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Lexical synesthesia in Croatian

In the first part of the paper, we highlight fundamental insights into synesthesia as a neurological phenomenon and then focus on the linguistic interpretation of synesthesia as a lexical mechanism. In neurology synesthesia denotes a specific and rare human ability of joint perception which emerges from a congenital ability to integrate sensations. Neurologists single out five basic manifestations of neurological synesthesia: colored sequences, colored music, affective perceptions, nonvisual couplings and spatial sequences. The main impetus for neurological synesthesia is language, but neurological synesthesia is not the cognitive source for lexical synesthesia. Neurological synesthesia is the ability among the *rare* individuals to join together the sensations from various sensory domains into one unique sensation. Lexical synesthesia is the *general* language mechanism which enables the creation of secondary meanings of polysemous lexemes. We understand lexical synesthesia as the syntagmatic connection of the words whose primary lexical meanings relate to different sensory domains, whereby one of the elements of the syntagm retains its primary meaning while the other activates its secondary meaning and leaves its primary sensory domain. Research into lexical synesthesia is most often based on extracting congruent syntagms of adjectives and nouns from dictionaries and corpora of general language. On the basis of the Croatian syntagms extracted that comprise an adjective and a noun (e.g. *topao glas* 'warm voice', *hladne boje* 'cold colors', *kiseo osmijeh* 'sour smile', *sladak miris* 'sweet smell') we isolated the types of synesthetic transfer in Croatian and determined their frequency. Inspired by Stephen Ullmann's insights into the dominant tendencies in the synesthetic transfers, we created hierarchy of sensory modalities for Croatian language: TOUCH → TASTE → SMELL → SIGHT → HEARING.

1. Introduction

The meaning of the word *synesthesia* can be clarified by comparing it to the word that contains the same root – *anesthesia*: while anesthesia (Greek, *anaisthēsía*) means '(state) without sensation', synesthesia (Greek, *synaísthēsis*) is 'joint sensation'. *Synesthesia* is not a common noun, i.e. a unit in the general vocabulary, but rather a polysemous term used in psychology to denote 'learning and sensation that

what we observe through our senses may intertwine (fragrance can have shapes, colors, sounds, etc.)', in literary theory, rhetoric and stylistics 'figure of speech for connecting images that do not belong to the same sense (*the tender blue*)', in physiology 'a sensation in one part of the body as a result of a stimulus in another body part', and in film studies 'adjusting colors and sounds, e.g. suggesting the sound dynamics by using colors'.[1] Croatian dictionaries and encyclopedias have not registered any meanings of *synesthesia* in linguistics and neurology. Considering the similarities observed in how synesthesia is interpreted in these two disciplines and the necessity to distinguish between the phenomena they separately observe, we will first highlight fundamental insight into synesthesia as a neurological phenomenon and then focus on the linguistic interpretation of synesthesia as a lexical mechanism.

There are four main aims to this paper: first, to exclude neurological synesthesia as the cognitive origin of lexical synesthesia and highlight conceptual metaphor as its origin; second, to refute speculations about conceptual metonymy as the foundation for lexical synesthesia, which aligns with establishing conceptual metaphor as the cognitive mechanism that enables lexical synesthesia to emerge; third, to set up a comprehensive list of examples of lexical synesthesia in Croatian and describe this neglected mechanism of deriving secondary meaning in polysemous Croatian lexemes; fourth, to create a hierarchy of sensory modalities for Croatian language.

2. Synesthesia in neurology

The term *synesthesia* in neurology denotes a specific and rare human ability of joint perception. People who see colored sounds, sense the taste of colors, experience pain or orgasm in particular color or in any other way connect sensations from different sensory domains are called *synesthetes*. The neurologist Richard E. Cytowic has paid great attention to them since the 1980s. Cytowic reinstated this phenomenon as a research topic, as synesthesia had been recognized and named some 300 years ago, but neglected nevertheless for being inconsistent, rare and sporadic and as such not appropriate for serious medical research.[2]

Neurological research has stated that synesthesia is found in one out of 25,000 persons, synesthetes are more frequently women and left–handed persons than men and right–handed persons, the joint sensations are not intentional or con-

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1 Word definitions in this article are taken primarily from *Veliki rječnik hrvatskoga jezika* by Vladimir Anić (2004). The meaning of the word *synesthesia* in film studies was taken from the website enciklopedija.hr (sinestezija. *Hrvatska enciklopedija, mrežno izdanje*. Leksikografski zavod Miroslav Krleža, 2021. Accessed 22 September 2023. http://www.enciklopedija.hr/Natuknica.aspx?ID=56112).

2 Cytowic's website (https://cytowic.net/) contains a comprehensive list of his publications as well as video recordings of his numerous lectures.

trolled and synesthetes find it strange that not all people experience their environment similarly (Cytowic 1995). Furthermore, what has also been found is that synesthetes do not only have uncommon sensory experience but an unusual personality as well that influences their relations with other people and are prone to neurosis and schizotypal personality disorder (STPD) (Banissy et al. 2013: 830–831).

On the basis of the neurological and interdisciplinary research so far, Cytowic (2018: 3) defines synesthesia as "a hereditary condition in which a triggering stimulus evokes the automatic, involuntary, affect–laden, and conscious perception of a sensory or conceptual property that differs from that of the trigger". Synesthesia as a hereditary state is called *developmental synesthesia* and is distinct from *acquired synesthesia* which may appear as a result of sensory deprivation, state of meditative focus, temporal lobe epilepsy, head trauma and other types of brain injuries (*idem*: 205). A subtype of acquired synesthesia or a separate type of synesthesia altogether is synesthesia induced by psychoactive substances and psychopharmaceuticals. Although all types of neurological synesthesia make interesting matter, including the differences in how they are manifested, in this article we will consider only developmental synesthesia due to its properties, i.e. it is automatic, non–voluntary, perceptual, consistent, long–term, conscious, observed in early childhood. In comparison to acquired synesthesia, it is not artificially induced, acute, imaginary or a result of brain pathology.

Cytowic (2018: 240–241) stresses that developmental synesthesia is formed in early childhood when the brain's plasticity is at its highest. It is formed because the synesthete's brain is genetically specific and changes over time while the child learns and acquires various knowledge. Hence, the tendency for synesthesia is genetically determined but the specific variants of synesthesia are influenced by the environment and learning. It is for this reason that developmental synesthesia is "an excellent illustration of how nature interacts with nurture" (*idem*: 34): what is hereditary is the biological, genetic tendency towards establishing multimodal connections in the brain and then this tendency interferes with the learned and culturally specific knowledge such as time units, numbers, alphabet, colors, music notes, names of food products etc. Although synesthesia is manifested in various ways, Cytowic (2018: 59–65) singles out five basic and most frequents manifestations (cf. Novich et al. 2011).

- *Colored sequences*. Ordered sequences, especially those overlearned such as numbers, the alphabet, days of the week and months of the year, stimulate the experience of color.[3]
- *Colored music*. Notes, chords, keys, timbre of musical instruments, rhythm and other musical properties elicit the sensation of color.

3 This type of synesthetic joint sensation is well illustrated by the title of the book by Richard E. Cytowic and David Eagleman *Wednesday is Indigo Blue* (2009). The foreword is written by Dmitri Nabokov, a synesthete himself, son of Vladimir Nabokov, who was also a synesthete. Among famous people claimed to be (or have been) synesthetes are Marilyn Monroe, Billie Eilish, Nikola Tesla, Duke Ellington, Vasily Kandinsky, Franz Liszt, Richard Wagner, Pharrell Williams, Tori Amos, Mary J. Blige, Beyoncé etc.

- *Affective perceptions*. Valenced, consciously felt emotions towards someone's personality, tactile sensations (e.g. pain, caressing, slap, orgasm, temperature) and sense of attraction or disgust towards the taste or smell of something edible stimulate the sensation of color.
- *Nonvisual couplings*. Different senses and concepts induce nonvisual reactions (e.g. a sound may induce the sense of taste).
- *Spatial sequences*. Any overlearned sequence (e.g. numbers, workdays, months in a year) is experienced as a concrete three–dimensional object, i.e. is reified.

As Cytowic (2018: 4–6) notes, synesthesia is most often manifested as a sensation of colored days of the week, followed by seeing letters, numbers and punctuation marks in color although they are printed in black. While written graphemes induce the sensation of color, articulated phonemes most often induce the synesthetic reaction of taste. It could be said that language is the key impetus for synesthetic experience: "graphemes, phonemes, and whole words induce as many as 88 percent of all synesthetic sensations"; *idem*: 31). Language units most frequently induce color integration, but it has been confirmed that they trigger a diverse range of synesthetic associations with textures, shapes, movement and shimmering. In addition, phonemes can trigger gustatory sensations that are further layered with the sensation of temperature in regard to integration with the sense of temperature and properties such as "crunchy, soft, soggy or gritty" (*idem*).

Aside from the canonical synesthetic types listed by Cytowic, neurologists have discovered some specific multimodal reactions that transcend the perceptual framework and join senses with social factors, motor skills and emotions. Amin et al. (2011) discuss *social synesthesia* in regard to associating sex and human traits with specific graphemes and single digits. In their research, participants–synesthetes described, for example, the grapheme ⟨g⟩ as an older, old–fashioned woman, the grapheme ⟨s⟩ as a woman with many friends, who likes company and is very popular (*idem*: 261); letters and numbers in light color were perceived as fun and optimistic, while black letters were often found irritable, intolerant and cold; male numbers and letters were described as having straight edges, while female were perceived as curvy (*idem*: 262). Social synesthesia can be seen as a synonym for personifying graphemes and numbers and is a fascinating phenomenon, which has not been investigated enough to be made comparable to numerous confirmed instances of perceptive synesthesia. The strangest type of synesthesia, according to Cytowic (1995), is the *audiomotor synesthesia* that entices the person to position their body in various shapes depending on the sound of individual words. There is an example of a 15–year–old male who was compelled by the pronunciation of some proper names to always perform identical movements with his fingers, arms and legs, without exception and consistently (Devereux 1966). Another strange and rare type is *tactile–emotion synesthesia* (Ramachandran and Brang 2008) in which touching certain textiles and textures causes different emotions. For ex-

ample, when touching denim, the participants would feel depressed or disgusted, while touching silk would make them feel happy and content (*idem*: 393).

In the paragraphs above, we have brought together the more common and sufficiently described types of developmental synesthesia with the more rare and striking types, which clearly shows that synesthetic joint sensations are not universal but rather unique and specific. Therefore, Cytowic (2018: 17) argues that synesthesia is no longer to be observed as a phenomenon with clearly delineated subtypes but is better viewed "as a multidimensional spectrum". The upper end of the spectrum contains the prototypical perceptual synesthesias such as colored sounds, numbers and days of the week as well as sounds connected with taste. At the low end we find the broadly received metaphors such as warm and cool colors and high and low temperatures. The center of the spectrum contains "experiences like goose bumps, empathic pain, imagery inspired by music or an aroma, hypnogogic hallucinations, and Proustian memories evoked by a sensory episode" (*idem*). What Cytowic places at the lower end of the synesthetic spectrum we will not be considering as examples of neurological synesthesia but rather conventional examples of lexical synesthesia. Lexical synesthesia does not emerge from a neurological condition of joint perception confirmed among a small number of persons, but from the universal cognitive mechanism that all people use called the conceptual metaphor. This will be elaborated later in the article.

Cytowic (2018: 42) believes that what synesthetes consciously experience as joint perception implicitly exists in nonsynesthetes. Diaphonia or *cross talk* exists in our brains, and the difference lies in that synesthetes are aware of such mixing of signals from various parts of the brain, while nonsynesthetes are not. In other words, synesthetes view reality differently from nonsynesthetes, so synesthesia confirms the universal truth that people in general do not experience reality in the same manner. Considering that every brain develops over time in its specific environment, "it constructs a person who has never existed before and will never exist again" (*idem*: 86). If our brains were only passive recipients of content, then we would all be experiencing the world in the same manner, have the same perspective and – last but not least – be the same person. However, the human brain "is not a passive antenna but instead constructs reality from the tiny slice that it samples from the physical world" (*idem*: 244). In its numerous variants, synesthesia points out the great differences in how we perceive the world. "It reminds us that each brain uniquely filters what it perceives in the first place, making the world thoroughly subjective" (*idem*: 244).

We have already highlighted that language is the key impetus for synesthetic sensations. We should also add another important role of the knowledge of language in the formation of synesthesia. Namely, although it emerges from a congenital ability to integrate sensations, it is also strongly influenced by the vocabulary acquired and learned as well as the conceptual knowledge (cf. Cytowic 2018: 122), i.e. the factors that lexical semantics includes in the definition of the lexical mean-

ing of a word. It is for this reason we will now direct our focus to lexical synesthesia and distinguish it from the neurological kind.[4]

3. Synesthesia in linguistics

Neurologists have made some truly exciting discoveries about synesthesia which may have attracted more attention than the linguistic contributions to this phenomenon.[5] However, the renewed interest in synesthesia appeared in semantics earlier than in neurology, around mid–twentieth century. In the remainder of this article, our aim is to show that insights of lexical semantics into synesthesia are as interesting as the neurological findings are and the two perspectives are also highly complementary.

In the Croatian national curricula, synesthesia is introduced as a figure of speech, i.e. it is treated similar to metaphor and usually considered its branch. Of course, this is wrong because metaphor and synesthesia are not only figures of speech, but they are also lexical mechanisms for creating secondary meanings of polysemous lexemes. In line with the tenets of Cognitive Linguistics, the linguistic source for lexical and stylistic mechanisms is found in equivalent cognitive mechanisms which enable all people to similarly experience the world around them and code and articulate the world through language (Raffaelli 2015: 177). The cognitive mechanisms of the *conceptual metaphor* and *conceptual metonymy* enable the linguistic realization of *lexical* and *stylistic metaphor*, *synesthesia*, *metonymy* and *synecdoche* (Dragićević 2007: 147–151). Lexical and stylistic metaphor and synesthesia stem from the conceptual metaphor; lexical and stylistic metonymy and synecdoche stem from the conceptual metonymy. Lexical mechanisms serve to derive secondary meanings of polysemous lexemes and are studied by lexical semantics. Stylistic mechanisms are figures that stylistically infuse a literary text and are studied in stylistics, literary theory and rhetoric.

It is necessary in this article to distinguish between two levels of linguistic realization of synesthesia – stylistic and lexical – and leave the stylistic kind entirely to stylistics. We will dedicate this space to lexical synesthesia.[6] The difference be-

4 Winter (2019: 70–72) discusses the necessity for precise delineation of the various meanings of the term *synesthesia*. He places special emphasis on distinguishing the two kinds of synesthesia that we are dealing with in this article: he calls neurological synesthesia *canonical synesthesia*, and lexical synesthesia is *synesthetic metaphor* (*idem*: 67–77).

5 Recent linguistic research into synesthesia can be found in the field of sensory linguistics which studies "how language relates to the senses", "[h]ow are sensory perceptions packaged into words", "[h]ow do languages differ in how perception is encoded" and "how do words relate to the underlying perceptual systems in the brain" (Winter 2019: 1).

6 What we call *lexical synesthesia* in this article is what most authors that we cite call *synesthetic metaphor* (cf. e.g. Marks 1982; Day 1995–1996; Yu 2003; Shen and Gil 2007; Ronga et al. 2012). Research publications in psychology and neuroscience will also use the term *synesthetic metaphor* as reference to the linguistic phenomenon, while the term *perceptual* or *neuropsychological synesthesia* is used for the neurological phenomenon (Strik Lievers 2017: 87).

tween these two kinds of synesthesia, both created through language, is interpreted in the same manner as the difference between stylistic and lexical metaphors: the former are original, affective and exciting, and the latter are common, fossilized and inconspicuous. The following examples from the renowned Croatian poets and novelists are all effective connections not anticipated to appear between nouns and their modifiers, which is the basis of stylistic synesthesia: *plavo podne* 'blue noon' by Antun Branko Šimić, *modri psalam* 'livid–colored psalm' by Miroslav Krleža, *gorka svjetlost* 'bitter light' by Anka Žagar, *krezub pogled* 'toothless gaze' by Josip Sever and *riječi crne od dubine* 'words dark with depth' by Tin Ujević (Bagić 2012: 297–298). Common lexical synesthesia is evident in phrases such as *visoka temperatura* 'high temperature', *hrapav glas* 'raspy voice' (Cro. lit. 'coarse, grating voice'), *tople boje* 'warm colors', *duboki tonovi* 'deep tones' and *oštar miris* 'sharp smell'. These are not a match to the expressive potential of stylistic synesthesia, or rather, they are completely empty of that potential. What is common to both kinds of synesthesia is the syntagmatic connection of the words whose primary lexical meanings relate to different sensory domains (Marks 1982: 177; Shen and Cohen 1998: 124; Yu 2003: 20; Shen and Gil 2007: 51; Ronga et al. 2012: 139; Strik Lievers 2015: 69–70), whereby one of the elements of the syntagm retains its primary meaning, while the other activates its secondary meaning and leaves its primary sensory domain. For instance, in the syntagm *hrapav glas* 'hoarse voice' (Cro. lit. 'coarse, grating voice'), the noun *glas* 'voice' retains its primary meaning 'effect of the vocal tract' and the adjective *hrapav* 'hoarse; coarse' leaves its primary tactile domain ('of uneven, rough surface') and activates its secondary meaning in the auditory domain ('which is hoarse, not clear; ragged'). In the definition itself of the secondary meaning of the adjective *hrapav* 'hoarse; coarse', another lexical synesthesia is revealed that brings together the visual and auditory domains linking the voice with color. The noun *boja* 'color' is primarily linked to the visual domain ('sensation on the eye from various light emissions'), but the secondary meaning breaks away into the auditory domain ('sensation that the human voice invokes to the sense of hearing'), which results in the frequent syntagm *boja glasa* 'color of voice'. What is more, this lexical connection of the visual and auditory domains can be upgraded with the tactile domain in the syntagm *topla boja glasa* 'warm voice' (Cro. lit. 'warm color of voice') and still remain in the neutral register. So, not even the attractive mechanism of synesthesia in its lexical realization causes astonishment or excitement, hence it should be distinguished from stylistic synesthesia. As a principle, it is important to distinguish lexical mechanisms that participate in the creation of secondary meanings of polysemous lexemes from the mechanisms of the same name that are used in stylistic figures. In other words, *lexical* metaphor, metonymy, synecdoche and synesthesia should be understood as a kind of lexicogenesis – along with neologisms and word formation (Geeraerts 2010: 23, 237; Cuyckens and Zawada 2001: xiv) and distinguished from *stylistic* metaphor, metonymy, synecdoche and synesthesia as properties of figurative discourse. It is

evident that the names of the mechanisms are polysemous, their origin is in rhetoric and the native speakers of Croatian will primarily associate them with figures of speech because it is what they are taught in school. In Croatian curricula, two levels should be added to this primary association, the *conceptual* and the *lexical*. The conceptual level is primary in the full sense of the word because it is the cognitive starting point of language mechanisms and enables their articulation. Metaphorical and metonymic thinking is universal and innate to people, so everyday metaphorical and metonymic expressions that emerge from such cognitive processes are considered usual and natural (cf. Lakoff and Johnson 1980: 29). Such broadly accepted and inconspicuous everyday metaphors and metonymies are lexical metaphors, metonymies, synecdoche and synesthesia which help establish the secondary meanings of polysemous lexemes (e.g. *noga stola* 'leg of a table'; *jagodica prsta* 'tip of the finger', Cro. lit. 'the small strawberry of the finger'; *krilo zrakoplova* 'wing of a plane'; *čitam Krležu* 'I am reading [the author] Krleža'; *žlica šećera* 'spoonful of sugar', Cro. lit. 'spoon of sugar'; *bolnice štrajkaju* 'hospitals are on strike'; *mudra glava* 'wise head'; *poznata lica* 'familiar faces'; *pojesti voće* 'to eat fruit'; *tople boje* 'warm colors'; *hrapav glas* 'hoarse voice', Cro. lit. 'coarse, grating voice'; *slatkast miris* 'sweet smell'). Any unconventional and astonishing metaphors and metonymies may be observed only when the cognitive metaphoric and metonymic patterns are used to create unexpected, original phrases, which is the basis for creating stylistic figures. It is not difficult to see that understanding and decoding them requires greater effort than understanding the equivalent lexical mechanisms. Thus, we believe it is necessary to first introduce lexical mechanisms, and then the stylistic kind in school curricula. Let us clarify this.

Stylistic synesthesia mentioned earlier, such as *livid–colored psalm* and *toothless gaze*, are far less comprehensible than lexical synesthesia such as *deep voice* and *high temperature*. Therefore, from the point of view of teaching methodology, it would be welcome and justified to start teaching synesthetic transfer on the basis of everyday lexical synesthesia (e.g. *tople boje* 'warm colors'; *oštar miris* 'sharp smell') which students are already well acquainted with. Such examples would help in recognizing and learning about the connections between two different sensory domains and in gradually analyzing synesthetic mechanisms. The opportunity to identify synesthesia in everyday language would help students prepare and become motivated to decode challenging stylistic synesthesia.

Our interest in synesthesia stems from the perspective of lexical semantics which means that we are leaving stylistic synesthesia aside, remembering at the same time that every instance of linguistic shaping of synesthesia – realized either through stylization or lexicalization – has to be anchored in the cognitive mechanism of the *conceptual metaphor* which enables us to mentally link two different domains on the basis of the similarities observed (Lakoff and Johnson 1980: 6–7; Raffaelli 2015: 178).

4. Introducing lexical synesthesia

Research interest into synesthesia can be traced back to mid–20th–century semantics thanks to Stephen Ullmann, who analyzed synesthetic connections of words in the nineteenth–century English, French and Hungarian literature respectively. Ullmann noticed that some types of connecting different sensory domains are not random but show a determined pattern (Ullmann 1945, 1957: 266–289, 1962: 216–218, 1964: 86–88). So, he introduced the *directionality principle* and summarized the dominant tendencies in the synesthetic transfers in the following three conclusions:

1. transfers move from "lower" senses (touch, taste, smell) to "higher" (sight, hearing);[7]
2. words from the domain of touch most often join words from other sensory domains and function as their modifiers;
3. words from the domain of hearing are most often joined with words from other sensory domains and function as the head of such syntagm (Ullmann 1957: 280–283, 1964: 86–87).[8]

It could be said that in synesthetic transfers touch gives (away) and hearing receives the most. Ullmann showed the direction of synesthetic transfers with a hierarchy of sensory modalities, which sees modality as a partial sensory sensation which is a component in comprehensive perception:

TOUCH ⟶ TEMPERATURE ⟶ TASTE ⟶ SMELL ⟶ HEARING ⟶ SIGHT.

The hierarchy implies that sensory transfers move exclusively from left to right, i.e. words for senses on the left often develop secondary meanings related to other sensory domains, while words for the senses on the right are in that sense more conservative and tend to remain within its primary domain. Croatian syntagms *hladna boja* 'cool color' and *hrapav glas* 'hoarse voice' (Cro. lit. 'coarse, grating voice') contain widely accepted, common synesthetic connection of adjectives from the tactile domain with nouns from the visual and auditory domains. There are either no examples of the reverse order (e.g. **obojen/bezbojan/šaren dodir* 'colored/colorless/multicolor touch'; **glasan dodir* 'loud touch') or they are very rare and unique (e.g. *visoka* i *niska temperatura* 'high and low temperature') or highly expressive,

7 To clarify: a synesthetic syntagm, such as *topao glas* 'warm voice', is composed of a head and a modifier. The modifier usually refers to a lower sense (e.g. touch), whereas the head of the syntagm refers to a higher sense (such as hearing).

8 Hierarchy of the senses – in which sight is considered the highest, most advanced and most developed form of perception, followed by hearing, smell and taste, while touch is the lowest, primary sense – is no more than a cultural standard and has no universal status. Classen (1993: 1) mentioned the indigenous community Ongee from the Andaman Islands in South Pacific, whose members believe that the sense of smell is the vital force of the universe and the foundation of personal and social identity. They greet each other by asking "How is your nose?" and their primary concern is maintaining the olfactory balance within individuals and in the universe. The folk model of our sensory experiences divided into five separate senses along with any version of this hierarchy has been extensively covered by Winter (2019: 11–15, 99–103).

which makes them examples of stylistic and not lexical synesthesia (e.g. *mračan dodir* 'dark touch'; *tih/nijem dodir* 'silent/mute touch'). Considering that touch is situated on the farthest left end of the hierarchy, it can be concluded that words that primarily denote tactile sensation tend to develop secondary meanings mostly through the mechanism of lexical synesthesia. Similarly, words that primarily denote visual or auditory sensations are the least prone to such polysemous developments. In conclusion, words from the tactile domain easily modify words from other sensory domains, while words from the visual and auditory domains usually remain within their primary domains and receive modifiers from other domains.

We could ask why Ullmann placed sight on the farthest right end of the hierarchy and at the same time highlighted that "hearing receives the most". This is the result of statistical data leveling (Ullmann 1957: 283). The lexicon of the visual domain is richer than the lexicon of the auditory domain, so in the corpus that Ullmann studied there were more frequent examples of synesthetic description of visual sensations. However, the examples related to the auditory domain as the recipient of modifiers from other domains are more diverse because auditory sensations are less concrete than the visual ones and need more "outside support" than the shapes and colors we experience through sight. Thus, there are more examples of synesthetic description of visual sensations, but the examples of synesthetic description of auditory sensations are more diverse, and it is for this reason that hearing and sight are situated equally on the right end of the hierarchy.

Many linguists tested Ullmann's hierarchy of sensory modalities in non–figurative discourse in different languages, distinguishing between Ullmann's stylistic synesthesia and the equivalent lexical synesthesia. Most of them rejected the special position on the hierarchy for temperature and subsumed it under touch. There were some other smaller interventions as well, but in general they confirmed the ranking of senses in synesthetic transfers. Williams (1976) was the first to test the hierarchy of sensory modalities in everyday English and confirmed the degrees on the hierarchy by presenting some confirmations from other Indo–European languages and Japanese as well. Shen (1997) verified Ullmann's hierarchy with data from Hebrew, Yu (1992) and Zhao et al. (2018) used Chinese data and Strik Lievers (2015) provided Italian data.

Day (1995–1996, 2016) investigated how complementary the ranking and the dominant combination of senses in synesthetic syntagmatic word connections are in English and German.[9] Day concluded that in synestheticly organized syntagms in both languages the most frequent are adjectives of touch and nouns of hearing, e.g. *soft word*, *sharp crack*, Ger. *samtige Stimme* 'velvety voice', Ger. *scharfer Ton* 'sharp tone'.

9 Day's website (http://www.daysyn.com/index.html) contains a regularly updated comprehensive list of references on synesthesia. Readers interested in the joint perception phenomenon can use this website as a good source of relevant references.

Inspired by Day's findings, Dragićević (2007: 157–159) investigated synesthetic transfer in Serbian, which she illustrated abundantly from monolingual dictionaries of general Serbian. Her conclusions were as follows:

- nouns of hearing are most often described by adjectives of touch (e.g. *topao glas* 'warm voice'), then sight, i.e. colors and dimensions (e.g. *dubok glas* 'deep voice'; *svetao glas* 'light voice') and sometimes taste (e.g. *gorak vapaj* 'bitter cry');
- nouns of smell are most often described by adjectives of taste (e.g. *sladak miris* 'sweet smell'), touch (e.g. *težak miris* 'heavy smell') and, more seldom, sight (e.g. *bled miris* 'pale smell');
- nouns of sight are most often described by adjectives of touch (e.g. *tople boje* 'warm colors');
- in syntagms that synestheticly link an adjective and a noun, we most often find adjectives of touch, and seldom adjectives of smell and hearing.

In their studies of synesthetic transfers, some authors notice that nouns of sight are most often described with adjectives of the same domain, as it is lexically most prolific, while adjectives of smell are seldom used to describe nouns from other sensory domains because olfactory adjectives are scarce (Strik Lievers 2015; Dragićević 2007: 158).

5. Lexical synesthesia in Croatian

Antea Zec (2019) conducted a valuable pioneering investigation into lexical synesthesia in Croatian based on extracting synesthetic connections between words from two electronic corpora (*Croatian Language Repository*[10] and *Croatian National Corpus*[11]) and two dictionaries of general Croatian (*Veliki rječnik hrvatskoga jezika* by Vladimir Anić from 2004 and *Rječnik hrvatskoga jezika* edited by Jure Šonje from 2000). In this article, the data listed is supplemented by examples from the *Croatian web corpus* (hrWaC).[12] First, we carefully read through both general dictionaries of Croatian and manually extracted all nouns and adjectives whose primary lexical meaning refers to senses (e.g. *glas* 'voice', *ton* 'tone', *zvuk* 'sound', *glazba* 'music', *melodija* 'melody', *boja* 'color', *zelenilo* 'greenery, verdure', *rumenilo* 'blush', *prizor* 'scene', *slika* 'image, picture', *okus* 'flavor, taste', *hrana* 'food', *gorčina* 'bitterness', *slatkoća* 'sweetness', *miris* 'scent, smell', *zadah* 'odor', *vonj* 'reek', *smrad* 'stench', *dodir* 'touch', *temperatura* 'temperature', *vrućina* 'heat'; *topao* 'warm', *hladan* 'cold', *oštar* 'sharp', *mek* 'soft', *nježan* 'delicate, gentle', *visok* 'high, tall', *nizak* 'low, short', *tanak* 'slim', *svijetao* 'light', *čist* 'clean', *sladak* 'sweet', *gorak* 'bitter', *kiseo* 'sour', *ljut* 'hot, spicy', *slan* 'salty', *tih* 'silent', *nijem* 'mute', *glasan* 'loud', *bučan*

10 See http://riznica.ihjj.hr/index.hr.html (accessed 30 October 2023).
11 See http://filip.ffzg.hr/cgi–bin/run.cgi/first_form (accessed 30 October 2023).
12 See http://nlp.ffzg.hr/resources/corpora/hrwac/ (accessed 30 October 2023).

'noisy'). Then we used the electronic corpora to search all contexts in which these nouns and adjectives appear, made lists of syntagms with nouns and adjectives that contain synesthetic features and created a list of examples for analysis.13 For this paper we also used the *Croatian web corpus* (*Hrvatski mrežni korpus = hrWaC*) because it provides numerous examples from conversations, multimedia and other non–fiction texts in comparison with the *Croatian National Corpus* and *Croatian Language Repository*. The two corpora abound in literary texts and offer plenty of examples of stylistic synesthesia, making them a rich source for research into that particular phenomenon. However, our objective was to find conventionalized, everyday lexical synesthesia, so it was necessary to expand our search and use the electronic corpus *hrWaC*; it is stylistically heterogeneous and comprises texts that are often not (or less) edited, proofread or monitored and belong to various discourse types.

The synesthetic syntagms we extracted and listed were then classified according to the nouns for senses – hearing, sight, taste, smell and touch – as the main components which retain their primary lexical meanings in these syntagms. Within each sensory domain we grouped syntagms in which the noun takes the adjective from another sensory domain (e.g. one group contains syntagms with the noun from the domain of hearing and the adjective from the domain of touch; another group contains syntagms with the noun from the domain of hearing and the adjective from the domain of sight, and so on). Next, we ranked the frequency of how nouns from each sensory domain connect with the adjectives from each sensory domain (e.g. nouns from the domain of hearing are more frequently connected with adjectives from the domain of touch, then with adjectives from the domain of sight, and least often with adjectives from the domain of taste). Having ranked the results, we estimated the frequency of all types of synesthetic connections between adjectives and nouns and, finally, we created a hierarchy of sensory modalities for Croatian.

The material collected as described here does not exhaust all possible materials for studying lexical synesthesia in Croatian, so the findings presented in this article are to be viewed as preliminary insight and can serve as impetus for future research. Our interpretation should therefore be seen as a description of the tendencies of synesthetic transfer observed in Croatian. However, it is important to note here that our results correspond to the research results obtained by Antea Zec (2019), the difference being the higher number of examples included in our research. We strongly believe that any further attempt at gathering additional examples of lexical synesthesia in Croatian will only reaffirm the results from this paper, primarily the order of values in the hierarchy of lexical modalities. In other words, we presume that this hierarchy can be created on the basis of a representative (not

13 Research into lexical synesthesia is most often based on extracting congruent syntagms of adjectives and nouns from dictionaries and corpora of general language. The interpretation is that the adjective modifies the noun, not that the noun reduces the meaning of the adjective (Winter 2019: 68).

all–encompassing) number of examples of lexical synesthesia in a particular language – as already conducted by some of the authors cited in this paper – and that hierarchies created for different languages do reflect some universal tendencies.

On the basis of our list of syntagms that contain an adjective and a noun, we isolated the types of synesthetic transfer in Croatian and estimated their frequency:

- nouns of **hearing** are most often described by adjectives of **touch** (e.g. *topao glas* 'warm voice', *hladan glas* 'cold voice', *hrapav glas* 'hoarse voice' [Cro. lit. 'coarse, grating voice'], *oštar glas* 'sharp voice', *mek glas* 'soft voice', *baršunast glas* 'velvety voice', *svilenkast glas* 'silky voice', *nježan glas* 'tender voice', *oštar ton* 'sharp tone', *bolan krik* 'painful cry', *blagi tonovi* 'mild tones', *nježna melodija* 'tender melody', *grube riječi* 'tough words', *tople riječi* 'warm words', *mlak odgovor* 'lukewarm response', *vreli uzdah* 'lustful breathing' [Cro. lit. 'hot inhale'], *vrući razgovori* 'sexy talk' [Cro. lit. 'hot talk'], *lagana glazba* 'light music', *nježna muzika* 'tender music', *nježni napjev* 'light tune' [Cro. lit. 'gentle tune'], *meki vokali* 'soft vocals', *teški rifovi* 'heavy riffs', *tvrdi rifovi* 'hard riffs'), then adjectives of **sight** (e.g. *dubok glas* 'deep voice', *visok glas* '*high–pitched voice*' [Cro. lit. 'high voice'], *visoko pjevanje* 'high–pitched singing' [Cro. lit. 'high singing'], *tanak glas* 'weak voice' [Cro. lit. 'thin voice'], *sitan glas* 'tiny voice', *svijetli zvuk* 'light sound', *bistar zvuk* 'clear sound', čist *ton* 'clear tone' [Cro. lit. 'clean tone'], *jasan ton* 'clear tone', *tamni tonovi* 'dark tones', *povišeni tonovi* 'raised tones', *snižen ton* 'lower tone', *duboki registar* 'deep register', *visoki registar* 'high register', *lijepa glazba* 'pretty music', *vedar smijeh* 'cheerful smile', *velika buka* 'great noise', *slikovit govor* 'graphic speech', *ružne riječi* 'ugly words') and finally **taste** (e.g. *sladak glas* 'sweet voice', *meden glas* 'honeyed voice', *slatka melodija* 'sweet melody', *sladunjava glazba* 'saccharine music', *gorki tonovi* 'bitter tone', *ljuti uzvici* 'angry cries' [Cro. lit. 'hot [spicy] cries'], *gorki plač* 'heavy sobbing' [Cro. lit. 'bitter sobbing'], *gorki vapaj* 'bitter cry');
- nouns of **sight** are most often described by adjectives of **touch** (e.g. *tople boje* 'warm colors', *hladne boje* 'cold colors', *meka svjetlost* 'soft light', *nježno zelenilo* 'tender greenery', *lagano rumenilo* 'light blush', *oštra slika* 'sharp image', *hladan pogled* 'cold stare', *tupi pogled* 'dull stare', *hladne oči* 'cold eyes', *tople oči* 'warm eyes', *topli prizori* 'warm scene', *vrući prizori* 'hot scenes', *mlaka igra* 'tepid game', *blagi sumrak* 'mild dusk'), and less often by adjectives of **taste** (e.g. *kiseo osmijeh* 'sour smile', *gorak osmijeh* 'bitter smile', *kiselo lice* 'sour face', *gorke suze* 'bitter tears', *ljuti pogled* 'angry stare' [Cro. lit. 'hot [spicy] stare'], *sladak dečko* 'cute boy' [Cro. lit. 'sweet boy'], *sladunjav film* 'saccharine movie') and **hearing** (e.g. *drečave boje* 'flashy colors' [Cro. lit. 'loud colors'], *tiha dolina* 'silent valley', *tiha vatra* 'silent fire', *nijemi film* 'silent film', *nijema slika* 'mute image');
- nouns of **taste** are described by adjectives of **touch** (e.g. *blagi okus* 'mild taste', *lagani okus* 'light taste', *kremast okus* 'creamy taste', *svileni okus* 'silky

taste', *teško piće* 'heavy drinks', *teška hrana* 'heavy food', *teška gorčina* 'heavy bitterness', *blaga slatkoća* 'mild sweetness', *meka slatkoća* 'soft sweetness', *lagana gorčina* 'light bitterness', *nježna kiselina* 'tender acidity') and **sight** (e.g. *lijep okus* 'nice taste', *zanosan okus* 'gorgeous taste', *čist okus* 'clean taste', *prozračan okus* 'airy taste', *puni okus* 'full taste', *zaokružen okus* 'rounded taste', *velika gorčina* 'great bitterness', *divno jelo* 'wonderful meal', *prekrasno varivo* 'beautiful stew') and, in some cases, **hearing** (e.g. *reski okus* 'tart flavor' [Cro. lit. 'piercing taste'], *reska jabuka* 'crisp apple' [Cro. lit. 'piercing apple']);

- nouns of **smell** are described by adjectives of **touch** (e.g. *oštar miris* 'sharp, pungent smell', *mlak miris* 'tepid smell', *težak zadah* 'very bad breath' [Cro. lit. 'heavy bad breath'], *težak smrad* 'heavy smell', *težak vonj* 'heavy odor', *suhi miris* 'dry smell', *vlažan vonj* 'humid stench', *jedak vonj* 'acrid stench', *lagani parfem* 'light perfume', *blagi miris* 'mild smell', *puderasti miris* 'powdery smell'), **taste** (e.g. *sladak miris* 'sweet smell', *slani miris* 'salty smell', *pikantan miris* 'piquant smell', *gorak zadah* 'bitter stench', *kiseli smrad* 'sour reek', *bljutav smrad* 'stale reek', *ljuti vonj* 'sharp odor' [Cro. lit. 'hot [spicy] odor'], *kiselkast vonj* 'sour odor'), **sight** (e.g. *lijep miris* 'nice smell', *zavodljiv miris* 'seductive smell', *privlačan miris* 'attractive smell', *gadan smrad* 'disgusting reek', *prljavi smrad* 'dirty reek', *ružan vonj* 'ugly odor') and **hearing** (e.g. *reski miris* 'sharp smell' [Cro. lit. 'piercing smell'], *reski vonj* 'sharp odor' [Cro. lit. 'piercing odor']);
- nouns of **touch** are described by adjectives of **sight** (e.g. *visoka temperatura* 'high temperature', *niska temperatura* 'low temperature', *velika vrućina* 'big heat', *mala vrućica* 'small fever', *dubok dodir* 'deep touch'), **hearing** (e.g. *tih dodir* 'silent touch', *bučan poljubac* 'loud kiss') and **taste** (e.g. *ljuta bol* 'sharp pain' [Cro. lit. 'hot [spicy] pain'], *slatki dodir* 'sweet touch').

Based on the synesthetic transfers analyzed and illustrated within separate sensory domains, some tendencies of synesthetic transfers in Croatian can be determined in a general sense.

- In those syntagms that synestheticly link adjectives and nouns, the most frequent are adjectives of touch that modify nouns across all sensory domains (e.g. *topao glas* 'warm voice', *hladne boje* 'cold colors', *teška hrana* 'heavy food', *oštar miris* 'sharp, pungent smell'). This means that adjectives of touch are the most prone to creating secondary meanings through lexical synesthesia. Adjectives of smell have not been recorded in such syntagms.
- In syntagms that synestheticly link adjectives and nouns, nouns of hearing are the most frequent (e.g. čist *ton* 'clean tone', *oštar glas* 'sharp voice', *slatka melodija* 'sweet melody') and sight (e.g. *tople boje* 'warm colors', *kiseo osmijeh* 'sour smile', *nijemi film* 'silent film'), and nouns of touch are the least frequent (e.g. *visoka i niska temperatura* 'high and low temperature').

Preliminary data gathered for this article and the ensuing analysis of synesthetic transfers in Croatian mostly confirm Ullmann's hierarchy of sensory modalities. This is the order of modalities in Croatian:

TOUCH ⟶ TASTE ⟶ SMELL ⟶ SIGHT ⟶ HEARING.

To sum up, in synesthetic connections of nouns and adjectives, it is the sense of touch that gives the most and hearing receives the most.[14] On its margins or the farthest ends of the hierarchy of synesthetic transfers in Croatian, the findings are identical to hierarchies in non–figurative English (Day 1995–1996; Strik Lievers 2015), German (Day 1995–1996), Serbian (Dragićević 2007), Italian (Strik Lievers 2015) and Chinese (Yu 1992; Zhao et al. 2018). More precisely, the Croatian hierarchy is entirely identical to the English one and differs from others only in a single change in order (e.g. in relation to Serbian or German, sight and smell switch places). In relation to the initial Ullman's hierarchy, we observe a switch between sight and hearing on the right end of many recent hierarchies, which is not to be seen as a serious breach of the hierarchy of synesthetic transfers because Ullmann himself (1957: 283) stated that nouns of hearing are the most frequent targets of synesthetic adjectival description and sight and hearing are to be seen as equals on the right end of the hierarchy. In general, Ullmann's hierarchy and any hierarchy that has emerged from it is not to be interpreted as absolute, strict and universal, but rather as an indication of the basic tendencies of synesthetic connection between two lexemes. Considering that all possible synestheticly organized syntagms cannot be reviewed, recorded or imagined across all natural languages, we state here that any hierarchy is an illustration of the tendencies of synesthetic connections in the corpus observed and there is a considerable resemblance in the direction of synesthetic transfers in all languages investigated so far.

6. Why are there no fragrant sounds and smelly images?

In Cognitive Linguistics, the conceptual domain of space holds a special position as the dominant source domain that is mapped onto different abstract domains and helps their mental organization. Space is then a concrete domain *par excellence* that enables us to conceptualize abstract phenomena as visible three–dimensional locations, objects and materials. Mental mapping of space onto abstract domains enables the realization of lexical metaphors in which lexemes that primarily denote space are then used in their secondary meaning to denote time

14 Examples of synesthetic integration of nouns and verbs (e.g. *miris grize* 'smell (that) bites', *boje vrište* 'colors (that) scream', *buka ubija* 'noise (that) kills', čuti se *mejlom* 'talk via e–mail' [Cro. lit. 'hear each other via e–mail'], čuti miris 'to hear the smell'), adverbs and verbs (e.g. *visoko pjevati* 'to sing high', *duboko pjevati* 'to sing low' [Cro. lit. 'to sing deep']) and other word connections (e.g. *boja glasa* 'color of voice', *govor tijela* 'body language') are seldom found. This is why we designed the hierarchy of sensory modalities in Croatian according to the adjective–noun synesthetic syntagms, which means that in future research different other syntagms will have to be considered as well.

(e.g. *daleka prošlost* 'remote past', *bliska budućnost* 'near future'), abstract quantities (e.g. *visoka inflacija* 'high inflation', *niske cijene* 'low prices'), assessment (e.g. *velik umjetnik* 'great artist', *visoka moda* 'high fashion') etc. The salience of space as the source domain in metaphoric transfer is highlighted here in order to argue for the order of senses on the hierarchy of sensory modalities. Considering that sound does not exist as a visible or palpable object in space, words of hearing are exceptionally prone to descriptions with words from other sensory domains which provide a certain level of concreteness. This is why sound is on the right end of the hierarchy, as it remains in its primary domain and welcomes adjectives from all other domains. Smell is similar to sound in the sense that it "hangs in the air", i.e. it is not a concrete object in space, so words from the olfactory domain are more likely to be complemented by words from other domains than to be attributed themselves to these domains. If we observe the hierarchy of sensory modalities, we may notice that nouns of smell are most often joined by adjectives of the domains on the left, i.e. the adjectives of touch and taste (e.g. *oštar miris* 'sharp smell', *težak zadah* 'very bad breath' (Cro. lit. 'heavy bad breath'), *vlažan vonj* 'humid stench', *lagani parfem* 'light perfume', *bljutav smrad* 'stale reek', *sladak miris* 'sweet smell', *gorak zadah* 'bitter stench', *kiselkast vonj* 'sour odor'). The position on the hierarchy would make it seem so that the adjectives of smell will stand with the nouns from the right–side domains (sight and hearing), but this is not the case in non–figurative Croatian. In the previous paragraph, we have presented no synestheticly created syntagm with an adjective of smell. So, how did smell take its place mid–hierarchy and not right next to hearing? The vocabulary used to describe the domain of smell in Croatian is lacking, as in all languages mentioned, especially the adjectives in the domain which in essence comprise the antonymic pair *mirisan – smrdljiv* 'fragrant – smelly', while the vocabulary of sight is prolific. Hence, the number of words used to denote sensory domains highly impacts the statistics of synesthetic transfers and the creation of the hierarchy of sensory modalities.

7. The cognitive origin of lexical synesthesia

At the end of this paper, it is important to highlight once again that language is the main impetus for neurological synesthesia, but that neurological synesthesia is not the cognitive source for lexical synesthesia. Neurological synesthesia is the ability among the rare individuals to join together the sensations from various sensory domains into one unique sensation, i.e. to hear and see colored sounds or colored days of the week. Lexical synesthesia is the general language mechanism which enables the creation of secondary meanings of polysemous lexemes. Besides that, *rare* individuals with developmental neurological synesthesia are *aware* of their unique joint sensations, while lexical synesthesia is at the disposal of *all* speakers who are *not* even *aware* of it (Winter 2019: 71). The frequency of individual kinds of synesthetic integrations is not complementary between the neurological

and lexical fields. For instance, in lexical synesthesia the most common are palpable sounds (Ullmann 1957, 1962; Williams 1976; Day 1995–1996; Dragićević 2007; Strik Lievers 2015), while in neurological synesthesia the most common are colored sequences (Cytowic 1995, 2018; Novich et al. 2011). In general, in neurological synesthesia different non–visual sensations most often stimulate the sensation of color, which in turn is rarely found in lexical synesthesia. Neurological synesthetic integration is often motivated by sequences, numbers and letters (e.g. days of the week, months in a year, alphabet, etc.), which has no equivalent examples in lexical synesthesia (Winter 2019: 74). Finally, along with the canonical forms of developmental neurological synesthesia, we listed a set of its specific and rare manifestations and concluded that neurological synesthetic integration is not universal but unique and specific. On the other hand, all instances of lexical synesthesia are canonical; they are widely known and accepted, confirmed in dictionaries and are not the result of occasional and random integration of words from various sensory domains.

Lexical synesthesia as a *general* mechanism of language cannot be derived from neurological synesthesia as an *exceptional* human ability. The general lexical mechanisms originate from the general cognitive mechanisms and in this arrangement, lexical synesthesia is derived from the conceptual metaphor. However, the question arises whether lexical synesthesia is really founded on metaphorical grounds (only) (cf. Dragićević 2007: 157, 160; Strik Lievers 2017; Winter 2019: 67–77, 79–97). This doubt is laid out by the prerequirement of the metaphor to connect two entirely different domains of human experience. If we name a traffic sign a *zebra* (an animal in Africa), we really have connected two different domains. However, when the sensation from one sensory domain is closely defined by a word from another sensory domain, i.e. we call a color warm or a scent sweet, we remain in the same superordinate domain, that of PERCEPTION – and connect its subdomains. It is for this reason we pose the question whether lexical synesthesia can only be derived from the conceptual metaphor and if its metonymic sources should (also) be taken into consideration (cf. Barcelona 2014). Dirven (1985: 99–100) situates synesthesia halfway between metaphor and metonymy: different sensations can be considered contiguous and the proximity of entities within the same domain is the basis for metonymy; however, the motivation of the secondary meaning of an adjective synestheticly linked with a noun is not transparent and cannot be directly observed, hence the connection between synesthesia and metaphor. Some authors (e.g. Rakova 2003; Paradis and Eeg–Olofsson 2013; Winter 2019) have gone a step further and stated that lexical transfers between different sensory domains are not examples of polysemous lexemes whose secondary meanings are created through lexical metaphor, but monosemous lexemes of a very broad denotational range with several syncretic meanings.

Cytowic (2018: 102) states that neurological synesthesia illustrates how memory, embodied perception and metaphorical thinking are mutually supported

and give sense to utterances such as "Her name is green" or "Wednesday is indigo blue". He connects neurological synesthesia with metaphor exclusively and does not speculate about its metonymic foundation. Strik Lievers (2017: 87) states that the metaphorical foundation of lexical synesthesia is determined and default, not only because it is generally accepted but also because most authors who study synesthesia do not even question this. This is why we find it important to highlight that we also find it more acceptable that lexical synesthesia emerges from the conceptual metaphor rather than from the conceptual metonymy. Metonymic transfers are systematic, formulaic, predictable and will take in all words from the same semantic field. Lexical synesthesia is idiosyncratic, unpredictable and will take in only some words from a semantic field. For example, the Croatian sentence *Popila sam jednu čašu* 'I had a glass' clearly shows that the speaker is focused on the content of the glass. Similarly, uttering the sentences *Popila sam jednu bocu/šalicu* 'I had a bottle/cup/mug' or *Pojela sam pun tanjur/lonac/zdjelu* 'I had a full plate/pot/bowl' clearly points to the content in the containers listed. Comprehending the focus on the content is a consequence of the conceptual metonymy CONTAINER FOR CONTENT. On the other hand, there are *tople/hladne boje* 'warm/cool colors', but not **tople/hladne slike* 'warm/cool images'; there is *nježno zelenilo* 'tender greenery', but not **grubo zelenilo* 'rough greenery'; there is *visok glas/ton* 'high voice/tone', but not **visoka pjesma/glazba* 'high song/music'. Red is a warm color, but it is *not taken as default* because it "does not have the intrinsic property of being warm" (Strik Lievers 2017: 90). *Red* and *warm* are two different properties which do not belong to the same domain, so the syntagm *topla boja* 'warm color' is not a consequence of establishing metonymic shortcuts between close entities within the same domain, but of lexical synesthesia that creates connections between *some* entities from different sensory domains (*idem*). Therefore, we do not accept the view that the adjective *topao* 'warm' developed the secondary meaning connected with the color on the basis of metonymic shortcuts, but rather on the basis of the metaphoric transfer. Equally, we reject those interpretations that see the adjective *topao* 'warm' as a monosemous lexeme of broad denotation with several syncretic meanings and we present two reasons for this: first, these meanings are too far apart to be described by using a single dictionary definition; second, it is wrong to assume that native speakers of Croatian will automatically associate the adjective *topao* 'warm' with the property of being warm, and the property of color, and the property of kindness and affection, and the property of empathy. We agree with Strik Lievers (2017: 95) that lexical synesthesia is used to derive secondary meanings of polysemous lexemes and that lexical synesthesia is a separate kind of metaphor. Synesthesia differs from the typical examples of metaphoric transfer because the source and target domains belong to the same superordinate domain – the domain of PERCEPTION – but mark different and conceptually separate sensations which cannot be classified within the predictable metonymic patterns.

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Leksička sinestezija u hrvatskome jeziku

U prvom dijelu rada sažimaju se osnovne spoznaje o sinesteziji kao neurološkoj pojavi, nakon čega se sinestezija tumači iz lingvističke perspektive i određuje kao leksički mehanizam. Terminom *sinestezija* u neurologiji se označava osobita i rijetka ljudska sposobnost združene percepcije koja proizlazi iz urođene mogućnosti sjedinjavanja osjetâ iz različitih osjetilnih domena u jedinstven osjet. Ljudi koji vide obojene zvukove, osjećaju okus boja, doživljavaju bol ili orgazam u određenoj boji ili na kakav drukčiji način povezuju podražaje iz različitih osjetilnih domena nazivaju se sinestetima. Neurolozi izdvajaju pet osnovnih manifestacija neurološke sinestezije: obojene nizove (npr. sinesteti vide crvena slova ili plave brojeve iako su otisnuti crnom bojom), obojenu glazbu (npr. ritam, timbar i akord izazivaju sinestetima doživljaj boje), afektivnu percepciju (npr. bol, milovanje i šamar izazivaju sinestetima doživljaj boje), nevizualna združivanja (npr. sinesteti osjećaju gorke zvukove ili slane mirise) i prostorne sekvencije (npr. mjesece u godini sinesteti doživljavaju kao trodimenzionalne objekte). Jezik je glavni pokretač neurološke sinestezije, ali neurološka sinestezija nije kognitivni izvor leksičke sinestezije. Neurološka sinestezija sposobnost je *rijetkih* pojedinaca da združuju podražaje iz različitih osjetilnih domena u jedinstven osjet, a leksička je sinestezija *općí* jezični mehanizam koji omogućuje izvođenje sekundarnih značenja polisemnih leksema. Leksičku sinesteziju razumijevamo kao sintagmatsko povezivanje riječi kojima se primarna leksička značenja odnose na različite osjetilne domene, pričem jedna sastavnica sintagme zadržava primarno značenje, a druga aktivira sekundarno značenje izlazeći iz svoje primarne osjetilne domene (npr. *topao glas*, *hladne boje*, *kiseo osmijeh*, *sladak miris*). *Četiri su osnovna cilja ovoga rada: prvo, isključiti neurološku sinesteziju kao kognitivno ishodište leksičke sinestezije i naglasiti da ona izvire iz konceptualne metafore; drugo, u skladu s* postuliranjem konceptualne metafore kao kognitivnog mehanizma koji omogućuje realizaciju leksičke sinestezije odbaciti spekulacije o njezinoj utemeljenosti na konceptualnoj metonimiji; treće, sastaviti

opsežan katalog hrvatskih primjera leksičke sinestezije i opisati taj, dosad zanemarivan, mehanizam deriviranja sekundarnih značenja polisemnih hrvatskih leksema; četvrto, oblikovati ljestvicu osjetilnih modaliteta za hrvatski jezik. Na temelju ekscerptiranih hrvatskih sinestetskih sintagma koje povezuju pridjev i imenicu izolirali smo osnovne vrste sinestetskih transfera u hrvatskom jeziku i procijenili njihovu učestalost. Potaknuti uvidima Stephena Ullmanna o dominantnim tendencijama pri sinestetskim transferima, oblikovali smo ljestvicu osjetilnih modaliteta za hrvatski jezik: DODIR → OKUS → MIRIS → VID → SLUH.

Keywords: lexical synesthesia, Croatian language,, neurological synesthesia, hierarchy of sensory modalities, polysemy, conceptual metaphor

Ključne riječi: leksička sinestezija, hrvatski jezik, neurološka sinestezija, ljestvica osjetilnih modaliteta, polisemija, konceptualna metafora