the fourth group, the object stands for that which can be perceived by the nose. It emerged that the German-speaking participants used the naming strategy for referring to the source of a smell somewhat more so than Estonians.

## 4.2 Description task results

The aim of the description task was two-fold: to provide broader information on how speakers of the two languages conceptualise the field of the perception of smell and which key internal parameters the language-users paid attention to in doing so, and to determine the lexical items used to constitute descriptions.

### 4.2.1 Quantitative results of description task

A quantitative overview of the elicitation is provided in Table 4. The results are similar, with the Estonians proving slightly more eager to produce a higher number of descriptions on average. As mentioned in the list task, the amount of unique answers could be seen to reflect the cooperation of the participants and their creativity in odour-naming, but it also emphasises the individuality of odour sensation (Engen 1987). The

results of the description task will be examined in order to demonstrate which lexical instruments were used to describe odours: e.g. word semantics regarding types of responses.

### 4.2.2 Word semantics regarding types of responses

Table A1 in Appendix I provides an overview of the descriptive terms collected, together with their cognitive salience index (*S*) of 0.01 or higher. In total, 21% of all of the Estonian responses and 27% of all of the German responses were unique and are not listed in Table A1 (Table 4 and Appendix I).

The most remarkable feature the elicited words (Table A1 in Appendix I) indicate, is their multisensorial character; e.g. *magus/süß* 'sweet' and *soolane/salzig* 'salty' may be categorised as gustatory, *terav/scharf* and *vürtsikas/würzig* may be referred to the sensation of touch as well as gustatory, and *suitsune/rauchig* 'smoky' and *kõrbenud* 'burnt' may be considered as either olfactory or visual. So, the active smell lexicon of the speakers of Estonian and German seems to reflect the multisensorial character of the perception of smell (Winter 2016, 2019).

The two highest-ranked adjectives in the listings of both languages refer to positive hedonic sensations: *magus/süß* 'sweet' and *meeldiv/angenehm* 'pleasant'. The relatively large differences in the cognitive salience indexes may stem from weaker agreement among the speakers to some extent, but it also indicates creativity and individual associations in the language use of the participants. Furthermore, different speakers name different words to underline individual nuances of smell perception and to accentuate personal emotions and experiences using words they can remember in the moment. Olfactory language traces many individual differences and is subjective and emotional in its nature, as often expressed within language sciences (Staniewski 2017).

### 4.2.3 Naming strategies of description task results

The word lists of descriptive words were analysed with respect to what (multi)sensorial qualities and naming strategies they revealed (Figure 2). In this time, the analysis covered the first and foremost field of application as well as the evaluative connotations of the words.

#### Crossmodal use

As mentioned before, for analysing the empirical results, the five-sense folk-model for distinguishing the senses was used. As Bagli (2021, 68) says, "Although the partitioning of the sensorium into mutually exclusive categories reflects a highly entrenched and controversial folk-model, it represents a useful analytical tool to gain insights into the lexicon of perception and into its multisensory nature." (cf. Winter 2019).

There are a few adjectives whose use can be regarded primarily to the linguistic domain of odours. These descriptions in both languages are *aromaatne/aromatisch* 'aromatic' and *haisev/stinkend* 'foul-smelling' or the colloquial word *stinkig* 'smelly' in German. Other odour-specific adjectives in Estonian are *kopitanud* 'stale' and *läppunud* 'musty', while in German, they include *penetrant* 'obtrusive' and *wohlriechend* 'fragrant'. These adjectives have an evaluative component in their meanings, as explained below.

As the results (Table A1, Appendix I) reveal, speakers of both languages tend to use a considerably high number of words with cross-modal character.

**Table 4:** Overview of results of description task

| L1 | Participants | Total responses | Different responses offered | Average responses per person | Unique responses |
|---|---|---|---|---|---|
| Estonian | 43 | 606 | 223 | 14.09 | 127 |
| German | 43 | 523 | 227 | 12.16 | 143 |

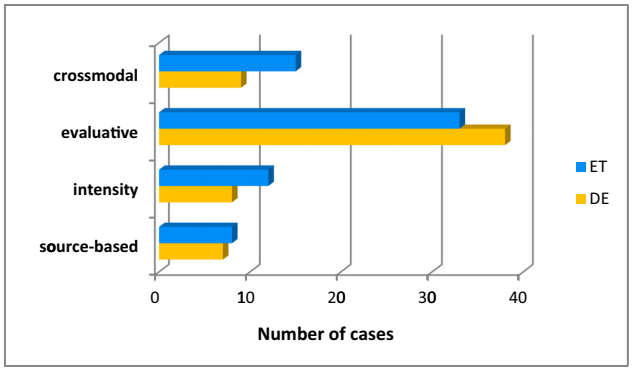


**Figure 2:** A comparative distribution of the naming strategies among the salient responses (Table A1).

The highest-ranked word in Table A1 (Appendix I) in both languages is the basic taste term *magus*/*süß* 'sweet' (basic taste terms: see Sutrop 2002, Majid and Levinson 2008, Bagli 2021). Other basic taste terms also constitute salient descriptors that are represented in both languages for characterising olfactory domain (Table A1, Appendix I): *hapu*/*sauer* 'sour', *kibe*/*bitter* 'bitter' and *soolane*/*salzig* 'salty' (see also *Discussion*). Lehrer (1978, 98) has indicated that 'words denoting taste cannot always be separated clearly from those for feel and smell' (cf. Staniewski 2017). The active usage of the basic taste terms for describing odours confirming the high multisensorial nature of the taste words (cf. Winter 2019, Bagli 2021).

In the results, multisensorial nature has also five of all of the mentioned coinciding words: *värske/frisch* 'fresh', *vürtsikas/würzig* 'spicy', *aromaatne/aromatisch* 'aromatic', *isuäratav/appetitlich* 'appetising', and *imal/süßlich* 'cloying'.

Six different terms were used to describe smells in Estonian: *kirbe* 'rank', *vänge* 'pungent', *tummine* 'thick', *lääge* 'sickly-sweet', *hapukas* 'sourish', and *roiskuv* 'rotten'; and four words in German: *lecker* 'delicious', *abgestanden* 'stale', *fruchtig* 'fruity', and *fischig* 'fishy'.

The first equivalent meanings of all of the adjectives listed here are cross-modal in their use, e.g. refer particularly to both taste and smell (refer to *EKI ühendsõnastik 2021 Sõnaveeb* 2021 for the Estonian terms, *Duden* 2022 for the German terms), but due to their multisensorial characteristics, the adjectives are often used for describing other sensory modalities as well, e.g. *värske*/*frisch* 'fresh', *tummine* 'thick' and *lääge* 'sickly-sweet' also as visual, in their figurative meaning. Our results are well in line with the multisensoriality view of the smell lexicon, and this applies equally well to both German and Estonian.

### Subjective evaluation

This group contains adjectives which refer to a personal opinion of a smell experience. There are evaluative adjectives among the listed salient responses in both languages which designate ostensibly the good or bad quality of an odour; e.g. these are general evaluative adjectives (cf. Vainik and Brzozowska 2019). To describe individual positive odour sensations, Estonians use general evaluative adjectives like *meeldiv* 'pleasant', *hea* 'good', *isuäratav* 'appetising', and *ligitõmbav* 'attractive', and for negative odour sensations, the evaluative adjectives *ebameeldiv* 'unpleasant', *vastik* 'disgusting', *halb* 'bad', *rõve* 'revolting', *eemaletõukav* 'repulsive', *haisev* 'foul-smelling', and *roiskuv* 'rotten' are used. Compared to Estonian evaluative responses, it seemed that the German speakers tended to make a more distinctive differentiation between good and bad smells, and named twice as many general evaluative adjectives: *angenehm* 'pleasant', *gut* 'good', *fein* 'delicate', *anziehend* 'attractive', *lecker* 'delicious', *appetitlich* 'appetising', *wohltuend* 'soothing', *wohlriechend* 'fragrant' and *betörend* 'captivating' good odours, and *schlecht* 'bad', *stinkend* 'foul-smelling', *ekelig* 'disgusting', *unangenehm* 'unpleasant', *beißend* 'acrid', *abstoßend* 'repulsive', *stechend* 'stinging', *ätzend* 'pungent', *ekelhaft* 'disgusting', *stinkig* 'smelly', *stickig* 'stuffy', *penetrant* 'obtrusive', *abgestanden* 'stale', and *übel* 'rank' for bad odours.

A closer look at the description task results reveals that the vast majority of the adjectives of both languages are evaluative in nature. A number of evaluative adjectives are more specific in their meaning, and these adjectives can be classified as specific evaluative adjectives (Vainik and Brzozowska 2019). Positive

connotation imply also adjectives such as *aromaatne/aromatisch* 'aromatic', *värske/frisch* 'fresh', *õrn/lieblich* 'smooth', *lilleline/blumig* 'flowery', *tummine* 'thick, rich in taste' or *kodune* 'homey' in Estonian, and *fruchtig* 'puuviljane' in German. Regarding smell perception and word-inherent meaning, negative connotation have Estonian adjectives such as *kirbe* 'rank', *vänge* 'pungent', *kopitanud* 'fusty', *kõrbenud* 'burnt', *lääge* 'sickly-sweet', *umbne* 'stuffy', *läppunud* 'musty', *imal* 'cloying', as well as *keemiline* 'chemical' and *tolmune* 'dusty'; and in German *süßlich* 'cloying', *streng* 'tangy', *stickig* 'stuffy' and *fischig* 'fishy'. Somewhat negative connotation can be associated also with the adjectives *suitsune/rauchig*, *verraucht* 'smoky', and *kuiv/trocken* 'dry'.

Adjectives that denote the intensity of a smell perception can also perform positive or negative perception and, therefore, denote deep personal positive or negative feelings evoked by smells: *terav/scharf* 'spicy', *vürtsikas/würzig* 'hot', *intensiivne/intensiivne* 'intensive', *tugev/stark* 'strong', as well as *hapukas* 'soury', *nõrk* 'weak', *kange* 'hard' in Estonian whose connotation is only apparent in context and which can also be seen as specific evaluative adjectives (cf. Vainik and Brzozowska 2019).

The most salient response in the description task results in both languages is the word *magus/süß* 'sweet' which has a very obvious positive emotional meaning; conversely, the adjective *kibe/bitter* 'bitter' among the salient responses is negatively loaded. As Lehrer (1978, 98) noticed that "sweet means 'pleasant' while sour and bitter connote unpleasantness" (cf. Vainik 2018, Bagli 2021). So, for basic taste sensations, dedicated adjectives used for describing odours reflect also pleasantness or unpleasantness.

The results of the current study show that the active smell term lexicon of Estonian and German contains more adjectives with negative connotations (POS: ET = 10, DE = 12; NEG: ET = 19, DE = 18 of total ET = 42 and DE = 43 most salience responses) than with positive connotation.

### Odour intensity

There were 12 adjectives in Estonian and eight in German which refer to odour intensity (Figure 2) whereas *terav/scharf* 'spicy', *vürtsikas/würzig* 'hot', and *intensiivne/intensive* 'intense', tugev/*stark* 'strong' are coinciding. Among the responses from both participant groups, there are more adjectives which refer to a strong and intense odour than a mild one. Intense odours were expressed using seven adjectives in Estonian: *terav* 'sharp', *vänge* 'pungent', *vürtsikas* 'spicy', *intensiivne* 'intense', *tummine* 'thick', *tugev* 'strong' and *kange* 'tangy'; and four in German: *scharf* 'sharp', *intensiv* 'intense', *streng* 'tangy', and *stark* 'strong'. Mild odours were characterised with just two adjectives in each group: with *õrn* 'subtle' and *nõrk* 'weak' in Estonian and with *mild* 'mild' and *lieblich* 'smooth' in German.

The adjective *hapukas* 'sourish' in Estonian is a derivative from the basic taste word hapu, indicates decreased quality of sour, and means *kergelt, veidi hapu* (EKSS 2009) 'slightly sour'. The Estonian *lääge* 'sickly-sweet' is synonymous with *imal/süsslich* 'cloying' in both languages, which denote an excessively sweet, unpleasant perception.

The adjective *tummine* 'thick' describes a food or drink with a viscous texture which is highly nourishing (EKI ühendsõnastik 2021).

The most salient adjective referring to intensity in the description task results (Table A1) with a similar cognitive salience index is *terav* (*S* = 0.46)/*scharf* (*S* = 0.47) 'spicy'. *Terav/scharf* 'spicy' is a touch adjective. Both *terav/scharf* 'spicy' and *vürtsikas/würzig* 'hot' designate something that has a lot of spice(s) in it, with a strong and sharp taste (*EKI ühendsõnastik* 2021). Thus, both adjectives refer to spiciness and heat sensations (cf. Rakova 2003), i.e. to pain sensation, so-called nociception (e.g. Basbaum et al. 2009), and perception of temperature (cf. *painful touch*, Bagli 2021). Pain sensation is considered to be a sensation that accompanies eating and drinking, and is often part of the sense of taste (Basbaum et al. 2009). This seems to give additional evidence that sensory adjectives are used multisensorially.

### Source of a sensation

Both the Estonian and German speakers named source-based adjectives that apply to odours. First, the above-mentioned taste term *soolane/salzig* 'salty' is also a source-based taste adjective which has *sool*/*Salz* 'salt' as its roots in Estonian and German, respectively. The same is true of the adjective *vürtsikas/würzig* 'spicy', where

the root is *vürts/Gewürz* 'spice', and where the adjective is used to express the intensity of an odour, as mentioned earlier. Other similar source-based adjectives named by both groups were *lilleline/blumig* 'flowery' and *suitsune/rauchig* 'smoky'. The German adjective *verraucht* 'smoky' also belongs to this group and is a full synonym of the German word *rauchig* 'smoky'. Unlike the Germans, the Estonian participants named source-based adjectives like *kodune* 'homy', *keemiline* 'chemical', *tolmune* 'dusty', and *mehelik* 'masculine'. Among the German source-based adjectives were two words which are used in the German language only for that which has the distinctive taste or smell of fruit or fish: *fruchtig* 'fruity' and *fischig* 'fishy'.

The number of source-based responses in the data was low. The nature and formulation of the task questions may have had an impact on these results (Appendix I). The source-based strategy of odour-naming was generally utilised in the unique responses not reported here. To illustrate the collected data in regard to unique answers, here are presented just some of the examples – the Estonian *hirmutav* 'scary', *puidune* 'woody', *roosiline* 'rosy' and *jõulune* 'Christmassy'; and the German *beängstigend* 'scary', *erdig* 'earthy', and *weihnachtlich* 'Christmassy'. As can be seen from this, the similarity of responses between the two groups even exists in unique responses such as *hirmutav/beängstigend* 'scary' and *jõulune/weihnachtlich* 'Christmassy'. There were also associative nouns and even phrases like *merelõhn* 'smell of the sea' or *märja koera hais* 'stench of a wet dog' in Estonian, and *Regen* 'rain', *Kaffee* 'coffee' and *Erinnerungen wachrufend* 'brings back memories' in German.

## 5 Discussion and conclusion

First, the results of the data analysis in this study reveal that both Estonian and German contain almost no basic odour terms or specific abstract words that can be used to refer solely to odours (Section 3.1., *cf.* Sutrop 2002, 94). This is reflected in the high cognitive salience index of the nouns first mentioned in the list task, which revealed that the Estonian word *lõhn* 'smell' and the German word *Geruch* 'smell' are the only basic terms in these two languages. Therefore, in both Estonian and German, there seems to be only one basic term for designating something that can be perceived by the nose as an odour. Current data of this study confirm the previous finding that "*lõhn* 'smell' is the only basic smell term (a noun) in Estonian" (Sutrop 2002, 92–3) and enables to claim that *Geruch* 'smell' holds the status of basic smell term in German.

Second, evaluative smell words in the collected data of this study include adjectives that refer to the quality and intensity of an odour ('Results'). According to the results of the description task, the most salient active odour descriptors reflect the choice of lexical strategies: pleasantness and unpleasantness seem to be the key factors based on which language-users decide how to put their perceptions into words. Based on word-inherent meaning, the evaluative adjectives of this study can be divided according to Vainik and Brzozowska (2019) as follows: in general evaluative adjectives (e.g. *meeldiv/angenehm* 'pleasant', *halb/schlecht* 'bad', etc.), and specific evaluative adjectives which in turn involve: adjectives with positive or negative connotations (*aromaatne/aromatisch* 'aromatic', *kodune* 'homy *fruchtig* 'fruity'), and adjectives referring to the intensity of a sensation (e.g. *intensiivne/intensive* 'intensive', *tugev/stark* 'strong'): the positive or negative connotation of which is only revealed in context; therefore, further context-based research would be necessary.

Despite the individual differences, an interesting observation could be made: the negative association types were dominant whereas the lesser number of positive types occurred as more frequent and salient (*cf.* Burenhult and Majid 2011, 23). Furthermore, although in a language with fewer words for expressing positive emotions, and these words are similar in their content, their frequency of use is significantly higher than that of words for negative emotions (Allik 1997, Vainik and Brzozowska 2019). On the other hand, Winter found evidence on the basis of his analyses of sensory words, using emotional valence ratings in isolation, (2016, 2019) that taste and smell words are on the whole more emotionally valenced than words of other sensory modalities. Hence, the results of his analyses showed that English smell adjectives are overall more negative than taste adjectives (Winter 2019, 292), due to the probability that people are exposed to unpleasant odours more often than unpleasant tastes, since people can usually choose what to eat, but not what to smell. As the word-inherent meanings of the Estonian and German evaluative adjectives of this study indicate, the results of the current study

are in line with what was found by Winter (2016, 2019; also Osgood et al. 1957). According to the findings of the current study, the active smell term lexicon of Estonian and German contains more adjectives with negative connotations and less with positive connotations. This observation appears to give additional evidence to the previous assumptions that smell perception is preferably described with a negative loaded vocabulary, and the active smell vocabulary seems to have more negative words for describing odours.

Third, another linguistic strategy to describe odours in the current study was using source-based descriptions. When people do not use comparative phrases (i.e. *it smells like…*) to describe smells, they tend to name the source of the aroma instead (Levinson and Majid 2014). As the results revealed, the amount of source-based words was relatively small among the elicited responses – merely one-third. This is less than assumed on the basis of previous cross-cultural research (cf. Burenhult and Majid 2011, Majid and Levinson 2011), which has shown that speakers tend to opt for source-based words when speaking about odours. The small amount of source-based words elicited in this study could stem from the nature and formulation of the task's questions.

As many results of the different studies on sensory vocabulary (e.g. Winter 2016, 2019, Bagli 2021) have shown, the often use of adjectives of basic taste sensations (sweet, salty, sour, bitter) for expressing other sensory modalities, particularly for smell, indicates the multisensorial nature of the basic taste terms. The comparison of the Estonian and German reveals a clear tendency for cross-modal use of lexical items. According to the salient results of the description task of this study, all four basic taste terms were used for describing odours. In both languages, the word *magus/süss* 'sweet' is the most salient response among the results of the description task which highlights its high multisensorial character. In addition, a closer look at the descriptive terms of the two studies (Sutrop 2002, Zurbuchen 2021) reveals a tendency for increased use of basic taste terms: more such terms were mentioned in this study than nearly 20 years ago (Sutrop 2002), when only two basic taste terms were among the most salient words: namely *magus* 'sweet' and *kibe* 'bitter'. In this study, however, all four basic taste terms were among the most salient description task responses: *magus* 'sweet', *hapu* 'sour', *kibe* 'bitter', and *soolane* 'salty'. It should be emphasised that the taste term *soolane* 'salty' did not arise in Sutrop's (2002) study at all. Owing to the fact that the taste term *magus/süß* 'sweet' is cognitively the most salient and, therefore, a prototypical response in both languages, it is a significant indication of the multisensorial character of the perception, on the one hand, and of the lack of specific odour terms on the other. Moreover, the adjectives dedicated to basic tastes as well as adjectives which generally denote other sensory modalities, including evaluative, source-based adjectives as well as adjectives referring to intensity, used to name and describe smells in this study reflecting the multimodal nature of smell perception. The results of the list and description tasks appear to indicate that olfactory sensation is highly complex and occasionally inseparable from other stimuli, such as touch and taste. Therefore, insufficient smell vocabulary may be supplemented with descriptors of other stimuli.

To conclude, the main results of the current study give additional supporting evidence for findings and assumptions made in previous research on sensory lexicon (cf. Sutrop 2002, Majid and Burenhult 2014, Staniewski 2017, Winter 2016, 2019) that odour vocabulary tends to be subjective and personal, therefore, highly evaluative. The active smell lexicon in Estonian and German appears to have more designators for bad smells than for good ones, although positive descriptors are more salient than negative descriptors. Additionally, the active use of general polysemous adjectives dedicated to other sensory modalities like taste and touch, according to the five-sense folk-model, underlines the multisensoriality of the sensory lexicon which can be seen as novel proof for the cross-modal character of sensory language.

## 6 Summary

This study was designed to compare and analyse active odour vocabulary in Estonian and German with respect to salience on the basis of the results of an empirical study. The aim was to compare the similarities and differences of the results in the two languages in order to identify which lexical strategies people use to name and describe odours, how the active smell lexicons are structured, and what the relevant cognitive and cultural aspects of active smell vocabularies are in Estonian and German. Two tasks – a list and a description task – were conducted

in order to collect linguistic data. The authors hypothesised that the active vocabulary of the two unrelated languages under study would have many similarities, both in vocabulary range and in naming strategies.

As the results of this comparative study revealed, there were consistent patterns in word choices for naming and describing odours in both tasks and both participant groups. The distinctive quantitative and qualitative findings of both languages confirm the hypothesis that the active odour lexicons of the two genetically unrelated languages are remarkably similar.

The most salient word in the list task in both languages was *lõhn/Geruch* 'smell', which serves simply as an umbrella term for that which can be perceived by the nose as an odour. The most salient word in the description task, the taste word *magus/süß* 'sweet', and other salient words referring to other sense modalities (taste and touch) which suggest that smell is a multisensorial experience, and it is characterised primarily by sensory words with multisensorial character. Furthermore, the lack of specific odour terms can preferably be alleviated with the help of vocabulary pertaining to the other sense modalities and general polysemous words in Estonian as well as in German.

Both the Estonian and German participants favoured evaluative terms based on odour valence and intensity. The amount of source-based descriptors was moderate considering that the findings from many cross-cultural studies have indicated that people speaking WEIRD languages are prone to use terms that refer to the object emitting the smell when describing familiar odours (*cf.* Burenhult and Majid 2011, Majid and Levinson 2011). The high rate of unique types among the responses given by both the Estonian-speaking and German-speaking participants could, on the one hand, be explained by stressing the deeply individual experience of odour sensation and creativity in odour naming, while on the other hand, it could be considered a sign of a low degree of codability and relatively weak interspeaker agreement.

Overall, numerous studies involving different speakers of WEIRD languages (Ayabe-Kanamura et al. 1998, Staniewski 2016, Winter 2016) support the view that olfaction is poorly coded in language. The results of this study provide additional insight: odours are not particularly codable in Estonian or German either, but there are lexical strategies for expressing odour sensations in both languages, and these lexical items and strategies are more similar than they were previously assumed to be.

Thus, to gain more supporting evidence for several topics of the current study (the evaluative character of the Estonian and German smell vocabulary, the positive or negative context-based connotation of adjectives referring to intensity, etc.), a further in-depth research is necessary, combining and comparing distinctive empirical and corpus data.

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## References

Allik, Jüri. 1997. *Psühholoogia lihtsusest*. [On the simplicity of psychology]. Tartu: University of Tartu Press.

Arshamian, Artin, Richard C. Gerkin, Nicole Kruspe, Ewelina Wnuk, Simeon Floyd, Carolyn O'Meara, Gabriela Garrido Rodriguez, Johan N. Lundström, Joel D. Mainland, and Asifa Majid. 2021. "The perception of odour pleasantness is shared across cultures." *Current Biology*. doi: 10.1101/2021.03.01.433367 (18.04.2023).

Ayabe-Kanamura, Saho, Ina Schicker, Matthias Laska, Robyn Hudson, Hans Distel, Tatsu Kobayakawa, and Sachiko Saito. 1998. "Differences in perception of everyday odors: a Japanese-German cross-cultural study." *Chemical Senses* 23, 31–8. doi: 10.1093/chemse/23.1.31 (2.05.2023).

Bagli, Marco. 2021. *Tastes we live by: The linguistic conceptualisation of Taste in English*. Berlin Boston: De Gruyter Mouton.

Barlösius, Eva. 1987. "Riechen und Schmecken – Riechendes und Schmeckendes." [Smell and taste – smelling and tasting]. *Kölner Zeitschrift für Soziologie und Sozialpsychologie. (Wiesbaden)* 39, 367–75.

Basbaum, Allan I., Diana M. Bautista, Grégory Scherrer, David Julius. 2009. "Cellular and molecular mechanismus of pain." *Cell* 139, 267–84.

Berlin, Brent and Paul Kay. 1969. *Basic color terms: their universality and evolution*. Berkeley: University of California Press.

Burenhult, Niclas and Asifa Majid. 2011. "Olfaction in Aslian ideology and language." *The Senses and Society* 6(1), 19–29. doi: 10.2752/174589311X12893982233597 (13.05.2023).

Classen, Constance. 2019. "Words of sense." *Perception metaphors*, edited by Laura J. Speed, Carolyn O'Meara, Lila San Roque, and Asifa Majid, p. 17–43. Amsterdam: John Benjamins Publishing Company. doi: 10.1075/celcr.19.02cla (23.04.2023).

Croijmans, Ilja, Artin Arshamian, Laura Speed, and Asifa Majid. 2021. "Wine experts' recognition of wine odours is not verbally mediated." *Journal of Experimental Psychology: General* 150(3), 545–59. doi: 10.1037/xge0000949 (23.04.2023).

Croijmans, Ilja and Asifa Majid. 2016. "Not all flavor expertise is equal: The language of wine and coffee experts." *PLoS ONE* 11(6), e0155845. doi: 10.1371/journal.pone.0155845 (25.04.2024).

De Sousa, Hilário. 2011. "Changes in the language of perception in Cantonese." *The Senses and Society* 6, 38–47. doi: 10.2752/174589311X12893982233678 (25.04.2023).

Engen, Trygg. 1987. "Remembering odours and their names." *American Scientist* 75(5), 497–503. https://www.jstor.org/stable/27854791 (28.04.2023).

Herz, Rachel S. 2002. "Influences of odors on mood and affective cognition." In *Olfaction, Taste, and Cognition*, edited by Catherine Rouby, Benoist Schaal, Danièle Dubois, Rémi Gervais, and A. Holley, p. 160–77. Cambridge: Cambridge University Press.

Jütte, Robert. 2012. "The sense of smell in historical perspective." *Sensory Perception*, edited by Friedrich G. Barth, Patrizia Giampieri-Deutsch, and Hans-Dieter Klein. Vienna: Springer. doi: 10.1007/978-3-211-99751-2_18.

Köster, Egon Peter. 2002. "The specific characteristics of the sense of smell." In *Olfaction, taste, and cognition*, edited by Catherine Rouby, Beonist Schaal, Danièle Dubois, Rémi Gervais, and A. Holley, p. 27–43. Cambridge, United Kingdom: Cambridge University Press. doi: 10.1017/CBO9780511546389 (15.05.2023).

Laufer, Batia. 2001. "Quantitative evaluation of vocabulary: how it can be done and what it is good for." In *Experimenting with uncertainty*, edited by C. Elder, A. Brown, E. Grove, K. Hill, N. Iwashita, T. Lumley, T. McNamara, and K. O'Loughlin, p. 241–50. Cambridge University Press.

Lawless, Harry and Trygg Engen. 1977. "Associations to odours: interference, mnemonics, and verbal labeling." *Journal of Experimental Psychology: Human Learning and Memory* 3(1), 52–9. doi: 10.1037/0278-7393.3.1.52 (16.05.2023).

Lehrer, Adrienne. 1978. "Structures of the lexicon and transfer of meaning." *Lingua* 45, 95–123.

Le Guèrer, Annick. 2002. "Olfaction and cognition: A philosophical and psychoanalytic view." In *Olfaction, taste, and cognition*, edited by Catherine Rouby, Beonist Schaal, Danièle Dubois, Rémi Gervais, and A. Holley, p. 3–15. Cambridge, United Kingdom: Cambridge University Press. doi: 10.1017/CBO9780511546389 (27.04.2023).

Levinson, Stephen C. and Asifa Majid. 2014. "Differential ineffability and the senses." *Mind and Language* 29, 407–27. doi: 10.1111/mila.12057 (29.04.2023).

Majid, Asifa and Niclas Burenhult. 2014. "Odours are expressible in language, as long as you speak the right language." *Cognition* 130(2), 266–70. doi: 10.1016/j.cognition.2013.11.004 (23.04.2023).

Majid, Asifa. 2015. "Cultural factors shape olfactory language." *Trends in Cognitive Sciences* 19(11), 629–30. doi: 10.1016/j.tics.2015.06.009 (16.05.2023).

Majid, Asifa and Nicole Kruspe. 2018. "Hunter-gatherer olfaction is special." *Current Biology: CB* 28(3), 409–413.e2. doi: 10.1016/j.cub.2017.12.014 (29.04.2023).

Majid, Asifa and Stephen C. Levinson. 2008. "Language does provide support for basic tastes." *Behavioral and Brain Sciences* 31(1), 86–7. doi: 10.1017/S0140525X08003476 (29.04.2023).

Majid, Asifa and Stephen C. Levinson. 2011. "The senses in language and culture." *The Senses and Society* 6(1), 5–18. doi: 10.2752/174589311X12893982233551 (21.04.2023).

Majid, Asifa, Seán G. Roberts, Ludy Cilissen, Karen Emmorey, Brenda Nicodemus, Lucinda O'Grady, Bencie Woll, Barbara LeLan, Hilário de Sousa, Brian Cansler, Shakila Shayan, Connie de Vos, Gunter Senft, N. J. Enfield, Rogayah A. Razak, Sebastian Fedden, Silvia Tufvesson, Mark Dingemanse, Ozge Ozturk, Penelope Brown, Clair Hill, Olivier Le Guen, Vincent Hirtzel, Rik van Gijn, Mark A. Sicoli, and Stephen C. Levinson. 2018. "Differential coding of perception in the world's languages." In *Proceedings of the National Academy of Sciences of the United States of America* 115(45), 11369–76. doi: 10.1073/pnas.1720419115 (21.04.2023).

Olofsson, Jonas K. and Jay A. Gottfried. 2015. "The muted sense: Neurocognitive limitations of olfactory language." *Trends in Cognitive Sciences* 19, 314–21. doi: 10.1016/j.tics.2015.04.007 (25.04.2023).

Osgood, Charles E., George J. Suci, and Percy H. Tannenbaum. 1957. *The measurement of meaning*. Urbana: University of Illinois Press.

Rakova, Marina. 2003. The Extent of the Literal: Metaphor, polysemy and theories of concepts. New York: Palgrave Macmillan.

Ross, Kristiina. 2002. "Baltisaksa pastorid ja eesti keel." [Baltic German parsons and the Estonian language]. *Keel ja Kirjandus* 4, 225–30.

Ross, Kristiina. 2016. “Die Entstehung der estnischen Schriftsprache im Kontext der deutschen und estnischen Kulturgeschichte.” [The evolution of the Estonian written language in the context of German and Estonian cultural history]. In *Jahrbuch des Vereins für niederdeutsche Sprachforschung*, p. 57–68. Kiel/Hamburg: Wachholtz Verlag – Murmann Publishers. (Niededeutsches Jahrbuch).
Ross, Kristiina. 2019. “Meie ja teie eesti kirjakeel.” [Our and your written Estonian]. *Keel ja Kirjandus* 1–2, 57–68. doi: 10.54013/kk735a5 (14. 09.2022).
Rozin, Paul. 1982. ““Taste-smell confusions” and the duality of the olfactory sense.” *Perception and Psychophysics* 31(4), 397–401. doi: 10. 3758/bf03202667 (15.09.2022).
Staniewski, Przemysław. 2014. “Überlegungen zur Basisebene des olfaktorischen Wortschatzes im Deutschen und im Polnischen.” [Considerations on the basic level of olfaction vocabulary in German and Polish]. In *Felder der Sprache. Felder der Forschung. Lodzer Germanistikbeiträge. Didaktische und Linguistische Implikationen der Interkulturellen*, edited by Zenon Weigt, Dorota Kaczmarek, Jacek Makowski, and Marcin Michoń. Wydawnictwo Uniwersytetu Łódzkiego, Łódź 2014. doi: 10.18778/7969-212-5.13 (21.04.2023).
Staniewski, Przemysław. 2016. “Hör- und Geruchswahrnehmungen im Deutschen und Polnischen – ein sprachlicher Vergleich und dessen theoretish-methodologische Implikationen.” [Auditory and olfactory perception in German and Polish – a linguistic comparison and its theoretical-methodological implications]. In *Sprache und Kommunikation in Theorie und Praxis*, edited by Edyta Błachut and Adam Gołębiowski, p. 181–200. Wrocław/Dresden: ATUT/Neisse Verlag.
Staniewski, Przemysław. 2017. “Geschmack und smak – sprachliche Aspekte der gustatorischen Wahrnehmung im Deutschen und Polnischen.” [Geschmack und smak - linguistic aspects of taste perception in Polish and German]. In *Beiträge zur Fremdsprachenvermittlung, Sonderheft 25*, p. 223–48. Landau: Verlag Empirische Pädagogik.
Sutrop, Urmas. 2002. “The vocabulary of sense perception in Estonian: structure and history.” In *Opuscula Fenno-Ugrica Gottingensia*, 8. Frankfurt am Main: Peter Lang.
Sutrop, Urmas. 2011. “Loetelukatse ja kognitiivse esiletuleku indeks.” [List task and a cognitive salience index]. In *Värvinimede raamat*, edited by Mari Uusküla and Urmas Sutrop, p. 51–61. Tallinn: Eesti Keele Sihtasutus.
Tafenau, Kai, Kristiina Ross, and Aivar Põldvee. 2023. See kuningas sest auvust, põrgukonn ja armutaim. *Eesti keelemõte* 1632–1732. [Estonian linguistic principles 1632–1732]. Tallinn, Estonia: Emakeele SA.
Tuulik, Maria. 2022. *“Adjektiivide süstemaatiline polüseemia eesti keeles tajuadjektiivide näitel.” [Systematic Polysemy of Estonian Adjectives on the Example of Perception Adjectives]*. PhD thesis. Tartu Ülikool.
Vainik, Ene. 2018. “Emotion meets taste. Taste-motivated emotion terms in Estonian.” In *Folklore: Electronic Journal of Folklore* 71(1), 129–55. doi: 10.7592/FEJF2018.71.vainik (11.05.2023).
Vainik, Ene and Dorota Brzozowska. 2019. “The use of positively valued adjectives and adverbs in Polish and Estonian casual conversations.” *Journal of Pragmatics* 153, 103–15. doi: 10.1016/j.pragma.2019.02.001 (17.05.2023).
Winter, Bodo. 2016. “Taste and smell words form an affectively loaded and emotionally flexible part of the English lexicon.” *Language, Cognition and Neuroscience* 31(8), 975–88. doi: 10.1080/23273798.2016.1193619 (11.05.2023).
Winter, Bodo. 2019. *Sensory Linguistics: Language, perception and metaphor*. Amsterdam/Philadelphia: John Benjamins.
Wnuk, Ewelina and Asifa Majid. 2012. "Olfaction in a hunter-gatherer society: Insights from language and culture." In Proceedings of the 34th annual conference of the cognitive science society, edited by Naomi Miyake, David Peebles, and Richard P. Cooper, p. 1155–60. Austin, Texas: Cognitive Science Society.
Wnuk, Ewelina and Asifa Majid. 2014. “Revisiting the limits of language: The odour lexicon of Maniq.” *Cognition* 131, 125–38. doi: 10.1016/j. cognition.2013.12.008 (20.04.2023).
Yeshurun, Yaara and Noam Sobel. 2010. “An odour is not worth a thousand words: From multidimensional odours to unidimensional odour objects.” *Annual Review of Psychology* 61, 219–41. doi: 10.1146/annurev.psych.60.110707.163639 (20.04.2023).
Zucco, Gesualdo M. 2003. “Anomalies in cognition: Olfactory memory.” *European Psychologist* 8(2), 77–86. doi: 10.1027/1016-9040.8.2.77 (20.04.2023).
Zurbuchen, Karin. 2021. *Empirically collected odour specific terms and descriptors in Estonian and German*. [dataset].

## Web references

Duden. 2022. *Bibliographisches Institut GmbH*. https://www.duden.de/(10.05.2023).
DWDS = Digitales Wörterbuch der deutschen Sprache 2023. https://www.dwds.de/wb/(10.05.2023)
Metsmägi, Iris, Meeli Sedrik, Sven-Erik Soosaar. Eesti etümoloogiasõnaraamat 2012.
Eesti Keele Sihtasutus. (5.05.2023)
EKI ühendsõnastik. 2021. https://sonaveeb.ee/(10.05.2023).
EKSS = Eesti keele seletav sõnaraamat. 2009. https://www.eki.ee/dict/ekss/(3.05.2023).

# Appendix I

**Table A1:** Description task results in Estonian and German

| No. | Description ET | Translation | *F* | *S* | Description DE | Translation | *F* | *S* |
|---|---|---|---|---|---|---|---|---|
| 1. | *magus* | sweet | 30 | 0.169 | *süß* | sweet | 21 | 0.091 |
| 2. | *meeldiv* | pleasant | 29 | 0.123 | *angenehm* | pleasant | 17 | 0.071 |
| 3. | *ebameeldiv* | unpleasant | 25 | 0.075 | *schlecht* | bad | 13 | 0.055 |
| 4. | *hapu* | sour | 13 | 0.052 | *salzig* | salty | 14 | 0.051 |
| 5. | *värske* | fresh | 19 | 0.050 | *scharf* | spicy | 10 | 0.047 |
| 6. | *vastik* | disgusting | 15 | 0.046 | *stinkend* | foul-smelling | 10 | 0.047 |
| 7. | *kirbe* | rank | 9 | 0.046 | *gut* | good | 10 | 0.044 |
| 8. | *terav* | spicy | 10 | 0.046 | *blumig* | flowery | 9 | 0.044 |
| 9. | *vänge* | pungent | 8 | 0.045 | *frisch* | fresh | 14 | 0.043 |
| 10. | *lilleline* | flowery | 15 | 0.044 | *ekelig* | disgusting | 12 | 0.039 |
| 11. | *hea* | good | 10 | 0.039 | *unangenehm* | unpleasant | 10 | 0.039 |
| 12. | *kibe* | acrid | 8 | 0.038 | *fein* | delicate | 6 | 0.036 |
| 13. | *vürtsikas* | hot | 9 | 0.032 | *anziehend* | attractive | 3 | 0.035 |
| 14. | *soolane* | salty | 9 | 0.030 | *aromatisch* | aromatic | 6 | 0.033 |
| 15. | *halb* | bad | 9 | 0.026 | *süßlich* | cloying | 6 | 0.032 |
| 16. | *rõve* | revolting | 8 | 0.024 | *beißend* | acrid | 4 | 0.031 |
| 17. | *aromaatne* | aromatic | 3 | 0.023 | *abstoßend* | repulsive | 10 | 0.029 |
| 18. | *kopitanud* | stale | 11 | 0.022 | *stechend* | stinging | 5 | 0.029 |
| 19. | *kõrbenud* | burnt | 6 | 0.020 | *lieblich* | smooth | 6 | 0.029 |
| 20. | *intensiivne* | intense | 4 | 0.019 | *mild* | mild | 5 | 0.025 |
| 21. | *tummine* | thick | 4 | 0.019 | *würzig* | hot | 8 | 0.024 |
| 22. | *isuäratav* | appetising | 5 | 0.018 | *ätzend* | pungent | 3 | 0.023 |
| 23. | *tugev* | strong | 5 | 0.018 | *ekelhaft* | disgusting | 6 | 0.022 |
| 24. | *eemaletõukav* | repulsive | 8 | 0.018 | *sauer* | sour | 6 | 0.019 |
| 25. | *mõru* | bitter | 3 | 0.017 | *stinkig* | smelly | 3 | 0.019 |
| 26. | *lääge* | sickly-sweet | 4 | 0.016 | *intensiv* | intense | 4 | 0.018 |
| 27. | *umbne* | stuffy | 5 | 0.015 | *lecker* | delicious | 4 | 0.018 |
| 28. | *hapukas* | soury | 3 | 0.013 | *appetitlich* | appetising | 5 | 0.018 |
| 29. | *haisev* | foul-smelling | 5 | 0.013 | *wohltuend* | soothing | 4 | 0.016 |
| 30. | *ligitõmbav* | attractive | 4 | 0.012 | *streng* | tangy | 3 | 0.016 |
| 31. | *õrn* | gentle | 4 | 0.012 | *stickig* | stuffy | 4 | 0.016 |
| 32. | *roiskuv* | rotten | 4 | 0.012 | *stark* | strong | 4 | 0.014 |
| 33. | *kodune* | homey | 4 | 0.011 | *wohlriechend* | fragrant | 3 | 0.014 |
| 34. | *läppunud* | musty | 3 | 0.011 | *feucht* | humid | 5 | 0.014 |
| 35. | *nõrk* | weak | 3 | 0.011 | *trocken* | dry | 4 | 0.013 |
| 36. | *suitsune* | smoky | 5 | 0.011 | *rauchig* | smoky | 3 | 0.012 |
| 37. | *imal* | cloying | 4 | 0.011 | *fruchtig* | fruity | 4 | 0.012 |
| 38. | *keemiline* | chemical | 4 | 0.011 | *penetrant* | obtrusive | 3 | 0.011 |
| 39. | *kuiv* | dry | 3 | 0.010 | *betörend* | captivating | 4 | 0.011 |
| 40. | *tolmune* | dusty | 3 | 0.010 | *verraucht* | smoky | 3 | 0.010 |
| 41. | *ergutav* | stimulating | 6 | 0.010 | *abgestanden* | stale | 4 | 0.010 |
| 42. | *kange* | hard | 3 | 0.010 | *fischig* | fishy | 3 | 0.010 |
| 43. | *mehelik* | masculine | 3 | 0.010 | *übel* | rank | 4 | 0.010 |
| 44. | | | | | *bitter** | bitter | 3 | 0.010 |

Note: *S*, cognitive salience index; *F*, frequency. Data listed according to *S*. Only words with a cognitive salience index (*S*) of at least 0.01 were considered.

# Appendix II

**Questionnaire**

Nägemine, kuulmine, haistmine, maitsmine ja kompimine on inimese viis meelt./Sehen, Hören, Riechen, Schmecken und Tasten – das sind die klassischen 5 Sinne des Menschen./Humans have five basic senses: vision, hearing, touch, smell and taste.

NÄIDE/BEISPIEL/EXAMPLE: Kui me mõtleme kuulmismeelele, siis kogeme kõrvade kaudu nt heli, muusikat, müra, laulu, kõnet, sosinat, kõrgust, intensiivsust jpm./Wenn wir an den Hörsinn denken, dann können wir sagen, dass wir mit den Ohren Folgendes wahrnehmen: Klang, Musik, Lärm, Gesang, Sprache, Wispern, Höhe, Intensivität usw./When we think about the auditory sense, then our ears perceive, for instance, sounds, music, noise, singing, speech, whispering, pitch, intensity, and so on.

1. **Palun loetlege, mida tunneme ninaga./Zählen Sie bitte auf, was kann man mit der Nase wahrnehmen./ Please list the things that we can be sensed by the nose.**
2. **Mõelge eelmisele katsele ja loetlege palun omadussõnu, mis iseloomustavad ninaga kogetavat?/ Denken Sie an das Vorangehende und nennen Sie bitte Adjektive, die das beschreiben, was man mit der Nase wahrnehmen kann?/Please think back to the previous taskand list adjectives that describe the things that be sensed by the nose.**
3. **Palun nimetage lõhnameelega seotud tegusõnu./Nennen Sie bitte Verben der Geruchswahrnehmung./ Please list some verbs that are associated with the sense of smell.**