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Lexical-semantic representation of body parts in Serbian child language[1,2]

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Although words for human body parts appear early in children's vocabulary, relatively little is known about the conceptual and semantic development related to the body part words in preschool and early school ages. In this paper, we examine how children at ages 5, 7 and 9 use words and expressions to refer to the human body and its parts, and how these correspond to the segmentation and lexicalization of the body part terms in adults. Participants were asked to name the body parts that were depicted in the drawings showing the whole body (front or back) and the face, with a red dot marking the specific part. The results of the comparison between children and adults indicate that for the most parts of arms, legs, and face there is a gradual conceptual segmentation of body with age, reflected in a decrease

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in the use of holonyms and an increase in the use of meronyms in naming parts. However, such hierarchical organization could not be confirmed for other parts (trunk, shoulders, neck, head, some parts of the face), revealing different pathways in the acquisition of words. Children of all ages, especially 7– and 9-year-olds, seek alternative solutions for naming the body parts for which labels are missing in their vocabulary. In such cases, they name adjacent body parts, internal organs, and parts of the skeleton, or use prepositional phrases to refer to the surrounding areas. The results are compared with the findings of the previous studies, while the lexical-semantic change in the body parts terms and the hierarchical organization of the body part lexicon in child language are discussed.

The results were compared in light of previous findings of the developmental studies, on the lexical-semantic change, and the hierarchical organization of the body part lexicon in child language.

Keywords: body parts, lexical development, semantic development, meronymy, early school age, Serbian language

Introduction

The human body has a special status during the development of an individual because through it we receive various impressions from our environment and from the body itself, we interact with the physical and social environment, but we also experience our body as one of the objects in the world. As argued by Ayres (1961), much of our knowledge of the world begins with the knowledge of our body.

According to Piaget (1952), a baby's body is a source of cognitive development in the first two years of life as it constitutes the main means of interaction with the surrounding environment (the sensorimotor stage of development). Majid (2010) has pointed out developmental evidence as an argument that the body has a special status in our early cognition: infants less than an hour old are able to imitate facial movements (Meltzoff & Moore, 1983). Further, there are also indicators of an innate ability to perceive and interpret body parts because even a few weeks old babies can imitate simple manual gestures (Meltzoff & Moore, 1977).

Although early body representation and early vocabulary for body parts have been relatively well explored, little is known about later conceptual development (from age 5 onward) in relation to body parts and children's word reference.

Levels of representation of the human body

Neuropsychological research recognizes three distinctive body representations, which change during ontogenetic development (Slaughter at al., 2002; Slaughter at al., 2004). The first is *sensorimotor body representation*, which is basic, because a child learns about the world around it early,

but also about its own body, through sensations from different senses, movements and their integration (Rochat, 2010). The second, *visuospatial body representation*, as derived from the sensorimotor representation, can be defined as a topological map of locations derived primarily from the visual input that defines the body part boundaries and proximity relationships. It includes knowledge of the structural organization of the body with its parts, which enables its recognition among other physical objects (Buxbaum & Coslett, 2001; Sirigu et al., 1991). Finally, the most abstract level of *lexical-semantic representation*, related to conceptual knowledge of the body, is mediated by the symbolic language-based means referring to body parts' names, functions and their association with objects (Camoes-Costa et al., 2011). Whereas sensorimotor representations are considered not to be accessible to consciousness, we have awareness of the other two levels of body knowledge. A number of studies investigated the early representation of the human body in infants and toddlers and yielded important empirical results, such as the following: a. detailed visuospatial representation develops by 15–18 months of age, b. visuospatial representation of the face developmentally precedes body representation, and c. 12-month-old infants are able to distinguish two bodies, but are unable to distinguish the scrambled bodies from the non-scrambled human bodies (Müller & Liebermann, 2004).

In an earlier study 5– to 12-year-old participants were asked to assemble a human figure from 37 body parts and it was found that they knew the position of the trunk, head, and legs before they learned the position of the arms and hands (Gellert, 1975). A similar progression was found in the task of drawing a human figure which showed that the vertical orientation of the body was learned first. Before the children recognized the spatial relationships between specific parts, they showed that they knew of the existence of parts and first represented the parts that were important to them (Harris, 1963, after MacWhinney et al., 1987).

The focus of our research will be on the investigation of the development of the lexical-semantic representation of the body, as well as on the changes in the body parts' lexicon at different ages.

Universal vs. language-specific representation of body parts

The anatomical structure of the body can help speakers of different languages to encode parts of the human body based on perception and segmentation that are culturally universal. Since it is a physical object, assigning the names for the body and body parts may seem pretty straightforward and easy to grasp. Thus, previous research attempted to determine the universal perceptual and cognitive factors that shape the conceptual categorization in different semantic domains of language. Brown (1976) compiled empirical evidence

on cross-linguistic issues related to the anatomical partonomic (meronomic) organization of body parts. He concluded that human anatomical partonomy applied to both the body perception and nomenclature. It implies that speakers acquire body part terms in association with the particular labels available in adult language and in accordance with the natural partonomic organization of the body. Significant for our study, Liston (1972) examined the hierarchical organization of the head, trunk, arms and legs in the Serbo-Croatian language, and proposed an overview of the part-whole hierarchy in three to six[4] levels (e.g. *telo* 'body', *ruka* 'arm', *šaka* 'hand', *prst* 'finger', *nokat* 'nail', *noktište* 'half moon'). When it comes to the semantic relationship between the meanings of two lexical units, where the part-whole relationship connects two entities, one denoting a part of a whole and the other denoting that whole, we speak of *meronymy* (Croft & Cruse, 2004; Dilparić, 2012). Although the meronymy of human body terms is one of the most developed meronymies, it does not exceed six levels of hierarchy in depth in any language, which means that meronymy generally consists of a small number of levels of hierarchy. This shows that the standard Serbian language has developed lexis related to the segmented representation of the body and the high granularity of the description of the human body.

However, comparative studies showed that the human body may be conceptualized differently in different cultures, implying that the semantic features of the body part lexicon were not universal. Wolff and Malt (2010, p.7) pointed out that, given the available empirical material, "there may be few or no domains of human experience in which the vocabulary words covering the domain map cleanly onto one another across languages".

Segmentation of the body and extension of its parts have different granularity across languages (Burenhult, 2006; Enfield et al, 2021; Huisman et al., 2021; Terrill, 2006). Lukavele, a Papuan language of the Solomon Islands, has only one general term for arm, leg and foot (Terril, 2006). Speakers of Japonic languages exhibit large variation in the extension of head terms: Tohoku, Amami and Okinawa speakers generally exclude the face from a head word, while Miyako and Yaeyama speakers include it (Huisman et al., 2021). Jahai speakers (the Malay Peninsula) use different terms for anatomic details, but lack lexical terms for major body parts such as the 'trunk', 'limb', 'arm', and 'leg' (Burenhult, 2006). Research also revealed more specifically that both diversity and the universally shared patterns can be observed cross-linguistically (Devylder et al., 2020).

Early body part vocabulary

Words that refer to body parts are among the first words in children's vocabulary. Some of the widely utilised developmental assessments use body

4 In Brown's terms, it would be five levels, since the first 'body' is Level 0, not Level 1.

part identification as one of the measures of language development, cognitive development and adaptive behaviour, e.g. Gesell Developmental Schedules (Gesell & Armatruda, 1947), the Bayley Scales of Infant Development (Bayley, 1969), Stanford-Binet Test of Intelligence (Terman & Merrill, 1973), Peabody Picture Vocabulary Test (PPVT-III, Dunn & Dunn, 1997) and CDIs (Fenson et al., 2006).

The findings of the studies that investigated the early body part vocabulary (up to 4 years) show that words for the head and facial features are typically the first labels to be learned, followed by the names for arms and legs and fingers and toes (Camões-Costa et al., 2011; Cratty, 1970; MacWhinney et al., 1987; Slaughter et al., 2004), as well as that the words for joints and less salient body parts (e.g., the wrist, ankle, elbow, chin and neck) are acquired only later (MacWhinney et al, 1987; Witt et al., 1990). Further, it has been shown that the functions of salient and visible body parts which have easily identifiable and unique functions (such as sensory organs of the face, hands and feet) are learned earlier than the functions of other parts (Gellert, 1962; Jaakkola & Slaughter, 2002). In sum, these studies demonstrate that the perceptual salience of body parts, the tendency of parents to frequently comment and act on them as part of children's everyday routine (washing hands, face, ears, wiping nose, etc.) and exposure to a large amount of sensory input early on, affect which body parts labels will be learned first.

Research that systematically explores the development of the lexical-semantic representation of the human body is relatively rare (especially in recent decades), but the research that examines partonymy or the hierarchical organization of the body as part of lexical-semantic development is especially rare. Andersen (1978) revealed that young children first acquired the terms that belonged to a middle level of hierarchy: the eye and ear are acquired before the eyelash or earlobe, and before the head and body. Johnson and Kendrick (1984) tested English speaking preschool children (3, 4 and 5 years) by the mereology judgment task and asked them about a touched body part "Is this part of my arm?". It turned out that young children were sensitive to the difference between the labelled and unlabelled body parts (e.g. lower arm) and tended to identify all known labelled body parts as separate and unrelated to other labelled parts. Older children tended to accept the "part of" organization at all levels of hierarchy, but had difficulty with non-immediate relations between parts of parts of parts.

Body part vocabulary in preschool and early school years

Although the development of the body parts vocabulary at early ages has been relatively well explored, less is known about it in preschool and early school years.

In their study, Auclair and Jambaqué (2015) asked children 5 to 11 years of age to name the isolated body part pictures and found that their performance was better for facial body parts relative to other body parts, i.e. that the precedence in body knowledge for parts of the face persisted in older children. Additionally, they found that naming depictions of the upper and lower limbs, whose involvement in actions is easily recognized, was easier than naming of other body parts, whereas recognition of joints was still poor even at age 9. The results suggest that lexical-semantic body knowledge that develops at school age is still strongly determined by visuospatial representation, which develops much earlier.

Crowe and Prescott (2003) tested children between 5 to 10 years old (N=155, three age groups, mean ages 5:9, 7:7 and 10:0) in a semantic fluency task (freelisting), using body parts in order to understand the changes in memory organisation during this period of childhood. Children were told to produce all the body parts words they could remember during 1 minute. In addition to an increase in naming of body parts with age, the study showed that participants produced separate clusters for facial parts and other body parts. and that younger children were less productive with internal organs than older children. The authors recognized two underlying dimensions of organisation as the basis of clustering for body parts. The first was a topological basis for clustering (naming parts that were close together), based around a principal distinction between the head and the trunk. The second was functional, evident in the clustering of limbs (arm–leg) and, in older children, of joints (shoulder, elbow and knee), digits (finger–toe), and related internal organs (bone–muscle, heart–lung and kidney–liver) (Crowe & Prescott, 2003).

These findings are in line with the pertinent literature which show that preschool and school children's functional knowledge on internal organs is more elaborated within the formal education regarding the biology of human body (Carey, 1985; Inagaki & Hatano, 2002; Jaakkola & Slaughter, 2002).

It is also in accordance with the findings that children's words do not always refer to the same categorical structures that adults' words do, since children may associate their terms with different concepts (Lucareillo et al., 1992; Nelson, 1996; Nelson & Nelson, 1990; Yu & Nelson, 1993).

Aims

In this paper, we explore how the segmentation of the body and the lexicon referring to its parts in adult Serbian language are mirrored in the segmentation of the body and the lexicon of Serbian-speaking children at preschool and early school ages. Our starting point is that adult language is a model that codifies human experience with physical and social reality and thus shapes, delimits, connects and organises all segments and aspects of that experience.

The hierarchical organization of the lexicon of the human body, proposed by Liston (1972) for Serbian and by Brown (1976) for other 40 languages, is to be questioned as universal on the basis of the results of developmental research. In the acquisition of the vocabulary related to body parts, children are driven primarily by input, i.e. adult language, but also by their own sensorimotor, perceptual, and social experiences related to the body. More general age-related developmental constraints, such as the cognitive/conceptual development, the development of attention, memory, and pragmatic skills can also intervene significantly, as well as the specific knowledge on the body structure and functions of the body parts usually gained in formal education. These developmental and educational constraints influence how the body is represented not only in children's, but also in adult language, which will be discussed in the final section of the paper.

The study is grounded in two groups of previous developmental findings. The first group shows that natural features of the human body and its parts are perceptually available and present in the conceptualization and naming in children aged 1 to 4: a. an innate and early manifested ability to perceive the human body and imitate facial movements and simple manual gestures (Meltzoff & Moore, 1977; Meltzoff & Moore, 1983), b. the potential for early development of sensorimotor and more complex levels of body representation (Rochat, 2010; Slaughter et al., 2004), and c. early acquisition of body part words (Brownell et al., 2010; Camoes-Costa et al., 2011; MacWhinney, et al. 1987; Waugh & Brownell, 2015; Tincoff & Jusczik, 2012; Witt, Cermak & Coster, 1990).

The second group includes the findings collected from children aged 5 to puberty, revealing that: a. there is a prolonged conceptualization of the body structure with the gradual refinement of the semantic features of the body part words (Auclair & Jambaqué, 2015; Carey, 1985; Crowe & Prescott, 2003), b. identical children's and adults' words do not always refer to the same categorical structures (Lucareillo et al., 1992; Nelson, 1996; Nelson & Nelson, 1990; Yu & Nelson, 1993), and c. there is a significant contribution of formal education to conceptual development within biological knowledge (Inagaki & Hatano, 2002; Jaakkola & Slaughter, 2002).

Hypotheses

Because of developmental constraints, we expect that the segmentation of the body and naming of its parts in children (especially younger children) differ to some extent from the segmentation and naming of adults.

The main hypotheses of the study are hence as follows:

1. Adult participants will exhibit high granularity in the naming body parts task, thus revealing the hierarchical organization of the body, and

use specific terms based on the highly differentiated lexicon for body parts in the Serbian language: head, arm, leg, hand, foot, fingers, toes, face, chest, shoulders, etc. (Brown, 1976; Liston, 1972).

2. Based on the previous developmental findings on the early acquisition of numerous body parts terms, we expect the children participants of all ages to use a number of different terms referring not only to main body parts, but also specific terms for subparts such as the hand, foot, fingers, knee, eye, nose, ear, mouth, etc., included in everyday sensorimotor routines (Andersen, 1978; Brownell et al., 2010; Camões-Costa et al. 2011; Gesell, 1940; MacWhinney et al., 1987; Waugh & Brownell, 2015; Witt et al., 1990).
3. Based on previous developmental findings on the prolonged lexical-semantic development in child language in the field of body biology and other semantic domains (Auclair & Jambaqué, 2015; Inagaki & Hatano, 2002; Jaakkola & Slaughter, 2002; Lucariello et al., 1992; Markman, 1981; Nelson & Nelson, 1990; Nelson, 1996; Yu & Nelson, 1993; Reggin et al., 2021; Sell, 1992), we expect the children to use less specific terms and respond with less segmentation and granularity in naming body parts than adults, which is expected to change with age. We also expect the greatest deviation from the language of adults in the youngest children, reflected in the diversity of lexeme selection in responses.

Methods

The human body lends itself to this type of research because it is a natural object whose semantic representations encompass a limited domain with a specific and apparent structure, which can be observed separately and controlled methodologically. In this case, the possibility of arbitrary variation in the number and the semantic features of lexemes is relatively limited.

The study was conducted in two phases. The first phase was a part of a cross-linguistic study on the semantic systems within languages. Data were compiled from the native language-speaking adults by using the visual presentation of body parts (Jordan et al., 2009) and a standard elicitation task of naming for the purposes of the EOSS project[5] (Majid et al., 2010).

In the second phase, the same task and procedure were implemented to test the children of preschool and early school ages (see the *Participants* section) for the purpose of exploration of the body parts naming from the developmental perspective in the Serbian language. The study was conducted by the members of the Serbian team of the EOSS consortium.

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5 The *Evolution of Semantic Systems* project was supported by the Max Planck Gesellschaft.

Stimuli and Procedure

Participants were asked to name the body part on which a dot was located (*Figures 1* and *2*). The stimuli consisted of a set of 90 drawings, 70 of the whole body (front, back) and 20 of the face/head, with a red dot marking the specific body part (Jordan et al., 2009). The instruction for participants was translated from English to Serbian and back-translated for the translation control purposes (Appendix 1).

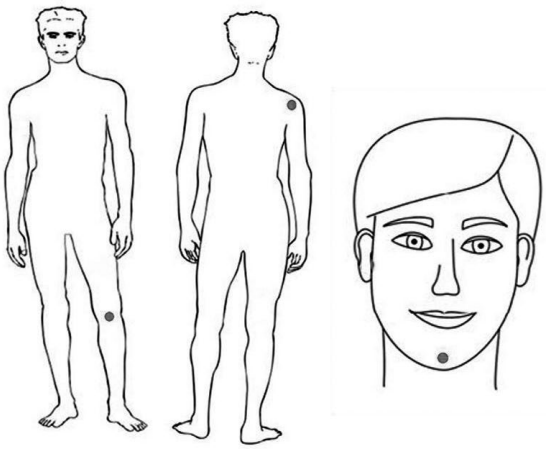


Figure 1. The body part naming task: three examples of the stimuli (knee, shoulder, and chin). Only one dot appeared on each picture, while the pictures changed one after another.

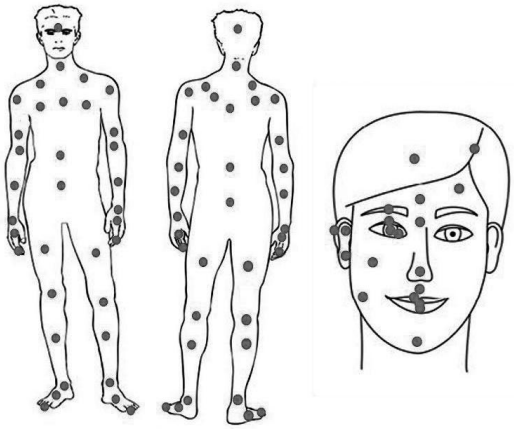


Figure 2. The body part naming task. The locations of the dot depicted the body parts to name.

The body part naming task. The testing was conducted with each participant individually in a quiet room and lasted for 10 to 15 minutes. One experimenter was interacting with the participant (giving instructions, posing questions, and showing pictures), and the other was taking notes on the participant's answers. The answers were audio recorded and transcribed in full length in order to be coded. Transcription was conducted according to the EOSS Procedure Manual (Majid et al., 2010)

The procedure with the children was slightly modified to support their participation. In the responses of some children, it became clear that they did not pay attention to the orientation of the figure, e.g., the dot was on the back trunk, while a child said *belly*. In such cases, the experimenter asked the child: *How is the man oriented, in which direction is he looking?* In all cases, the child immediately provided an alternative answer. In addition, children sometimes kept silent, without words, or said: *I don't know*. In these cases, the experimenter provided assistance by saying: *Show me where it is on your body*, or asking: *If you were bitten by a mosquito at this point* (the experimenter would point to the child's body part), *what would you say: a mosquito bit me – where?* These would help and the child would go on answering, at least to the next drawing.

Participants

Both children and adult samples were convenient and included 90 participants, who all gave their consent for participation in the study. The adult sample data were compiled within the cross-linguistic EOSS project (Majid et al., 2010) and consisted of 24 native Serbian-speaking monolingual undergraduate students of psychology at the University of Belgrade, Serbia. This part of the study received the ethics approval from the Ethics Assessment Committee of the Faculty of Arts and the Faculty of Philosophy, Theology and Religious Studies (EAC Humanities) at the Radboud University Nijmegen.

The children's sample was recruited from a public kindergarten and a primary school in the urban area of Belgrade and was selected from three age groups: preschool 5-year-olds, and school 7– and 9-year-olds. The criterion for the participants' exclusion was early bilingual experience in the family. Other demographic characteristics of the sample are presented in Table 1. Children's parents gave a written informed consent prior to testing. Along with the consent form, parents received an information sheet about the aims of the research and the procedure. The final recruitment was based on the child's voluntary participation. The developmental part of the study received the ethics approval from the Institutional Review Board (IRB), Department of Psychology, University of Belgrade – Faculty of Philosophy.

Table 1
Demographic characteristics of participants (N = 90)

Age group	**N**	**Mean age**	**Age range**	**female**	**male**	**Educational institution**
5 years	23	5;1	4;6 – 5;7	11	12	preschool
7 years	21	7;4	6;11 – 7;9	11	10	1st grade prim. school
9 years	22	9;2	8;10 – 9;9	11	11	3rd grade prim. school
Adults	24	19;3	18;11–19;7	12	12	university

Transcription and coding

Considering that numerous body parts have corresponding conventional names, one might assume that obtaining information from a dictionary of the standard Serbian language would be sufficient for gaining insight into the adult language. However, this research is based on the assumption that the word list of the standard dictionary does not provide complete information about the words and that it is important to collect data about the actual use of lexemes.

In accordance with the Procedures Manual (Majid et al., 2010) and the aims of the study, respondents' answers were transcribed verbatim and then coded. The aim of coding was to extract from each participant's answer the conventional Serbian word/phrase the respondent used to designate a particular part of the body. The coding enabled us to distinguish the use of lexemes of the standard Serbian language from the spontaneously produced non-conventional labels.

Monolexemic responses (*oko* 'eye' and *ruka* 'arm') were coded in the basic form of the word (lemma). Lexicalized and conventional multiword expressions such as *ušna školjka* 'earlobe' and *štitna žlezda* 'thyroid gland' were coded as polylexemic phrases. Complex descriptive non-conventional responses such as *gornji deo ruke* 'upper part of the arm' were reduced to the lexical core item *ruka* 'arm'. Prepositional phrases referring to particular body parts, such as *na licu* 'on the face', were reduced to the lexical core term *face*. On the other hand, prepositional phrases referring to the areas around body parts, such as *ispod ramena* 'below the shoulder' or *pored stopala* 'near the foot', were coded as prepositional phrases 'below the shoulder' and 'near the foot' because they referred to the areas around. Complex prepositional phrases that could not be decomposed in denoting a specific body part (as it would result in a change of meaning), such as *između nosa i usta* 'between the nose and mouth', and *između očiju* 'between the eyes', were coded in the full form.

The coding enabled us to produce the exhaustive list of unique participants' answers in both the adults' and children's samples.

Analysis

Our analysis included two phases – the qualitative and quantitative. In the qualitative analysis, the participants' answers were divided into different categories depending on their semantic content, i.e. their referent. The following eight types of answers were found in the uniques lists of responses:

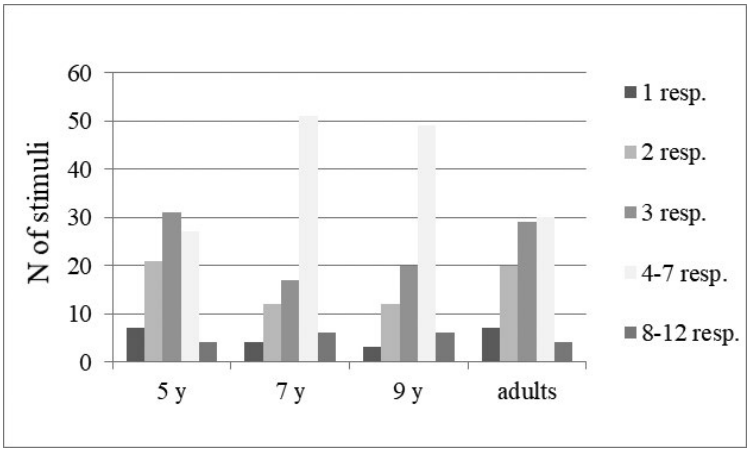
a) Holonym (H) – a generic response denoting a larger body part including the critical (smaller) part which is represented by another specific word; a term denoting a whole, a part of which is denoted by a second term; e.g., the word *arm* is a holonym of the word *hand*.
b) Meronym (M) – a specific term referring to a critical body part; a term denoting a part which is in a part-of relationship with its holonym. For example, *finger* is a meronym of *hand*, which is its holonym.
c) Adjacent body part terms (Adj) – the responses referring to adjacent parts or areas which are diffusely demarcated from the critical part; e.g., the *stomak* 'belly' provided for the picture referring to the chest. It revealed unclear borders between the parts/areas.
d) Prepositional phrases (PP) – the answers referring to the areas around body parts, e.g., *below the elbow*, and complex prepositional phrases which could not be decomposed, e.g., *between the eyes*, or *between the nose and mouth*.
e) Skeleton (Sk) – the responses referring to the parts of the skeleton, e.g., spine, scapula, vertebra;
f) Internal organ (IO) – the answers referring to internal organs inside that part of the body, e.g., brain, kidney, lungs;
g) Don't know answers (DK);
h) Error (Er) – the answers referring to a completely different part of the body unrelated to the critical one, e.g. *pazuh* 'armpit' for the Front_ankle_left.

The quantitative analysis provided the frequency of response types and enabled comparisons of their distribution across age levels based on the adult responses as a target. The differences between the responses of adults and children at three age levels were statistically tested by chi-square.

Results

Diversity of responses

Most stimuli elicited a large number of different lexemes (up to 12 different responses per stimulus), and the distribution of the number of different responses varied significantly by age: $\chi^2(12) = 25.370$, $N = 360$, $p < .013$ (Graph 1). The increase of diversity is visible at the age of 7 and 9 years, while the 5-year-olds' and adults' responses were less divergent.



Graph 1. Diversity of responses per stimuli across age.

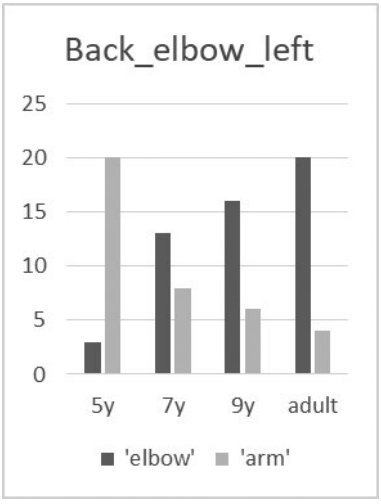
Body parts which elicited the least diversity of responses

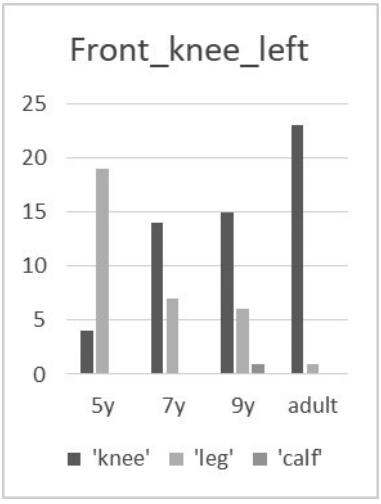
Of the total of 90 stimuli, only two items always elicited the same response in all participants: the drawing Lower_ear always elicited *uvo* 'ear', while the Nose always elicited *nos* 'nose'.

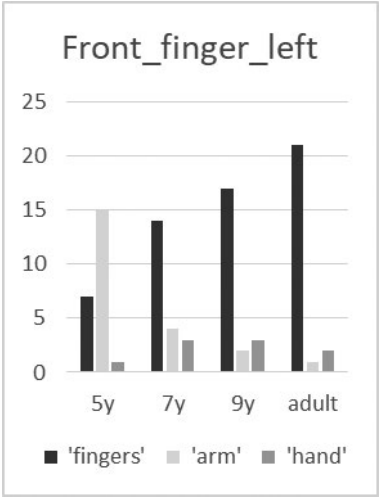
Stimuli with the least response diversity (maximum 3 different responses) also included: Back_elbow_left and right, Back_knee_left and right, Front_toe_left and right, Back_finger_left[6], Upper_ear and Outer_ear, Upper_lip, and Pupil. Graph 2 shows that all of these elicited a systematic decrease in the use of holonyms with age (e.g. *ruka* 'arm', *noga* 'leg', *oko* 'eye') and an increase in the use of meronyms (e.g. *lakat* 'elbow', *koleno* 'knee', *zenica* 'pupil'). It should be emphasized that the stimuli representing the paired body parts, such as the left and right arm or leg, received an almost identical distribution of responses. However, the transition from generic to specific terms (from holonyms to meronyms) was not recorded in the case of Upper_ear and Outer_ear, where the prevalent use of the generic *uvo* 'ear' remained dominant across age, while the lexicalized and conventional expression *ušna školjka* 'earlobe' was used very rarely. These results show that, for example, the arm and eye in child language could be segmented into smaller parts with specific terms, while the earlobe is rarely perceived and named separately from the whole ear in the Serbian language.

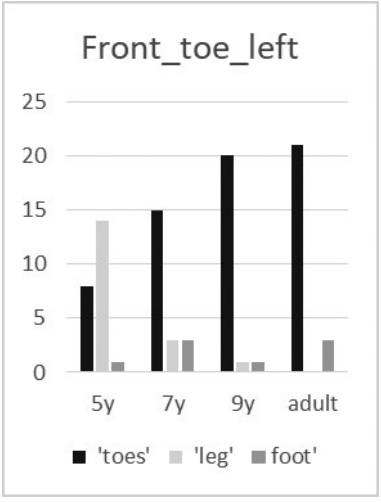
These differences in the perceptual and lexical partialization of body parts will be discussed in more detail in regard to other parts of the body.

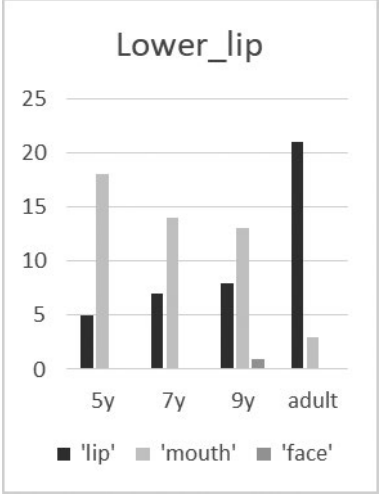
6 The whole body was presented from the back, while the dot was located at the fingers.

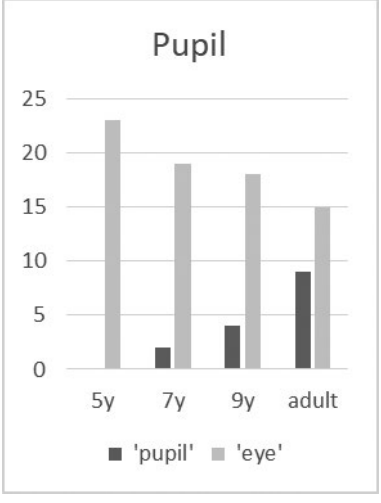

Back_elbow_left
25
20
15
10
5
0
5y
7y
9y
adult
'elbow'
'arm'

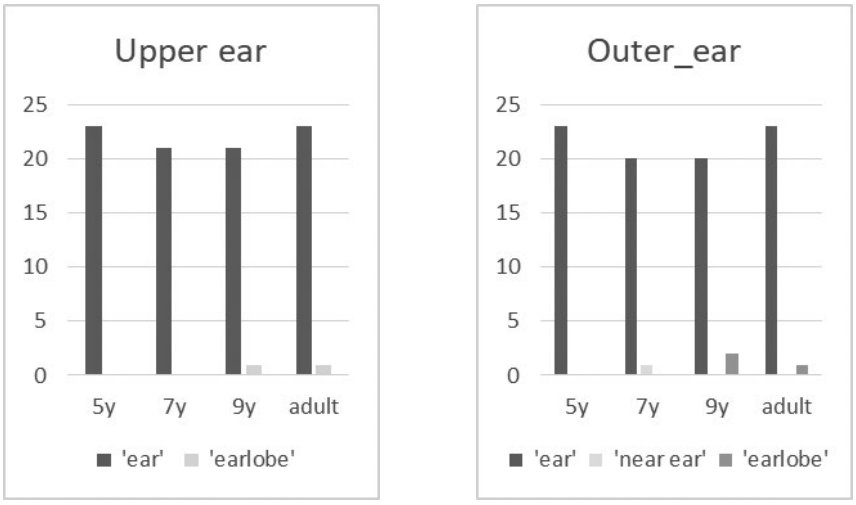

Front_knee_left
25
20
15
10
5
0
5y
7y
9y
adult
'knee'
'leg'
'calf'


Front_finger_left
25
20
15
10
5
0
5y
7y
9y
adult
'fingers'
'arm'
'hand'


Front_toe_left
25
20
15
10
5
0
5y
7y
9y
adult
'toes'
'leg'
foot'


Lower_lip
25
20
15
10
5
0
5y
7y
9y
adult
'lip'
'mouth'
'face'


Pupil
25
20
15
10
5
0
5y
7y
9y
adult
'pupil'
'eye'



Graph 2. The number of responses elicited by the stimuli with the least response diversity at different ages.

1.2 Body parts which elicited the greatest diversity of responses

As presented in Graph 1, most stimuli elicited a variety of responses. The largest number of different responses in this study was triggered by the drawings Under_nose and Front_chest presented in Appendix 2.

In a very diverse list of responses to the stimulus Under_nose (Appendix 3), the most frequent was the response which referred to an adjacent body part *nos* 'nose' (Adj), then the prepositional phrase *ispod nosa* 'under the nose' (PP) and the holonym *lice* 'face' (H). They were followed by the complex prepositional phrase *između nosa i usta* 'between the nose and mouth' (PP), then the lexical term referring to another adjacent body part *brkovi* 'moustache' (Adj), the expression *iznad usta* 'above the mouth' (PP) and other words and phrases with a low frequency. A large diversity of responses evenly spread within and across ages was obviously caused by the lack of specific and widely accepted terms for the particular body part in the Serbian language.

Regarding the Front_chest (Appendix 2), there was a systematic increase in the use of the meronym *grudi* 'chest' (M) with age and a decrease in the use of the term referring to an adjacent body part *stomak* 'belly' (Adj). Besides the conventional two-lexeme meronymous answer *grudni koš* 'chest cavity' (freq=3), the frequency of other options suggested by adults was 1 or 2. The distribution brings clear evidence that the conventional meronym *grudi* 'chest' is not widely used in young children due to a relatively weak segmentation and diffuse boundaries between the meaning of other terms related to the central forebody.

A developmental change was also observed in the following data (Front_chest, Appendix 3):

a) Children sometimes used the holonym *telo* 'body' (H) and the adjacent internal organs *srce* 'heart' and *pluća* 'lungs'(IO), which were all missing in the adults' responses;
b) Adults sometimes used multi-lexeme holonyms: *prednji deo tela* 'forebody', *gornji deo tela* 'upper body'. These are semantically less specific than the meronym *grudi* 'chest', but they are conventional in adult Serbian language, and were missing in the children's answers of this experiment;
c) Instead, children sometimes used the prepositional phrases referring to areas (*blizu ramena* 'near the shoulder', *blizu vrata* 'near the neck', and *između grudi* 'between the breasts'), which were all missing in the adults' responses.

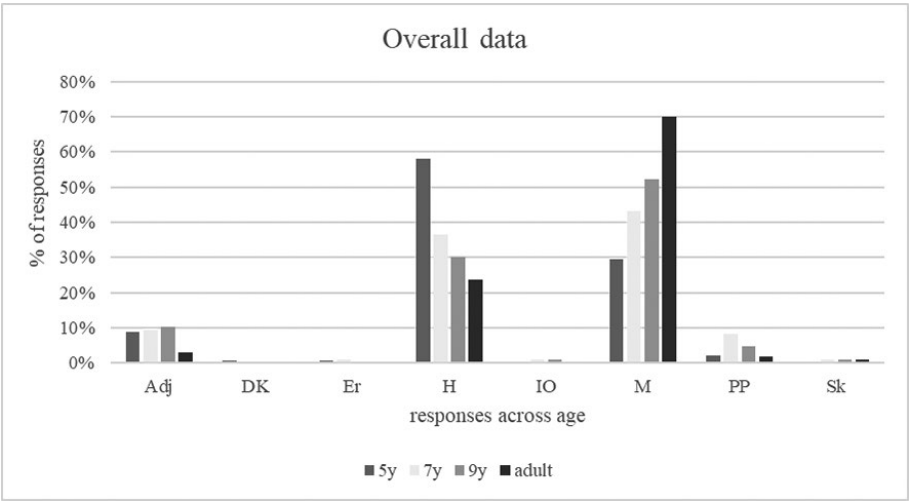
Further quantitative analysis will make it possible to verify this trend on the entire sample of stimuli and respondents.

1.3 Development of the body part lexicon: Transition from holonymy to meronymy

The adult production in this study represents the target body parts lexicon of the Serbian language towards which the language of all children tends to develop. So far, we have provided initial evidence that the degree of granularity of adults and children's terms for naming the body parts does not fully correspond. To examine these differences in more detail, we explore the distribution of response types within an overall set of data, and then across the main segments of the body: the leg, arm, shoulder, trunk, neck, and head.

1.3.1 Overall data

Graph 3 shows significant differences in the percentage of response types calculated on overall data for the participants of all ages: $\chi^2(21)=1044.936$, N=8083, p<.001. Holonyms (H) and meronyms (M) were found to be the most common response types. Note again the systematic decrease in the use of H and the increase in the use of M with age, as well as the low prevalence of other response types found in all age groups: the responses referring to adjacent body parts (Adj), prepositional phrases (PP), responses referring to internal organs (IO), parts of skeleton (Sk), errors (Er) and don't know (DK) answers. The overall frequency of these response types in the total sample of responses is very low (Graph 3), but two categories nevertheless stand out – Adj and PP.

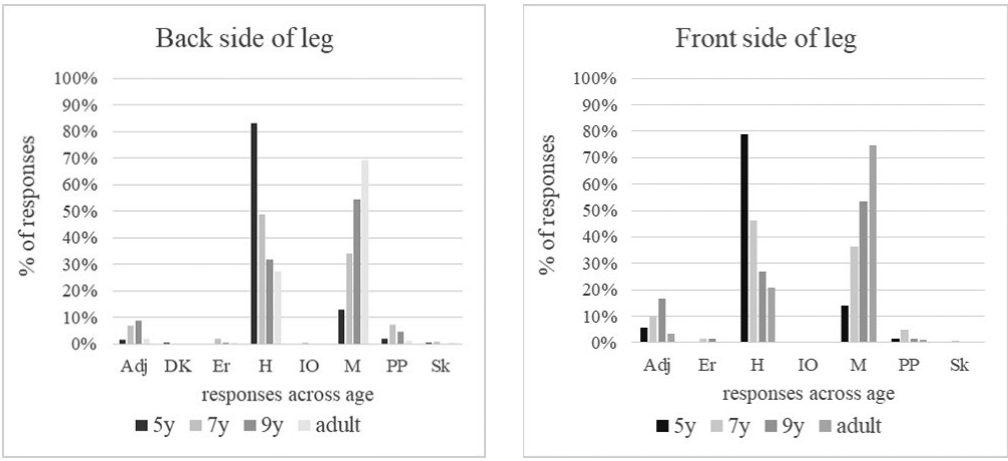


Graph 3. Different types of responses across ages: adjacent body part (Adj), don't know (DK), error (Er), holonym (H), internal organ (IO), meronym (M), prepositional phrase (PP), skeleton (Sk).

It is important to note here that the method applied in this study limited the exploration of the usage of the term *telo* 'body', since none of the stimuli referred to the body as a whole, but to its subparts. Nevertheless, the response *telo* 'body', appeared sometimes among younger children when referred to the back and chest, and once among adults when referred to the chest**.** It was coded as a holonym (H).

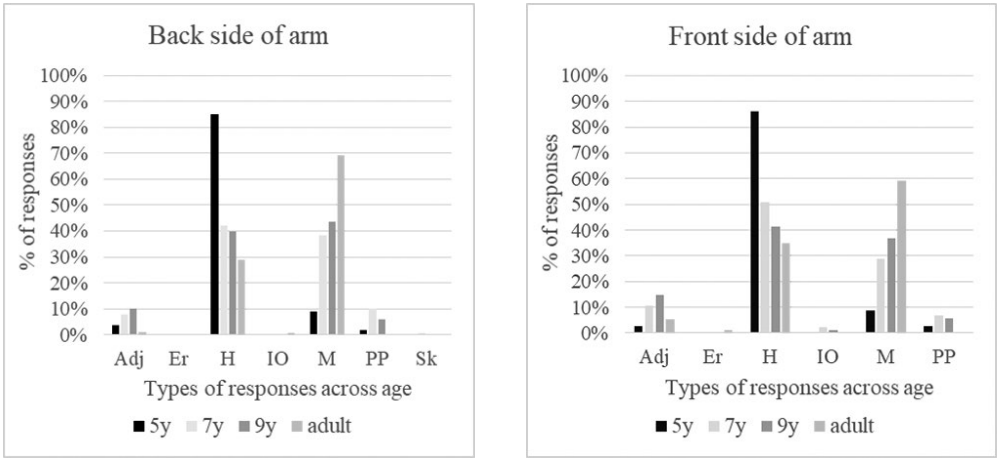
1.3.2 Legs and arms

The same trade-off between holonymy and meronymy was elicited by the drawings of leg parts: the front side $\chi^2(15)=308.75$, N=1078, $p<.001$, and the back side $\chi^2(21)=284.704$, N=1079, $p<.001$ (Graph 4). The distribution for paired body parts (e.g. the arm, hand, leg, knee) was almost identical, so only one side will be presented and discussed. Besides the transition from holonymy to meronymy across age, the data suggest that the responses referring to adjacent body parts (Adj) were slightly more frequent for the front than for the back side.



Graph 4. Different types of responses to leg parts: adjacent body part (Adj), don't know (DK), error (Er), holonym (H), internal organ (IO), meronym (M), prepositional phrase (PP), skeleton (Sk).

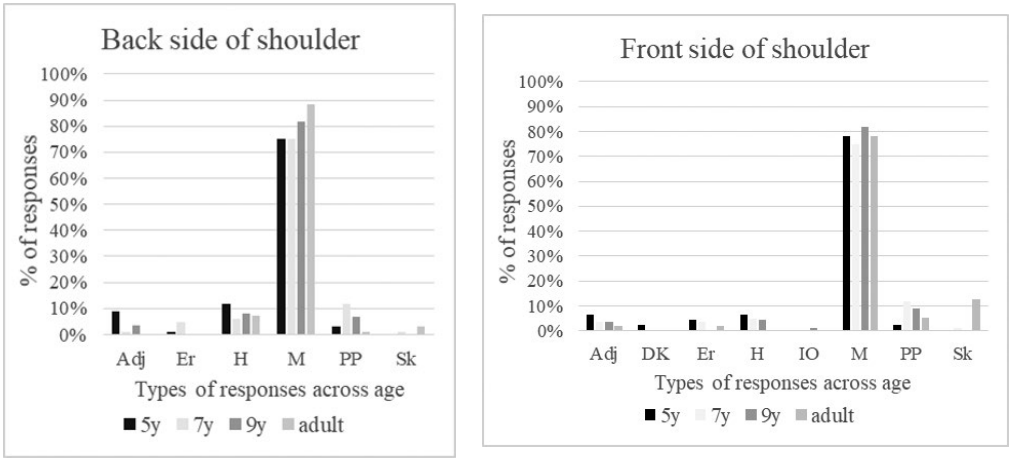
The distribution of response types across ages was also tested for the arm parts, and the transition from holonyms to meronyms was recorded: the front side of the arm $\chi^2(15)=257.669$, N=1080, $p<.001$, and the back side of the arm $\chi^2(18)=300.815$, N=1080, $p<.001$ (Graph 5). Adjacent body part responses were again somewhat more frequent for the front of the arm.



Graph 5. Different types of responses to the arm: adjacent body part (Adj), don't know (DK), error (Er), holonym (H), internal organ (IO), meronym (M), prepositional phrase (PP), skeleton (Sk).

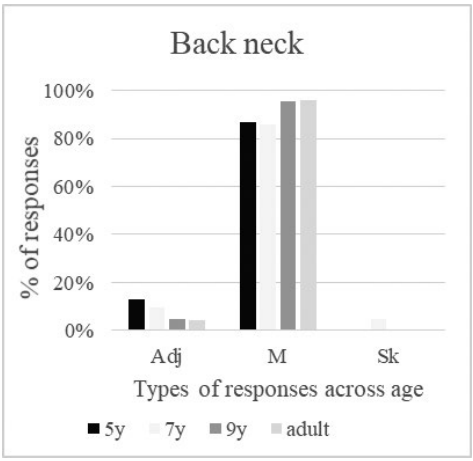
1.3.2 Shoulders and neck

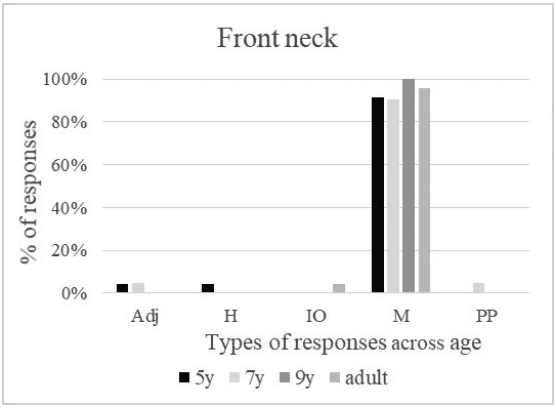
In contrast to the findings for legs and arms, where a transition from holonymy to meronymy is clearly evident, there is no such developmental trend when it comes to shoulders (Graph 6) – the meronym *rame* 'shoulder' is dominant in both the front and back of the body. The holonymic responses *leđa* 'back' and *ruka* 'arm' were rare: *ruka* never appeared in adults' responses and very rarely in children's. The reference to the adjacent parts such as *vrat* 'neck', and *pazuh* 'armpit' (Adj) were also rare. The usage of the meronym *rame* 'shoulder' is stable in all ages.



Graph 6. Different types of responses to the shoulder: adjacent body part (Adj), don't know (DK), error (Er), holonym (H), internal organ (IO), meronym (M), prepositional phrase (PP), skeleton (Sk).

No developmental change was found in the neck (Graph 7) presented by the drawings Front_throat and Back_neck (Appendix 2). Participants of all age groups predominantly used the specific term *vrat* 'neck' for both sides and rarely the term *grlo* 'throat' for the front (also coded as M). Adjacent parts were rarely referred to (*kičma* 'spine', *rame* 'shoulder', and *potiljak* 'occiput'). The adjacent *glava* 'head' was used only at the age of 5.



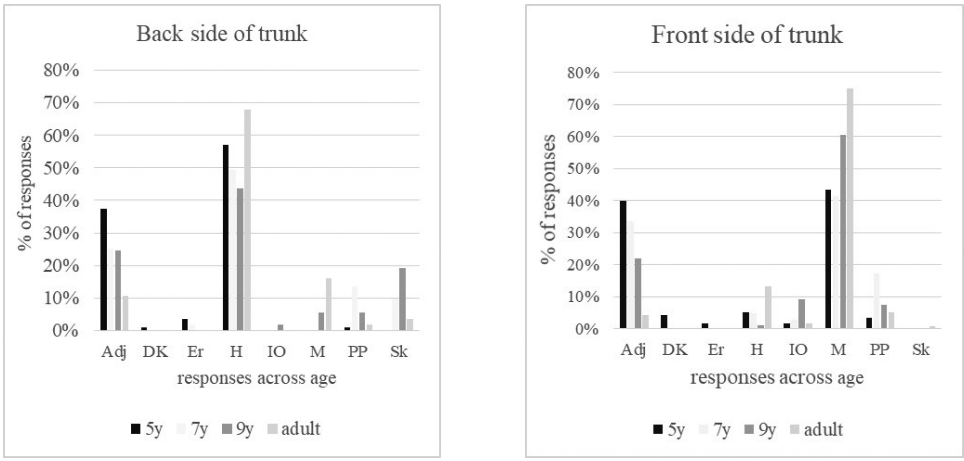


Graph 7. Different types of responses to the neck: adjacent body part (Adj), don't know (DK), error (Er), holonym (H), internal organ (IO), meronym (M), prepositional phrase (PP), skeleton (Sk).

1.3.3 Trunk

It should be noted that there were very few holonyms in the anterior trunk and very few meronyms in the posterior trunk; also, there is no transition from H to M as seen on the arms and legs (Graph 8). In the front trunk, a significant increase was recorded across age in meronyms – $\chi^2(3)=10.025$, N=498, p<.018, and a significant decrease across age in adjacent body parts – $\chi^2(3)=21.371$, N=220, p<.001. In the back trunk, a significant variation between ages was recorded in holonyms – $\chi^2(3)=8.314$, N=239, p<.039, and a significant decrease across age in adjacent body parts – $\chi^2(3)=16.85$, N=107, p<.001.

In the back trunk (Appendix 2), the generic term *leđa* 'back' was dominantly used among the participants of all ages (Graph 8). However, on the front, dominant meronyms divided the upper and lower parts of the trunk: *stomak* 'belly' for the Front_belly, *grudi* 'chest' for the Front_chest, and *rame* 'shoulder' for the Front_chest_left, and Front_chest_right.



Graph 8. Different types of responses to the trunk: adjacent body part (Adj), don't know (DK), error (Er), holonym (H), internal organ (IO), meronym (M), prepositional phrase (PP), skeleton (Sk).

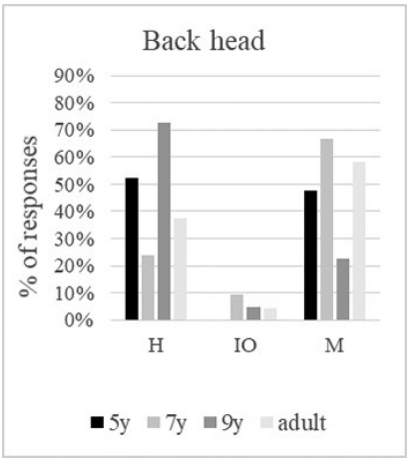
Instead, almost 40% of the 5-year-olds referred to adjacent body parts like *rame* 'shoulder' and *stomak* 'belly' for the front chest, or *kuk* 'hip' for the lower back. This inclination decreased with age for both sides of the trunk.

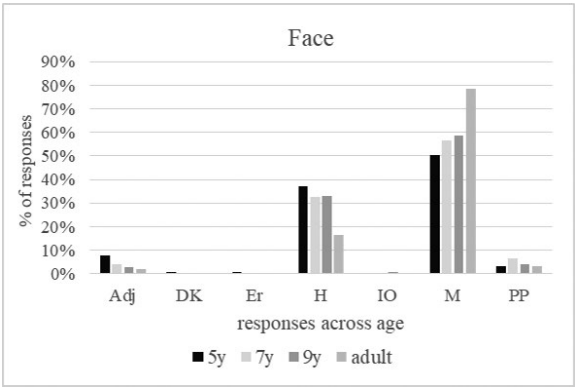
In addition, children referred to internal organs (*dijafragma* 'diaphragm', *srce* 'heart', *pluća* 'lungs', *bubreg* 'kidney'), parts of skeleton (*lopatica* 'scapula', *kičma* 'spine', *pršljen* 'vertebra', *kost* 'bone', *rebra* 'ribs'), or to a zone around the critical spot (by using prepositional phrases). Among the words that referred to an internal organ, there was the term brain, which they used for both sides of the head.

1.3.4 Head and face

The most conspicuous parts of the human body are probably the head and face. In this study, different parts of the face were presented with 20 pictures, while Back_head was depicted by only one drawing. The adult respondents use the specific term *potiljak* 'occiput' (M) for the back of the head more often than the generic word *glava* 'head' (H). For children, the terms *glava* 'head' and *kosa* 'hair' were dominant, changing over age.

As shown in Graph 9, the developmental trend for the face is clearly differentiated and confirms the transition from holonyms to meronyms over age: $\chi^2(18)=132.677$, N=1889, p<.001.





Graph 9. Different types of responses to the head: adjacent body part (Adj), don't know (DK), error (Er), holonym (H), internal organ (IO), meronym (M), prepositional phrase (PP), skeleton (Sk).

To make a more detailed comparison between the children's and adults' responses to the drawings that showed face parts, in Table 3 we present the first and second responses in the rank of frequency. Because of the limited space and based on the fact that the transition between age groups is regular and smooth (Graph 9), we show only the comparison between the two extreme age groups, the youngest and the oldest (5-year-olds and adults). The data show that the number of participants (freq) who used a meronym for a depicted body part is always lower among the 5-year-olds than among adults, which confirms the increase of meronyms with age. The answers to the stimulus Pupil revealed an additional level of granulation in adult responses since they used the meronym *zenica* 'pupil' besides the dominant holonym *oko* 'eye'. The children's alternative responses were mostly generic (H) or referred to adjacent body parts (Adj).

Table 3.
Parts of the head and face where the responses of 5-year-old children and adults differed to some extent.

stimuli	5 years	freq	adults	freq
Eyebrow	obrva 'eyebrow' (M)	12	obrva 'eyebrow'	24
	trepavice 'eyelashes' (Adj)	7		
Eyelid	oko 'eye' (H)	17	kapak 'eyelid' (M)	9
	trepavice 'eyelashes' (Adj)	4	oko 'eye' (H)	7
			trepavice 'eyelashes' (Adj)	7
Forehead_ middle_top	čelo 'forehead' (M)	13	čelo 'forehead' (M)	23
	glava 'head' (H)	3	lice 'face' (H)	1
	lice 'face' (H)	2		
	nos 'nose' (Adj)	2		
Forehead_right	čelo 'forehead' (M)	12	čelo 'forehead' (M)	23
	glava 'head' (H)	7	glava 'head' (H)	1
Front_head	čelo 'forehead' (M)	10	čelo 'forehead' (M)	21
	glava 'head' (H)	7	glava 'head' (H)	1
	kosa 'hair' (Adj)	4		
Lower_cheek	obraz 'cheek' (M)	14	obraz 'cheek' (M)	19
	lice 'face' (H)	5	lice 'face' (H)	2
	glava 'head' (H)	1	brada 'chin' (M)	1
	brada 'chin' (M)	1	ispod obraza 'below the cheek' (PP)	1
Lower_lip	usta 'mouth' (H)	16	usna 'lip' (M)	23
	usna 'lip' (M)	7	usta 'mouth' (H)	1
Mouth	usta 'mouth' (H)	15	usna 'lip' (M)	21
	usna 'lip' (M)	7	usta 'mouth' (H)	3
Part_hair	kosa 'hair' (H)	16	razdeljak 'part hair' (M)	10
	glava 'head' (H)	7	kosa 'hair' (H)	8
			glava 'head' (H)	5
Pupil	oko 'eye' (H)	23	oko 'eye' (H)	15
			zenica 'pupil' (M)	9
Under_nose	nos 'nose' (Adj)	6	nausnica 'part above the lip' (M)	4
	kod nosa 'near the nose' (PP)	3	iznad usne 'above the lip' (PP)	4
Upper_cheek	obraz 'cheek' (M)	14	obraz 'cheek' (M)	24
	lice 'face' (H)	7		
Upper_lip	usta 'mouth' (H)	18	usna 'lip' (M)	21
	usna 'lip' (M)	5	usta 'mouth' (H)	3

On the other hand, the analysis also revealed that 5-year-olds already achieved the highest agreement with adults in naming of some parts of the head and face (Table 4), which is in accordance with the previous findings that these words were among the first body part labels in early children's vocabulary (Camões-Costa et al., 2011; MacWhinney et al., 1987; Witt et al., 1990).

Table 4
Parts of the face and head for which the 5-year-olds and adults showed a high level of agreement in their dominant response.

stimuli	5 years	freq	adults	freq
Nose	nos 'nose' (M)	23	nos 'nose' (M)	24
Lower ear	uvo 'ear' (M)	23	uvo 'ear' (M)	24
Outer ear	uvo 'ear' (M)	23	uvo 'ear' (M)	23
Upper ear	uvo 'ear' (M)	23	uvo 'ear' (M)	23
Eye	oko 'eye' (M)	23	oko 'eye' (M)	23
Chin	brada 'chin' (M)	15	brada 'chin' (M)	23
Forehead middle	nos 'nose' (M)	19	nos 'nose' (M)	15
Hair	kosa 'hair' (M)	17	kosa 'hair' (M)	16
	glava 'head' (H)	5	glava 'head' (H)	5

Summary of the findings

Face and head. The transition from holonymy to meronymy across age was found for most parts of the face: the forehead, cheek, chin, mouth, lips, eyebrow, eyelid, and pupil. There are three parts of the face for which children of all ages had full or almost full agreement with adults in the naming task: eye, nose, and ear. The term *usta* 'mouth' is named early, while the inclination towards *usna* 'lip' is being developed across age. Children make errors when using *trepavice* 'eyelashes' for eyebrows and eyelids. Besides the term *uvo* 'ear', dominant in all ages, the Upper_ear and Outer_ear rarely elicited *ušna školjka* 'earlobe' in adults and 9-year-olds, which showed the increase in granularity in older groups. Besides the holonym *glava* 'head', the Back_head elicited the meronym *kosa* 'hair' in children, which decreased with age, and the meronym *potiljak* 'occiput' mostly in adults, which increased with age.

Legs and arms. The transition from holonymy to meronymy across age was found as a main effect in the analysis on overall data and then confirmed also for both sides of the leg and arm. The presence of other response types (Adj, PP, IO, Sk) was always much less frequent.

While for the back lower leg adults provided the meronym *list* 'calf' and for the front lower leg the meronyms *potkolenica* and *cevanica* 'shin', young children preferred *noga* 'leg' for both sides, which systematically decreased over age. For the front and back thighs, the term *butina* 'thigh' was preferred among the adults, while the preferable holonym *noga* 'leg' decreased among children with age. The front and back sides of the knee were referred to using *koleno* 'knee' in adults, and *noga* 'leg' in young children, which decreased with age. The same regularity was found in the case of the foot, ankle, and toes, always with systematic decrease of holonymy across age levels.

For arms, the meronym *nadlaktica* 'upper arm' was proposed by adults in the case of upper arm, while children produced the holonym *ruka* 'arm'. In the case of lower arm, the meronym *podlaktica* 'lower arm' was preferable among adults, versus the holonym *ruka* 'arm' in young children. Children's holonymic answers decreased with age, and the same regularity was recorded for other parts of the arm segmented in adult Serbian language (the elbow, hand, fingers, and wrist).

Trunk and shoulders. While the front trunk was segmented by participants of all ages into the chest, shoulder and abdomen, the posterior trunk was poorly segmented, as respondents of all ages used the holonym *leđa* 'back' predominantly for the lower, middle, and upper back. For the upper left and the upper right back, younger participants tended to refer to the adjacent part *rame* 'shoulder', but this decreased with age, while adults preferred the holonym *leđa* 'back'.

Even though the presence of holonyms for the front and the presence of meronyms for the back was very low, the number of meronyms increased with age for the front and the number of holonyms decreased with age for the back. Another developmental change was evident for both trunk sides in decreasing the number of responses with age that referred to adjacent body parts (Adj): younger participants referred to the belly, shoulder, or even neck instead of the chest, whereas, on the reverse side, they referred to the shoulder, neck, or even arm for the upper back. This revealed unclear borders between the adjacent parts/areas in the trunk.

When answering to the stimuli at anterior shoulders, participants of all ages very rarely used the holonym *trup* 'trunk'. When answering to the stimuli at back shoulders, adult participants never used the holonym *leđa* 'back' It seems that native Serbian speakers, including 5-year-old children, perceive the shoulders as separate from the trunk.

The responses referring to internal organs and skeleton were most frequent in 7– and 9-year-olds and indicated their search for an adequate term in cases when they lacked one. It happened mostly for the trunk, and rarely for other parts (e.g. *mozak* 'brain' for the back head, and *vena* 'vein' for the wrist, elbow, etc.). It is interesting to note that it was more present in these ages than among 5-year-olds, probably because the youngsters did not have cognitive and/or linguistic capacities for this kind of endeavour. The same applies to prepositional phrases which refer to areas.

Based on the hypotheses we made at the beginning of the study, we can confirm the following:

1. Adult participants used specific terms to refer to individual body parts and produced responses with high granularity according to hierarchical meronomic organization wherever it was possible. As expected,

they used conventional lexical terms and phrases of the Serbian language for small body parts across segments such as *šaka* 'hand', *stopalo* 'foot', *prst* 'finger/toe', *oko* 'eye', *kapak* 'eyelid', *usna* 'lip', *ušna školjka* 'earlobe', *ključna kost* 'clavicle' etc.

2. Children used specific words for the body parts such as hair, arm, leg, eye, nose, mouth, ear, back, foot, toes, fingers, knee, etc., as we expected based on the previous developmental findings of the early acquisition of body part terms (Andersen, 1978; Brownell et al., 2010; Camões-Costa et al., 2011; Gesell, 1940; MacWhinney et al., 1987; Waugh & Brownell, 2015; Witt et al., 1990).
3. Children used fewer meronyms and responded with less granularity when naming the body parts than adults, which was expected based on the previous developmental findings about the prolonged lexical-semantic development in other domains (Auclair & Jambaqué, 2015; Lucariello et al., 1992; Markman, 1981; Nelson & Nelson, 1990; Nelson, 1996; Yu & Nelson, 1993; Reggin et al., 2021; Sell, 1992). We were unable to confirm our expectation that the youngest children would deviate at most from the adults' responses on the measures of diversity of lexeme choice, as 7– and 9-year-olds responded with a greater variety of answers than did 5-year-olds. However, this particular result actually indicated the effects of formal education important for children, which was emphasized also by Inagaki and Hatano (2002), and Jaakkola and Slaughter (2002).

Discussion and conclusion

The dominance of holonyms over meronyms in the body parts vocabulary of early school-age children compared to adults, and the increasing segmentation of the body as evidenced by the granulation of the lexicon with age, are the most striking findings of our study. These apply to hierarchically organized body parts such as arms, legs, and some parts of the face, which only partially support Liston (1972) and Brown (1976). An additional relevant developmental indicator is that children of all ages, especially 7– and 9-year-olds, seek alternative solutions for the body parts names that are inadequate or still missing in their vocabulary. Hence, they name adjacent body parts, internal organs, and parts of the skeleton, or use prepositional phrases to refer to the surrounding areas. Such answers demonstrate the children's ability and inclination to think about their own responses, as well as a higher level of knowledge they acquired during formal education.

The participants' responses for the trunk are particularly interesting. First, the front and back of the body differ in the level of segmentation – the front side is also more segmented in input (adult) language. Second, for

the trunk only, the (front and back) terms for adjacent body parts occurred frequently, accounting for nearly 40% of all responses in the youngest age groups. Unlike the arms and legs, the trunk is structurally and dynamically little differentiated, so it is perceived and encoded in a "shallow" organization (as referred by Majid & Enfield, 2017, p. 102), contrary to the hierarchical partonomic organization of the body. It is based either on the *topological* principles – the relationships between the areas and boundaries around the adjacent body parts (Adj), skeleton parts (Sk), and zones around critical body parts (PP, expressed by prepositional phrases), or the *taxonomic* principles that were present in the responses referring to internal organs (IO). The later principles are highly context-dependent and pragmatically sensitive, and could be strongly influenced by formal education as proved for the concepts explored in Lucariello et al. (1992), Nelson and Nelson (1990), Yu and Nelson (1993), Sell (1992).

Since the partonomic hierarchy in the Serbian (adult) language is not equally present in all segments of the body, it was consequently not found or was rarely found in children's responses referring to the trunk, shoulders, neck, back head, and partly face. Among the face parts, the eye, nose, and ear were denoted early even by the youngest group of children in our sample. They were mostly named in the conventional ways, which did not change across age (similar as in the trunk), thus revealing the 'shallowness' of their hierarchy (Majid & Enfield, 2017). It seems that, at least from the age of 5 onward, they are mostly perceived as separate from the hierarchical structure of the head and face. Previous findings also reported the early acquisition of these terms (MacWhinney et al., 1987; Waugh & Brownell, 2015), all based on sensorimotor and visuospatial representations established in the 2nd year and before the visual-spatial representations of the body parts (Rochat, 2010; Slaughter et al., 2002).

Even in adult language, partonomy is only one among different kinds of the possible conceptual relations between body parts (Liston, 1972; Majid & Enfield, 2017). As already emphasized, "a collection of in-depth profiles of body part nomenclature in a range of languages [...] casts doubt on the claim that body part nomenclature is organized mereologically to any significant extent" (Majid & Enfield, 2017, p. 107). Hierarchical partonomy found in the Serbian child language for the most prominent body parts such as arms, legs and some parts of face does not extend to other segments of the body where topological and taxonomic relations seem to be dominant.

The study has also provided some evidence that a prolonged lexical-semantic development is necessarily constrained by the specific knowledge acquired in school settings, which makes possible different outcomes of developmental and language processes in different cultures and educational contexts. In other words, different languages can have more or less

differentiated conceptual structures and some of them may be developed quite late, or never, within a particular culture and/or formal education system. Because the question of "how the concepts and word meanings evolve in their adult counterparts is a fundamental developmental problem" (Nelson, 1996, p. 224), developmental and cross-linguistic studies could possibly inform each other about both the universal organizing principles within semantic domains, and the cultural and developmental specificities.

In conclusion, the findings converge to three sources of children's conceptualization and lexicalization of body parts: a. the anatomical structure of the body based on the early developed sensory-motor and visual-spatial representation, b. the culturally specific lexical material from the language input which guides native speakers' attention to particular parts and organization, and propels the acquisition of conventional labels, and c. the knowledge on the structure and functions of body parts and other natural systems available in the social context, including all sorts of formal and informal education.

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Leksičko-semantička reprezentacija delova tela kod dece na srpskom jeziku

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Apstrakt: Iako se nazivi za delove ljudskog tela pojavljuju rano u dečijem rečniku, relativno malo se zna o pojmovnom i semantičkom razvoju u ovom domenu na predškolskom i ranom školskom uzrastu. Istraživali smo kako deca uzrasta 5, 7 i 9 godina koriste reči i izraze za označavanje delove ljudskog tela i koliko se oni poklapaju sa segmentacijom tela i leksemama za delove tela kod odraslih. Ispitanici su zamoljeni da, na crtežu koji prikazuju celo telo (prednju ili zadnju stranu) ili lice, imenuju deo označen crvenom tačkom. Rezultati poređenja odgovora između dece i odraslih pokazuju da se sa uzrastom povećava upotreba meronima, a smanjuje upotreba holonima za imenovanje delova tela, što ukazuje na povećanje segmentacije tela na pojmovnom i leksičko-semantičkom planu sa uzrastom. Međutim, ovakva hijerarhijska organizacija nije mogla biti potvrđena za druge delove (trup, ramena, vrat, glava, pojedini delovi lica), otkrivajući različite razvojne putanje tokom usvajanja reči. Deca svih uzrasta, a posebno deca od 7 i 9 godina, traže alternativna rešenja za imenovanje delova tela za koje im nedostaju reči. U takvim slučajevima koriste nazive za susedne delove, unutrašnje organe i delove skeleta, ili upućuju na okolna područja koristeći predloške fraze. Rezultati su poređeni sa prethodnim nalazima razvojnih studija, a diskutovane su leksičko-semantičke promene reči za označavanje delova tela i pitanje njihove hijerarhijske organizacije u leksikonu dece.

Ključne reči: delovi ljudskog tela, leksički razvoj, semantički razvoj, meronimija, rani školski uzrast, srpski jezik

Appendix 1
Body parts naming task: Instruction for participants.

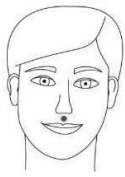
In this task, I will show you pictures of a person. In each picture, there is a red dot somewhere in the person's body. For each picture, I will ask you what that body part is called. Please give the first thing that comes to your mind. Don't worry about being too specific. Whether the dot is on the left or right part of the body is not important in this task. You may give the same description more than once – that's okay. Ready?

The first picture was shown, and the participant was asked what part of the body was marked:

Ovaj čika ima tačku na ...? 'The man has a dot on ...?'

The participants were expected to complete the sentence.

Appendix 2
Examples of stimuli in the body part naming task.

Front_chest	Front_throat	Back_neck		
				
Back trunk: Back_lower_back	Back trunk: Back_middle_ back	Back trunk: Back_upper_ back	Back trunk: Back_upper_ back left	Back trunk: Back_upper_back right
				
Front trunk: Front_belly	Front trunk: Front_chest	Front trunk: Front_chest_left	Front trunk: Front_chest_ right	
				
Forehead_middle	Pupil	Under_nose		
				

Appendix 3

Two lists of responses to the stimuli Under_nose and Front_chest with the frequencies which elicited the greatest diversity of responses in participants of all ages.

Under_nose	Resp. types	5y	7y	9y	adu.	all
blizu nosa 'near the nose'	PP	1				1
blizu nosa i blizu usta 'near the nose and near the mouth'	PP		1			1
blizu usne 'near the lip'	PP		1			1
blizu usta 'near the mouth'	PP			1		1
brada 'beard'	Adj				1	1
brkovi 'moustache'	Adj		1	2	3	6
filtrum 'filtrum'	M				1	1
glava 'head'	H	1	2	2		5
ispod nosa 'below the nose'	PP	1	3	2	3	9
ispred nosa 'in front of the nose'	PP	1				1
između nosa i usta 'between the nose and mouth'	PP		3	4		7
između usne i nosa 'between the lip and nose'	PP				1	1
između usta i nosa 'between the mouth and nose'	PP	1			1	2
iznad nosa 'above the nose'	PP			1		1
iznad usne 'above the lip'	PP				4	4
iznad usta 'above the mouth'	PP	1	2	2	1	6
kod nosa 'near the nose'	PP	3				3
lice 'face'	H		4	3	2	9
na ustima i nosu 'on mouth and nose'	PP	1				1
nausnica 'moustache'	M				4	4
ne znam 'I don't know'	DK	2				2
nos 'nose'	Adj	6	2	1		9
usna 'lip'	Adj	2	1	1	3	7
usta 'mouth'	Adj	2	1	2		5
više usta 'above the mouth'	PP			1		1
N of different responses		12	11	12	11	24

Front_chest	Resp. types	5 y	7 y	9 y	adult	all
blizu ramena 'near the shoulder'	PP		2			2
blizu vrata 'near the neck'	PP		1	1		2
dijafragma 'diaphragm'	IO				1	1
gornji deo tela 'upper part of the body'	H				1	1
grudi 'chest'	M	2	4	9	12	27
grudna kost 'sternum'	Sk				1	1
grudni koš 'chest cavity'	M				3	3
između grudi 'between the breasts'	PP			1		1
kod srca 'near the heart'	PP				1	1
kod vrata 'near the neck'	PP		1			1
ne znam 'I don't know'	DK	1				1
pluća 'chest cavity'	IO		1	1		2
prednji deo tela 'forebody'	H				2	2
pupak 'navel'	Adj		1			1
rame 'shoulder'	Adj	1				1
ruka 'arm'	Er	1				1
sisa 'tit'	Adj	1				1
srce 'heart'	IO	2		4		6
sredina tela 'middle of the body'	H				1	1
stomak 'belly'	Adj	10	7	4		21
telo 'body'	H	3	3			6
torzo 'torso'	H				2	2
trup 'trunk'	H			1		1
vrat 'neck'	Adj	2				2
N of different responses		9	8	7	9	24