PARTITIVITY AND SPACE: EVIDENCE FROM SPOKEN AND SIGN LANGUAGES

LUCIA VLÁŠKOVÁ[1], MARCIN WĄGIEL[2]

Abstract. In this work, we investigate partitivity marking in spoken and sign languages, focusing on the locative and ablative strategies. We aim to extend the typology of partitive constructions by including evidence from sign languages and to explore the semantic component allowing locative and ablative markers to serve as both spatial and partitivity expressions. We report on finding a new ablative construction in Czech Sign Language (ČZJ) using the sign FROM^IX-a, which differs from the [high] vs. [low] position strategy found in other sign languages. The sign language data further indicates the tight semantic relationship between the spatial use of locative and directional expressions and their use as partitive markers. We submit that the facts potentially support a mereotopological perspective on part-whole structures that treats parthood not as a primitive notion but rather as a notion that is derived from more general topological concepts.

Keywords: partitivity, partitives, part-whole relation, spatial prepositions, typology, sign language, mereotopology.

1. INTRODUCTION[3]

Partitives are grammatical constructions that express the part-whole relation. Their syntax and semantics have received a lot of attention in the literature (e.g., Jackendoff 1977, Selkirk 1977, Ladusaw 1982, Hoeksema 1996, de Hoop 1997, Barker 1998, Zamparelli 1998, Ionin et al. 2006, Martí i Girbau 2010, Falco and Zamparelli 2019, Wągiel 2019, 2021b, 2022). In English, partitives have the form in (1) (Martí i Girbau 2010) with the requirement

that the upstairs DP is headed by a quantifier and the embedded DP is entity-denoting (type *e*), and thus definite or specific (de Hoop 1997).

(1)   a. [_DP_ Det [_PP_ of [_DP_ Det NP]]]
       b. [some [of [my cucumbers]]]

      Depending on the type of the quantifier and the grammatical number of the embedded DP, one can distinguish between SET PARTITIVES in (2) and ENTITY PARTITIVES in (3). Set partitives describe individual parthood, i.e., they quantify in terms of cardinality of atomic objects making up a plurality, whereas entity partitives describe material parthood, i.e., they quantify over substance constituting an atomic entity.[4] Arguably, the two types of partitives involve different structures since only set partitives allow for numerals in the higher DP.

(2)   a. some of the watermelons
       b. half of the watermelons
       c. three of the watermelons
(3)   a. some of the watermelon
       b. half of the watermelon
       c. *three of the watermelon

      The English partitive marker *of* originated from the Old English *of* (the unstressed form of *æf*), which was an ablative preposition with the meaning 'from, out of'. An example from the Anglo-Saxon Gospel according to Saint Matthews is provided in (4).

(4)   Hé ástáh   **of**   ðam   wætere
       he ascended   from   the.DAT   water.DAT
       'He ascended from the water.'   (Old English; Bosworth 2014)

      The spatial meaning is also preserved in Modern English, where *of* can be used to describe distance and origin, as in (5)–(6), respectively.

(5)   There are no shops within 20 km **of** the cottage.
(6)   Jesus **of** Nazareth

      The relationship between spatial prepositions and partitive markers is not an English idiosyncrasy. Rather, it is a cross-linguistically established tendency, which invites the question about the relationship between the representation of space and partitivity in natural language. In this paper, we intend to contribute to the understanding of this relationship by discussing the marking of partitivity from a cross-linguistic perspective. In particular, we will contribute by extending the typology of partitive constructions established based on spoken

---

    [4] Mass partitives are the third type, see (i). In this case, the embedded DP is a mass term, and the entire construction specifies material parthood. However, we will not discuss mass partitives in this paper.
    (i) a. some of the juice
       b. half of the juice
       c. *three of the juice

languages by including evidence from sign languages, most importantly Czech Sign Language (ČZJ). We believe that our empirical findings open interesting theoretical questions regarding modeling the relationship between spatial representations and partitivity. In this context, we will speculate what semantic component allows for ablative and locative markers to serve both as spatial and partitivity expressions and suggest that the data potentially support a mereotopological approach to linguistic part-whole structures.

The paper is outlined as follows. In Section 2, we will discuss the typology of partitive marking in spoken languages with the special focus on the locative and ablative strategies. In Section 3, we will discuss findings of the previous research on partitives in sign language. Section 4 will describe the methodology that we employed in our study on partitive constructions in Czech Sign Language (ČZJ). In Sections 5, we will present and discuss our results. In Section 6, we will return to spoken languages to discuss semantic properties of spatial prepositions that are preserved in their abstract use as partitive markers and numeral modifiers. In Section 7, we will consider potential theoretical consequences of the typology of partitive marking for modeling representations of space and partitivity in natural language. Specifically, we will speculate that the findings potentially support a mereotopological approach to part-whole structures in natural language. Finally, Section 8 will conclude the paper.

The obtained data with video examples from Czech Sign Language relevant for the discussion in this paper can be found in an online repository: : muni.cz/go/CZJ_partitivity.

2. TYPOLOGY OF PARTITIVES

Cross-linguistic research on spoken languages identified so far three main marking strategies employed in order to express partitivity: (i) the POSSESSIVE strategy, (ii) the LOCATIVE strategy and (iii) the ABLATIVE (or separative) strategy (e.g., Hoeksema 1996, Koptjevskaja-Tamm 2009, Luraghi and Kittilä 2014, Tănase-Dogaru 2017, von Heusinger and Kornfilt 2017, Seržant 2021). In this section, we will briefly describe each of them.

2.1. The possessive strategy

The possessive strategy is based on the possession metaphor, and thus exploits possessive morphology to mark the part-whole relation. Intuitively, wholes are conceptualized as possessors, whereas parts are conceptualized as possessed entities. In example (7), the pronominal 3rd person plural possessive marker is a prefix on the quantifier. The literal meaning 'their some' gives rise to the set partitive interpretation. On the other hand, in (8) the possessive marker attaches before the nominalizing suffix. This results in the singular partitive semantics 'one of the women'. If the entire complex is followed by the plural marker, the plural meaning 'some of the women' arises.

(7) **Ma**-fan   e-su-ne
     3.PL.POSS-some   3.SG.N.OBJ-tie-IMPF
     'Some of them were tying it up.'

                                   (Lavukaleve, Papuan; Terrill 2003: 64, after Seržant 2021)

(8) máamachi-u-**a**-tʉ(-mʉ)
     woman-PL-POSS-NMLZ(-ANIM.PL)
     'one (some) of the women'

                                   (Ute, Uto-Aztecan; Givón 2011: 99, after Seržant 2021)

Notice that there are aspects of possession, namely certain aspects of inalienable possession, that can be viewed as a spatial relationship. Specifically, in some cases what is inalienably possessed is part of the possessor, e.g., the entity designated by *your nose* is an internal part of the referent of *you*. Though admittedly the examples in (7)–(8) are not cases of inalienable possession, we believe that the possibility of inalienable possession being the source of the metaphor fueling the possessive strategy remains an open issue. However, in this paper we will not discuss this strategy of partitivity marking. Instead, we will focus on the locative and ablative strategy, which clearly employ topological notions for the purpose of expressing partitivity.

2.2. The locative strategy

The locative strategy is based on the metaphor that the whole is a container in which parts are spatially located. In other words, parts are conceptualized as being topologically enclosed within the whole. Thus, the part-whole relation is marked by locative prepositions such as 'in' or by the locative case. The former is exemplified in (9), where the locative preposition is used to express the entity partitive (i.e., that what was eaten was part of a fish, not the entire animal) and in (10), where it marks the set partitive (corresponding roughly to 'one in the children'). On the other hand, in (11) the set partitive relation is triggered by the locative case marker on the noun ('two in the boys').

(9)   Na'e   kai 'a   e   tamasi'i'   **i** he   ika.
       PST   eat ABS   REF boy   in REF   fish
       'The boy ate some of a fish.'
               (Tongan, Malayo-Polynesian; Clark 1973: 600; after Luraghi and Kittilä 2014)
(10)   ọ̀ọ́rẹ   égbén   ábẹ   **íbè** yọ̀   úbó
       one   children   DEF.PL   LOC   go   house
       'One of the children went home.'
                             (Oko, Atlantic-Congo; Atoyebi 2010: 132; after Seržant 2021)
(11)   aaɳkuʈʈikaḷ-**il**   raɳʈə peer   vannu
       male.children-LOC   two   person   come.PST
       'Two of the boys came.'
                      (Malayalam, Dravidian; Asher and Kumari 1997: 218; after Seržant 2021)

On the assumption that morphology conveys meaning, the cross-linguistically attested syncretism between locative and partitive markers suggests that there is a component that is shared by locative and partitive semantics.

2.3. The ablative strategy

Finally, the ablative (or separative) strategy employs a spatial periphrasis based on the metaphor that the whole is the origin from which a part is separated. This means that parts are conceptualized as being originally spatially enclosed within the whole and then removed. Formally, this is expressed either via the use of the directional preposition 'from' or the ablative case. The examples in (12)–(13) illustrate the former case with 'from' marking the set partitive, whereas the ablative case marker in (14) illustrates the latter case (roughly 'two from the women').

(12) kathiir **min** in-niswaan
   many from DEF-women
   'a lot of (the) women'
             (Gulf Arabic, Afroasiatic; Holes 1990: 73, after Seržant 2021)

(13) E   toko lua **i** tamataene ne   mmai o fesoasoani mai ki au.
   NONPST NUM two from   young.man NONPST come and help   ADV to 1.SG
   'Two of the young men came and helped me.'
           (Tuvaluan, Austronesian; Besnier 2000: 330, after Seržant 2021)

(14) Ali kadın-lar-**dan** iki-sin-i   tanı-yor-du.
   Ali woman-PL-ABL two-3.SG-ACC know-PROG-PST
   'Ali knew two of the women.'
        (Turkish, Turkic; Enç 1991: 10, after von Heuslinger and Kornlift 2017)

The typology of partitive marking established based on the research on spoken languages reveals a cross-linguistic relationship between linguistic expressions describing topological relations, mainly locative and ablative prepositions, on the one hand, and part-whole relations, on the other. This indicates that perhaps the linguistic representations of space and partitivity are associated on a deep level, and thus theories of natural-language semantics should develop models that attempt to capture this relationship.

In the next section, we will discuss evidence from partitive constructions in sign language.

3. PARTITIVES IN SIGN LANGUAGES

In this section, we will cover the state-of-the-art partitive construction research on sign languages and find that only one strategy has been attested so far. Interestingly, however, it does not fit neatly into the typology presented in the previous section.

When searching for partitive constructions, different semantic strategies and their specific markers in sign languages, we are not able to utilize the same processes as in spoken languages and expect to find results similar to those presented in the previous section. The contrast is mainly due to the different modalities between the two language groups.

While the building blocks of the lexical items in spoken languages are assembled sequentially, sign languages structure the individual signs differently, namely the morphemes are layered on top of each other in a simultaneous fashion. Therefore, it is often difficult to tease apart individual morphemes and determine their contribution to the overall meaning of the sign.

Moreover, the modality difference is seen perhaps most apparently in how the signal is transmitted: sign languages use the so-called signing space (an area in front of the signer) in which the signs are produced. The signing space itself can contribute to the meaning of the signs, whether it is in its topological or syntactic use (Perniss 2012). When used topologically, the signing space reflects the placement, movement and respective position of the referents in the real world. On the other hand, the syntactic use of the signing space is adopted with a specific type of verbs, namely agreement verbs, to indicate the syntactic roles

of the verb arguments. Take as an example the sentences in (15) below.[5] Both of them contain a transitive verb ASK with a lexically specified handshape and movement, but the initial and the final position of the verb is dependent on the locations of the arguments that have been established beforehand. In the current example, it is location *a* on the right side of the signing space assigned to MOTHER via an indexical sign IX-a, and vice versa, location *b* on the left side of the signing space assigned to FATHER via an indexical sign IX-b. The movement of the transitive verb then begins in the subject location and finishes at the object location, creating the minimal pair in (15).

(15) a. MOTHER IX-a FATHER IX-b $_a$ASK$_b$
          'Mother asks father.'
      b. MOTHER IX-a FATHER IX-b $_b$ASK$_a$
          'Father asks mother.'

Not only does it matter where on the abstract horizontal plane in the signing space a specific sign is placed or directed to, but also its position on the vertical axis plays a potentially differentiating role. While the horizontal position (glossed usually as *a*, *b*, *c* from left to right) is indicative of the syntactic role of the given sign, the vertical placement (glossed usually as [high], [low], etc.) can trigger an inference about the referent of the sign. Take, for example, the following context in (16), adapted from Schlenker et al. (2013: (17)) where the normally positioned indexical sign prompts no special inference, but both the higher and lower locations contribute specific meanings to the sign, namely that the referent is tall, powerful or important when signed higher, and, on the other hand, the referent is short when their locus is lower (Schlenker et al. 2013).

(16) YESTERDAY IX-1 SEE R. IX-1 NOT UNDERSTAND IX-a$_{[high/normal/low]}$
      Yesterday I saw R [= body-anchored proper name]. I didn't understand them.
      a. [high]   *inference:* R is tall, powerful or important
      b. [normal]   *inference:* nothing special
      c. [low]   *inference:* R is short

A similar strategy has been observed in marking the partitive (among others) meaning of the noun phrases in several sign languages, where the different positioning of the signs indicates the specificity and/or partitivity of their meaning. Namely, when a quantifier within a certain noun phrase is signed in an upper location of the signing space, the whole noun phrase obtains a simple indefinite and non-specific meaning. This can be seen in the phrases in Catalan Sign Language (LSC) exemplified in (17) borrowed from Barberà (2015).

---

[5] The glossing conventions we adhere to in this paper are the following: SIGN (a gloss of a lexical sign is given in small caps), SIGN$_a$ (a letter subscript indicates the expression is signed in locus *a*, i.e. in a certain position in the signing space), $_a$SIGN$_b$ (two letter subscripts indicate a sign signed from locus *a* to locus *b*. Loci 1 and 2 correspond to the position of the signer and addressee, respectively), INDEX-a/IX-a (a pointing sign towards the locus *a*), SIGN^SIGN (two signs joined by a caret indicate compounding or a sign plus affix combination), SIGN++ (two pluses indicate sign reduplication), CL:c (a classifier is indicated using CL, followed by its specification/description).

(17) a. HOUSE SOME[high]
          'some houses'
      b. HOUSE ONE[high]
          'one house'
      c. HOUSE ANY[high]
          'any house'   (LSC; Barberà 2015)

More interestingly, the very same signs constituting the same phrases can yield a different meaning by positioning the quantifier of the noun phrase to the lower location of the signing space. This is again exemplified in (18) on LSC (borrowed from Barberà 2015), where the given phrases obtain specific and partitive interpretations.

(18) a. HOUSE SOME[low]
          'some of the houses'
      b. HOUSE ONE[low]
          'one of the houses'
      c. HOUSE ANY[low]
          'any of the houses'   (LSC; Barberà 2015)

Apart from being attested in LSC, as we have just seen, this strategy that we will call the [HIGH] vs. [LOW] strategy, has been attested also in other sign languages, namely American Sign Language (Bahan 1996) and Hong Kong Sign Language (Tang and Sze 2002). Interestingly, these sign languages are genetically unrelated, and therefore hint at the common core of the phenomenon, presumably based on their shared visual-spatial modality.

This is exactly the reason why we expected to find the [high] vs. [low] strategy also in Czech Sign Language (ČZJ). However, ČZJ seems to mark its partitive constructions using one of the strategies attested in spoken languages described in Section 2, rather than the expected [high] vs. [low] strategy, as will be reported in Section 5 below.

4. METHODOLOGY

In this section, we aim to present the object language on which we focused our study (4.1), the informants that provided their language expertise (4.2) and the process of the elicitation of the Czech Sign Language data that we obtained (4.3).

4.1. Czech Sign Language

For our descriptive study on partitive constructions, we chose to focus on Czech Sign Language (ČZJ). The choice was mainly made due to the convenient proximity of the language and the native signers, but it also promises interesting insights in virtually any linguistic subfield, as ČZJ is highly understudied, even for a sign language.

Czech Sign Language is the native language of the deaf signing community residing primarily in the Czech Republic. ČZJ is part of the French Sign Language family and it is estimated to have emerged around the time of the foundation of the first deaf school in the

region of historical Bohemia. Nowadays it has around 10 000 signers in the Czech Republic and the language is cultivated through a number of deaf schools and community centers throughout the country.

4.2. Informants

All of our elicited data originates from the native language experts we consulted. We recruited our informants from among our colleagues at Masaryk University in Brno, Czech Republic. In total, we collaborated with three informants, two female and one male. All of them are between 35 and 52 years old. Each of them is a native ČZJ signer, though not all are from deaf families (the variation was between the 1st and the 3rd generation). We also inquired about their level of proficiency in the written form of the spoken Czech language, since that was relevant during one of the tasks, and two out of three informants reported very good command of both writing and reading in Czech.

4.3. Elicitation

In this section, we will cover how the elicitation tasks were created and refined, what objects were used as physical props and which steps constituted the elicitation process itself.

The elicitation of partitive constructions in any language is difficult due to the close similarity of the truth conditions of partitive and non-partitive expressions. Take the sentences in (19) below as an example. One must carefully tweak the context of the expressions to convey the difference between the indefinite DP *three apples* in (19a) and the partitive DP *three of the apples* in (19b).

(19) a. Suzan ate three apples.
     b. Suzan ate three of the apples.

Moreover, in sign languages, the partitive constructions are especially difficult to elicit. This is a consequence of the nature of the visual modality that sign languages utilize. As described above, the usual way to express the partitive meaning cross-linguistically is through sequential morphology, whether it concerns a utilization of particular case marking on the restrictor noun and/or the quantifier, or an addition of a preposition to the nominal phrase. However, these instances of morphemes do not have a clear sequential equivalent in the visual modality, where most of the morphology has a simultaneous nature.

Let us now proceed with the presentation of the elicitation process. With each of the three informants, we conducted two separate sessions. The two sessions were held two months apart, so as to give the informants a relatively long time window in between to look at the topic with fresh eyes during the second session. The sessions were recorded on two separate cameras to avoid data loss due to camera malfunction. The recordings were stored privately and were used only by the researchers during the analysis of the obtained language data.

4.3.1. *First session*

At the beginning of the first session, the participants were informed about the conditions of the collaboration, the handling of the obtained language data including the session recordings and the general outline of the elicitation. After the recording started, the

informants were presented with the first objects, namely a solitary red die, three pink dice and a small number of dice of different colors. Their task was to name the objects in front of them and to produce all the possible descriptions in the plural scenarios. The aim of the variation in number and color was to familiarize the informants with the objects that will later be relevant in their tasks, and moreover, for the researchers to elicit a baseline citation form of the signs in various numbers.

The next step in the elicitation was free production. We created various situations using small objects as physical props and asked the informants to describe them. Our initial idea was to present the informants with a static scene of a set of objects varying along two dimensions, e.g., color, pattern, size, etc., which was aimed to yield sentences such as *Some of the big buttons are yellow*. However, our concern about this strategy was that the informants would take full advantage of the visual means of communication and use classifier constructions in combination with indexicals to render the visual scene in the signing space without having to use the specific grammatical construction we were looking for.

Therefore, we opted for an alternative elicitation strategy. We came to the decision of presenting the informants with real-life objects to be physically manipulated live during the sessions. We formulated two conditions that restricted the choice of the objects: (i) they need to be small enough for us to manipulate comfortably; (ii) they need to be common enough to have a lexicalized sign denoting them, and not a productive classifier. The advantage of this strategy is that now we only needed the objects to vary along one dimension, because the role of the second-dimension difference would be filled by the manipulation itself. Our final choice fell on dice of various colors, as exemplified in Fig. 1 below. We placed six green and six violet dice into a coffee mug, then six red and six blue ones into another one, and then six pink and six green ones into the third one.

Fig. 1. Dice used in elicitations.

The informants were given the mugs one by one and were asked to describe their contents to the camera. By physically emptying the mugs themselves, the informants should have been guided to avoid focusing on the visual layout of the objects that could have been prominent otherwise, e.g., when given image input. After the description, one of the researchers removed three dice of one color from the pile. The informants were now asked to describe what happened in their own words and come up with several different ways to express it. By asking for alternative means of expressing the event, we hoped to enhance the possibility of eliciting a partitive construction such as *Lucia took three of the blue dice*.

After going through each of the three mugs, we proceeded on to the next step – a guided elicitation. The informants were given a series of quantifiers in the written form of

the surrounding language of the hearing community, i.e., Czech, to translate to ČZJ. The quantifiers were the following: *three, six, nine, twelve, one third, half, two thirds, quarter, three quarters, part/some* and *most/majority*. After producing them in isolation, we presented the quantifiers one by one or in pairs and asked the informants to use them in sentences describing the same event, taking three dice of one color away. This way, we determined the availability of each of the selected quantifiers within these (possibly partitive) constructions such as *Lucia took half of the red dice,* or *Three quarters of the dice stayed on the table*.

As the final step of the first session, we presented the informants with examples of partitive constructions in Czech, and they were asked about the familiarity and translation. We created a total of four sentences, exemplified in (20) below, that were constructed so as to form two minimal pairs, i.e., partitive constructions in (20bd) and non-partitive constructions in (20ac), in which the differing construction was placed in the subject (20cd) and object position (20ab) to determine whether the syntactic position of the partitive constructions has any effect on the means of expression.

(20) a. Na stole bylo šest červených kostek. Lucia vzala tři.
          on table were six red   dice   Lucia took three
          'There were six red dice on the table. Lucia took three.'
      b. Na stole bylo šest červených kostek. Lucia vzala tři   z   nich.
          on table were six red   dice   Lucia took three from them
          'There were six red dice on the table. Lucia took three of them.'
      c. Na stole bylo šest červených kostek. Tři   zmizely.
          on table were six red   dice   three disappeared
          'There were six red dice on the table. Three disappeared.'
      d. Na stole bylo šest červených kostek. Tři   z nich zmizely.
          on table were six red   dice   three disappeared
          'There were six red dice on the table. Three of them disappeared.' (Czech, Slavic)

4.3.2. *Second session*

The second elicitation session was designed to focus solely on the discovered partitive construction and its properties. We started by showing the informants four sentences written in Czech, given below in (21), and asked them to translate them. The sentences are designed to elicit any potential differences between entity partitives (21ab) and set partitives (21cd) and also partitive (21bd) and non-partitive constructions (21ac).

(21) a. Na stole byl jahodový a   borůvkový koláč. Půlku jahodového jsem snědla.
          on table was strawberry and blueberry cake half strawberry am ate
          'There was a strawberry and a blueberry cake on the table. I ate half of the strawberry one.'
      b. Na stole byl jahodový a   borůvkový koláč. Půlku **z**   jahodového jsem snědla.
          on table was strawberry and blueberry cake half **from** strawberry am   ate
          'There was a strawberry and a blueberry cake on the table. I ate half of the strawberry one.'
      c. Na stole byly jahodové a   borůvkové koláče. Půlku jahodových jsem snědla.
          on table were strawberry and blueberry cakes half strawberry am   ate
          'There were strawberry and blueberry cakes on the table. I ate half of the strawberry ones.'

    d. Na stole byly jahodové   a   borůvkové koláče. Půlku **z**   jahodových jsem snědla.
        on table were strawberry and blueberry cakes half **from** strawberry am   ate
        'There were strawberry and blueberry cakes on the table. I ate half of the strawberry
        ones.'   (Czech, Slavic)

After producing these sentences, we asked our informants explicitly about the sign FROM^IX-a and asked them to judge the following sentences, exemplified in (22) below, according to their grammaticality and acceptability. These sentences were provided in glosses but were also signed by one of the researchers. They were also designed to uncover potential differences between entity partitives (22cd) and set partitives (22ab), on the one hand, and partitives (22bd) and non-partitive constructions (22ac), on the other one.

(22) a. TABLE BE/HAVE$_a$ CUBE++ SIX BLUE. THREE BLUE $_a$TAKE$_b$.
        'There were six blue dice on the table. Three blue ones were taken.'
    b. TABLE BE/HAVE$_a$ CUBE++ SIX BLUE. THREE **FROM^IX-a** BLUE $_a$TAKE$_b$.
        'There were six blue dice on the table. Three **of the** blue ones were taken.'
    c. TABLE BE/HAVE CAKE STRAWBERRY$_a$ BLUEBERRY$_b$. HALF STRAWBERRY EAT.
        'There was a strawberry and a blueberry cake on the table. I ate half of the strawberry one.'
    d. TABLE BE/HAVE CAKE STRAWBERRY$_a$ BLUEBERRY$_b$. HALF **FROM^IX-a** STRAWBERRY EAT.
        'There was a strawberry and a blueberry cake on the table. I ate half of the strawberry
        one.'   (ČZJ)

Finally, we focused on the first part of the sign, namely FROM, and asked the informants whether they are familiar with it, how frequently it is used and in which contexts it is felicitous. The next section will provide answers to the questions raised here and present the results of our elicitations.

5. PARTITIVES IN CZECH SIGN LANGUAGE

Let us now proceed to the presentation of the results. Based on the data from several other sign languages, we expected to find the same type of partitivity marking, namely the [high] vs. [low] strategy. Instead, however, we found a new construction utilizing the sign glossed as FROM^IX-a, which seems to fulfill the function of a partitive marker in ČZJ.

The minimal pair of sentences is exemplified in (23)–(24) below, where the noun phrase in (23) THREE BLUE ('three blue ones') is understood as simply indefinite, while the one in (24) THREE FROM^IX-a BLUE ('three of the blue ones') is considered a partitive construction. The sentences with and without FROM^IX-a are both grammatical and acceptable by our informants in the given contexts.

(23) TABLE BE/HAVE$_a$ CUBE++ SIX BLUE. THREE BLUE $_a$TAKE$_b$.
      'There were six blue dice on the table. Three blue ones were taken.'
                                (ČZJ, CZJ_infl_set_nonpart_3_cubes)

(24) TABLE BE/HAVE_a CUBE++ SIX BLUE. THREE **FROM^IX-a** BLUE _aTAKE_b.
      'There were six blue dice on the table. Three **of the** blue ones were taken.'
                                                    (ČZJ, CZJ_inf1_set_part_3_cubes)

      After finding the new construction, we proceeded to determine the semantic contribution and possible constraints of its use. The first question to answer was whether the FROM^IX-a marker is available in combination with both set and entity partitives. We tested this in the context exemplified below in (25) with a noun phrase that could be pragmatically used in both set and entity partitives.

(25) TABLE BE/HAVE CAKE STRAWBERRY_a BLUEBERRY_b. HALF **FROM^IX-a** STRAWBERRY EAT.
      'There was a strawberry and a blueberry cake on the table. I ate half of the strawberry one.'
                                                    (ČZJ, CZJ_inf1_entity_part_bare)

      Since ČZJ does not mark plurality via morphological means on the noun (CAKE) nor the modifier (STRAWBERRY and BLUEBERRY), the example could be, in fact, translated also as *There were strawberry and blueberry cakes on the table. I ate half of the strawberry ones.* Therefore, we needed to ensure the singular and plural denotation by the addition of other lexical items, namely the quantifiers ONE and FOUR. Both examples in (26) and (27) are grammatical and the inferences drawn from them by the native signers correspond to the intended meaning of entity and set partitives, respectively.

(26) TABLE BE/HAVE CAKE STRAWBERRY_a ONE_a BLUEBERRY_b ONE_b. HALF **FROM^IX-a** STRAWBERRY EAT.
      'There was one strawberry and one blueberry cake on the table. I ate half of the strawberry one.'
                                                    (ČZJ, CZJ_inf1_entity_part_1)

(27) TABLE BE/HAVE CAKE STRAWBERRY_a FOUR_a BLUEBERRY_b FOUR_b. HALF **FROM^IX-a** STRAWBERRY EAT.
      'There were four strawberry and four blueberry cakes on the table. I ate half of the strawberry ones.'
                                                    (ČZJ, CZJ_inf1_set_part_4_cakes)

      Upon determining the primary meaning of the partitive construction, we investigated the semantic and syntactic distributional properties of FROM^IX-a. Within its semantics, we tested the marker in combination with various numerals and other quantifiers such as *half, quarter* and *part*. The grammaticality and acceptability of sentences with alternative quantifiers did not differ based on their variation, and thus we did not find any constraints regarding compatibility. On the other hand, from a syntactic point of view, we verified whether the different position of the partitive construction with respect to the verb would yield any difference in grammaticality and acceptability of the sentences by our informants, but again we found that their judgment stayed consistent in both positions.

Let us now focus more on the partitive marker itself, its components and their use. The complex sign FROM^IX-a is a compound consisting of two separate lexical items, namely FROM and IX-a. The two individual parts are depicted below in Fig. 2.

Fig. 2: FROM^IX-a.

The latter part is represented by a simple indexical sign pointing to a location *a* in the signing space. This sign is attested in virtually every researched sign language and its function is that of a pronoun. The location where the sign points to is itself arbitrary, but it is bound by the pronoun's antecedent, in this case the restrictor of the partitive construction. Therefore, the indexical part of FROM^IX-a causes the whole partitive marker to be directional, and thus examples like (28) below, where the location of the antecedent and the pronoun do not correspond, are deemed ungrammatical.

(28) *TABLE BE/HAVE CAKE STRAWBERRY$_a$ BLUEBERRY$_b$. HALF FROM^IX-**b** STRAWBERRY EAT.
Intended meaning: 'There was a strawberry and a blueberry cake on the table. I ate half of the strawberry one.'   (ČZJ)

The initial part of FROM^IX-a, on the other hand, is highly untypical. FROM in ČZJ is used as a directional preposition, the rarity of which will be revealed toward the end of this section. First, let us present its form and the range of meanings it can convey. The sign can be produced in its one-handed or two-handed variants, where the added non-dominant hand copies the handshape and the movement of the dominant hand in a symmetrical fashion. According to our informants, the chosen variant has no effect on the meaning nor the context of use. The non-manual component of the sign is a mouthing, i.e., a silent articulation of a word or its part from the surrounding spoken language, of *od* ('from') in Czech. Based on this fact and the intuitions of our informants, we believe that FROM is a borrowed lexeme from spoken Czech and as such belongs to the non-native lexicon of ČZJ.

After consulting with our informants during the second elicitation, we determined a range of contexts in which FROM is used in ČZJ, together with corresponding aspects of its meaning. The most prominent use of FROM is a temporal one, exemplified in several typical phrases in (29) provided by our informants.

(29) a. FROM SMALL
         'since childhood'
      b. FROM 8-HOUR
         'since 8 o'clock'

c. FROM 15 YEARS
    'from 15 years'   (ČZJ)

The second frequent area of use of FROM is a spatial one presented in a couple of contexts in (30).

(30) a. IX-a FROM GERMANY
          'S/he's from Germany.'
      b. ROAD FROM SHOP TO TRAIN-STATION CLOSE
          'The road from the shop to the train station is closed.'
      c. TRAM FROM SQUARE FREEDOM
          'a tram from (the direction of) the Freedom Square'   (ČZJ)

Finally, we have discovered several other contexts in which FROM is frequently used, as seen in (31) below. It appears, though, these do not seem to fit into a single semantic category.

(31) a. GIFT FROM MOM
          'a gift from mom'
      b. CAKE FROM SHOP
          'a cake from the shop'
      c. FROM 200 CROWN
          'from 200 crowns'
      d. TABLE FROM WOOD
          'a table made of wood'
      e. AUNT FROM MOM
          'an aunt from mom's side'   (ČZJ)

Regarding the frequency of the use of FROM (and, in fact, any directional prepositions in sign language), it is very rare. This does not come as a surprise, since the encoding of the relationships between referents, which generally falls into the semantic domain of prepositions, is more likely to occur via grammatical means in sign languages, namely the highly iconic classifier constructions which indicate location or existence of referents somewhere in space, their motion through space or a change of their posture (Zwitserlood 2012). The meaning of prepositions such as, e.g., 'on' and 'under', would then be conveyed by the relative positioning of the respective classifiers denoting the referents in question, as is shown in (32).

(32) a. TABLE CL:flat$_{[mid]}$ APPLE CL:sphere$_{[high]}$
          'There's an apple **on** the table.'
      b. TABLE CL:flat$_{[mid]}$ APPLE CL:sphere$_{[low]}$
          'There's an apple **under** the table.'   (ČZJ)

Let us conclude this section by highlighting the relevance of the sign language data that we obtained for the broader typological discussion presented in Section 2. What we have discovered in ČZJ is essentially an ablative strategy with FROM^IX-a as a partitive marker.

The <u>FROM^IX-a</u> sign was a significant finding, since no such construction was attested in other researched sign languages so far. The visual modality provides ample grammatical means, namely the omnipresent iconicity and the classifier constructions, for denoting the respective spatial positioning of the referents using the locative or ablative strategy described above. However, in ČZJ, we find that lexical means, i.e., a directional preposition, have been used to encode partitivity. This hints at the tight semantic relationship between locative and directional expressions, on one hand, and partitive markers, on the other.

In the next section, we will come back to evidence from spoken languages in order to demonstrate that certain semantic properties of spatial prepositions are also preserved when these expressions are used in more abstract senses as partitive markers and numeral modifiers.

6. PROPERTIES OF SPATIAL EXPRESSIONS PRESERVED IN ABSTRACT DOMAINS

In the previous sections, we demonstrated the cross-linguistic relevance of spatial markers, mainly directional prepositions with the ablative interpretation ('from'), in deriving the part-whole semantics. On the assumption that morphology expresses meaning, the systematicity of both spoken and sign language data suggests a robust link between the manner in which human beings conceptualize space and partitivity in language. In this section, we return to partitives in spoken languages in order to show that certain semantic properties of spatial prepositions are preserved on their partitive use. For this purpose, we will investigate partitive constructions in Polish (e.g., Rutkowski 2007, Wągiel 2022). Moreover, we will discuss the use of spatial prepositions as numeral modifiers (e.g., Corver and Zwarts 2006, Nouwen 2008, 2010).

6.1. Spatial/partitive expressions and pluralities

Polish employs the ablative strategy and has two partitive markers that originate as directional prepositions, namely (i) *z* ('from') and (ii) the compositionally transparent *spośród* ('from among'), which results from the stacking of *z* ('from') and *pośród* ('among, amid'). The spatial use of the preposition *z* is illustrated in (33). Notice that it has an unrestricted distribution and can take both singular and plural complements.

(33) a. Hania wyciągnęła kartki   **z**   **książki**.
       Hania pulled.out   pages.ACC from book.GEN
       'Hania pulled out pages from the book.'
    b. Hania wyciągnęła kartki   **z**   **książek**.
       Hania pulled.out   pages.ACC from books.GEN
       'Hania pulled out pages from the books.'   (Polish, Slavic)

In contrast, the distribution of the locative preposition *pośród* ('among, amid') and the related complex directional preposition *spośród* ('from among') is much more constrained. Both require the nominal complement to denote a plurality of entities (that enclose or surround the relevant object or objects). Therefore, they are infelicitous with

expressions referring to singular entities. This is illustrated in (34), where (34a) is an awkward sentence since the singular noun 'book' denotes atomic objects, whereas (34b) with the plural 'books' is a normal sentence of Polish.

(34) a. #Hania wyciągnęła kartki   **s-pośród   książki**.
        Hania pulled.out   pages.ACC from-among book.GEN
        Intended meaning: 'Hania pulled out pages from among the book.'
     b. Hania wyciągnęła kartki   **s-pośród   książek**.
        Hania pulled.out   pages.ACC from-among books.GEN
        'Hania pulled out pages from among the books.'   (Polish, Slavic)

Crucially, the same restriction is preserved also on the partitive use of *spośród*, which makes it incompatible with entity partitives. This property of *spośród* distinguishes it from the simplex directional preposition *z*, which is felicitous both with entity and set partitives. To illustrate the contrast, consider (35)–(36). In (35a), *z* combines with the singular 'book', which together with the proportional quantifier 'half' gives rise to an entity partitive. The use of the plural 'books' in (35b) results in a set partitive construction.

(35) a. Hania przeczytała połowę **z   książki**,   którą   wczoraj kupiła.
        Hania bought   half.ACC from book.GEN that.ACC.SG yesterday she.bought
        'Hania read half of the book that she bought yesterday.'
     b. Hania przeczytała połowę **z   książek**,   które   wczoraj kupiła.
        Hania bought   half.ACC from books.GEN that.ACC.PL yesterday she.bought
        'Hania read half of the books that she bought yesterday.'   (Polish, Slavic)

In contrast, (36a) is infelicitous since *spośród* in its partitive function is still incompatible with complements denoting singular entities. This results in entity partitives marked with *spośród* being semantically anomalous. However, the noun 'books' in (36b) designates pluralities, and thus it is compatible with the distributional requirement of *spośród*. Consequently, set partitives with this marker are felicitous.

(36) a. #Hania przeczytała połowę **s-pośród   książki**,   którą   wczoraj kupiła.
        Hania read   half.ACC from-among book.GEN that.ACC.SG yesterday she.bought
        Intended meaning: 'Hania read half of the book that she bought yesterday.'
     b. Hania przeczytała połowę **s-pośród   książek**,   które   wczoraj kupiła.
        Hania read   half.ACC from-among books.GEN that.ACC.PL yesterday she.bought
        'Hania read half of the books that she bought yesterday.'   (Polish, Slavic)

Notice also that the behavior of *spośród* is not a Polish idiosyncrasy. In fact, it patterns with the Romanian *dintre* ('from among'), which is also used as a partitive marker and which also selects for definite plural DPs (Tănase-Dogaru 2018), as indicated in (37).

(37) doi **dintre**   studenţii   mei
     two from.among students.the my
     'two of my students'   (Romanian, Romance; Tănase-Dogaru 2018)

The data examined in this section extends the generalization based on the partitive marking patterns with an additional observation. The discussed evidence demonstrates that not only do spatial expressions cross-linguistically function as markers of partitivity but also that certain non-trivial topological properties of spatial expressions are preserved also on their partitive use. We take this fact to indicate a deep relationship between the representation of space and partitivity in natural-language semantics. Therefore, we want to suggest that the spatial (locative and ablative) metaphors of partitivity ought to be considered as something that might give us a clue of what proper semantic models of the part-whole relation should look like.

Next, we will explore a parallel between spatial prepositions in partitives and in modified numeral constructions, which will lead us to speculate on the potential theoretical relevance of the data discussed so far.

6.2. A parallel with numeral modifiers

The discussed phenomena regarding expression of space and partitivity seem to parallel the relationship between spatial modifiers and number words (e.g., Corver and Zwarts 2006, Nouwen 2008, 2010, 2016). Specifically, Corver and Zwarts (2006) observe that cross-linguistically spatial prepositions are commonly utilized as numeral modifiers expressing 'fewer' or 'more', as illustrated in (38)–(39) for English and Romanian, respectively.

(38) John found { **over** / **under** } 50 typos in the manuscript.   (Nouwen 2016: 1)
(39) Au fost **sub** 20 de copii la petrecere.
     have been below 20 PREP children at party
     'There were under 20 children at the party.'

                                        (Romanian, Romance; Corver and Zwarts 2006: 818)

Crucially, while many languages use vertically oriented prepositions in combination with numerals to express quantity, so far no language has been found that employs horizontally oriented prepositions for this purpose. Frequently, both locative and directional prepositions occur in this function (e.g., Nouwen 2008, 2010, Blok 2015).[6] Sentences (40)–(41) provide examples of directional modifiers.

(40) a. Jasper ran **up to** the edge of the lake.
     b. Jasper is allowed to invite **up to** 10 children to his party.   (Nouwen 2008: 573)
(41) The distance between Mars and the earth varies **from** 62 million miles **down to** 34 million miles.   (Nouwen 2008: 572)

The examples from Greek and Hebrew given in (42)–(43), respectively, further support the robustness of the cross-linguistic pattern. In both cases, vertical prepositions are used as numeral modifiers.

---

[6] Notice that there are non-trivial differences between the two classes, which we will ignore here (for details, see, e.g., Nouwen 2008, 2010, Blok 2015).

(42) a. To skili tu   Yani   kimate **kato apo** to trapezi.
          the dog the.GEN John.GEN sleeps under from the table
          'John's dog is sleeping under the table.'
      b. He tha epireastun i sindaxis   pu   ine **kato apo**   hilia evro.
          not will affected the pensions which are under from 1000 euro
          'The pensions that are under 1000 euro will not be affected.'

                                             (Greek, Hellenic; Nouwen 2016: 2)

(43) a. ha-tmuna   tluya **me-'al**   la-ax
          the-picture hang from-top to.the-fireplace
          'The picture is hanging above the fireplace.'
      b. yoni matsa **me-'al**   le-me'a šgi'ot   ba-sefer
          yoni found from-top to-100   mistakes in.the-book
          'Jon found over/above 100 mistakes in the book.'

                                          (Hebrew, Semitic; Nouwen 2016: 1–2)

In order to explain the data in (38)–(43), Nouwen (2016) attempts to make sense of the spatial metaphor for number in natural language and its interaction with compositional semantics by examining structural properties shared by the vertical spatial axis and scales. There are two core components of the proposal.

First, on Nouwen's approach numerals are treated as inherently scalar expressions. In semantics, a SCALE is an ordering of values that is associated with the meaning of a linguistic expression (e.g., Solt 2015). Formally, it is an ordered set of measures, i.e., a pair $\langle D, > \rangle$, where D is the set of degrees, i.e., abstract objects representing the measures, and $>$ is the ordering defined on that set. The type of scale corresponding to numbers is a ratio scale, i.e., a scale that traces the distance between the ordered elements and allows for multiplication (Stevens 1946). For instance, on the scale of weight the difference between 3 kg and 4 kg is 1 kg and the difference between 6 kg and 7 kg is also 1 kg. However, it is also straightforward that 6 kg is twice as much as 3 kg. On this view, numerals correspond to numbers, which are taken to be not isolated entities but rather ordered points on a scale, i.e., entities that are connected to each other via $>$.

The second aspect of Nouwen's proposal concerns the fact that the key component of a ratio scale is the existence of a non-arbitrary starting point. To illustrate, consider the scale of weight. Though 3 kg is a different measure than 3 lb, 0 kg equals 0 lb. Consequently, irrespective of the units in which the scale is calibrated, 0 is non-arbitrary since it always yields the same measure. Likewise, for the scale of quantity 0 is the non-arbitrary starting point designating the absence of entities. Now, Nouwen observes that in the human everyday experience of space only the vertical axis involves a fixed non-arbitrary starting point. This point corresponds to the notion of GROUND, which Nouwen takes to be engrained in our notion of space with gravity potentially playing an essential role by providing an absolute direction to the axis. Crucially, in the human experience of space the horizontal dimension lacks such a fixed non-arbitrary point. This applies both to the lateral axis (left-right) and to the frontal axis (front-back), which differ from the vertical axis in this respect.

Combining the two assumptions above results in that the ratio scale associated with numbers and the vertical axis in space share similar structural properties. This in turn allows vertically-oriented locative and directional prepositions such as those in (38)–(43) to function simultaneously as spatial expressions and numeral modifiers.

To conclude, in this section we showed that certain semantic properties of spatial expressions are preserved also on more abstract uses of these expressions, e.g., in their function as partitive markers. The parallel with numeral modifiers indicates that locative and directional aspects of spatial prepositions are active when applied to the domain of numbers. This means that the linguistic representation of the notion of space can interact also with abstract notions in a compositional fashion and Nouwen's (2016) proposal demonstrates that it is possible to make sense semantically of the spatial metaphor in abstract domains.

In the next section, we will speculate on the source of the cross-linguistic relationship between spatial (locative and ablative) prepositions and partitive markers. We submit that the typological marking patterns in question invite us to consider part-whole relations in natural language not in purely mereological terms, but rather as mereotopological phenomena.

7. THEORETICAL RELEVANCE: A MEREOTOPOLOGICAL PERSPECTIVE ON PARTITIVITY

Since Link (1983), most of the semantic research on the part-whole relation has been grounded in MEREOLOGY (for an overview, see Champollion and Krifka 2016). The prevailing approach assumes the PARTHOOD relation ($\sqsubseteq$), which is reflexive, transitive and antisymmetric, to be the core of the system. Typically, this notion is taken to be primitive and serves as the basis for deriving all other mereological concepts including the notions of SUM and OVERLAP. For the last 40 years, the mereological framework has proved to be a very useful tool for modeling part-whole structures in natural language and inspired multiple influential theories. However, there are well known issues with purely mereological approaches (for discussion, see Casati and Varzi 1999, Wągiel 2021b).

Mereology was criticized as a theory of part-whole structures since it does not seem to be able to capture sufficiently what it means to be a whole, which in turn results in discrepancies between mereological models and our intuitions regarding objects these models are intended to represent. Specifically, mereology cannot differentiate ontologically between structured configurations of parts and arbitrary sums (Casati and Varzi 1999, Wągiel 2021b).[7] Consequently, a whole cup and a random collection of shards of glass have the same mereological status though intuitively the two entities differ in an essential way. While the cup is an individuated object that forms an integrated whole, the collection of shards is just an arbitrary (scattered) plurality of entities. Yet, this distinction cannot be captured in purely mereological terms and calls for a more powerful framework referred to as MEREOTOPOLOGY. Mereotopology is a theory of parts and wholes that attempts to overcome the limits of mereology by combining mereological concepts with topological notions so that the resulting part-whole structures track not only what is part of what but also the spatial configuration of parts within a whole (e.g., Clarke 1981, Smith 1996, Roeper 1997, Casati and Varzi 1999, Varzi 2007; see also Grimm 2012, Lima 2014, Scontras 2014, Wągiel 2019, 2021ab, 2022, 2023, Grimm and Dočekal 2021, Igel 2021, Schvarcz and Wohlmuth 2021, Gréa 2023, Wągiel and Shlikhutka 2023, Kagan 2024 for linguistic applications). The key notion in the topological

---

[7] Moltmann (1997) emphasizes the relevance of structured parthood and integrity in semantics and develops an alternative approach. However, in general her account is not couched in standard mereology (see Pianesi 2002 for a critical assessment).

component of the theory is the CONNECTEDNESS relation (C), which is reflexive and symmetric but not transitive. C enables us to derive more ancillary topological concepts, which allow for capturing various spatial configurations of entities, including internal and tangential overlap as well as various forms of topologically structured collections of entities. One of the notions that can be defined in terms of connectedness is topological ENCLOSURE (E), see (44). In prose, x is enclosed in y if all things that are connected to x are also connected to y.

(44) $E(x,y) =_{def} \forall z[C(z,x) \rightarrow C(z,y)]$ (Casati and Varzi 1999: 52)

In general, there are two possible strategies for how to combine topology with mereology within a single mereotopological framework. The first strategy takes mereology as the basis of the system and introduces the topological component on top of it via a set of bridging principles that ensure the interactions between $\sqsubseteq$ and C (Casati and Varzi 1999, Varzi 2007). The crucial interaction is ensured by the principle of MONOTONICITY in (45), which guarantees that if an entity is part of another, it is also enclosed in it, i.e., whatever is connected to the former is also connected to the latter. In other words, parthood implies topological enclosure.

(45) $x \sqsubseteq y \rightarrow E(x,y)$ (Casati and Varzi 1999: 54)

To the best of our knowledge, all semantic approaches to part-whole structures that are grounded in mereotopology followed Grimm (2012) and assumed this strategy (e.g., Lima 2014, Scontras 2014, Wągiel 2019, 2021ab, 2022, 2023, Grimm and Dočekal 2021, Igel 2021, Schvarcz and Wohlmuth 2021, Gréa 2023, Wągiel and Shlikhutka 2023, Kagan 2024). Consequently, all contemporary mereotopological models of natural-language semantics take the mereological component as the basic one and extend it with topological notions. What we want to suggest is that the partitivity marking strategies based on spatial metaphors discussed in this paper indicate that the alternative option should also be explored.

The alternative view of mereotopology is based on the idea that topology is a more general and fundamental framework that subsumes mereology. In other words, topology serves as the core of the system and mereological concepts are derived from more basic topological notions (Whitehead 1929, Clarke 1981, Casati and Varzi 1999). On this view, parthood is defined in terms of topological enclosure, as provided in (46). In words, if an entity is topologically enclosed in another entity, it is its part. This view does not assume parthood to be elementary but rather derivative with respect to the more general topological notion.

(46) $E(x,y) \rightarrow x \sqsubseteq y$ (Casati and Varzi 1999: 63)

We are not aware of any attempt so far to model part-whole structures in natural language using this alternative perspective on the source of parthood. However, we submit that the cross-linguistic robustness (also across modalities) of the locative and ablative partitivity marking strategy potentially provides empirical support for a mereotopological approach that would be based on topology as the basis of the system. We believe that it is not impossible that the cross-linguistic marking patterns reflect the way space and partitivity are linguistically conceptualized. This in turn might offer certain hints regarding the proper

representation of parthood in natural language. Whether such an endeavor would prove to be more advantageous compared to other approaches to part-whole structures is of course an open question.

8. CONCLUSION

In this paper, we outlined the three strategies of partitive marking in spoken languages (namely the possessive, locative and ablative strategy) and compared them with the [high] vs. [low] strategy found in sign languages, which makes use of the signing space and does not fit neatly into the typology based on spoken languages. To the best of our knowledge, until now no construction employing a marking strategy different than [high] vs. [low] was attested in sign language.

We then reported on our study on partitives in Czech Sign Language. Surprisingly, we did not find the [high] vs. [low] strategy we expected due to the shared visual modality with other researched sign languages. Instead, we identified a new construction using the sign FROM^IX-a as a partitive marker. This partitive construction then places ČZJ into the group of languages that utilize the ablative strategy within the partitive marking.

This discovery hints at the relationship between locative and directional prepositions, on one hand, and partitive markers, on the other one. Furthermore, we demonstrated that certain properties of spatial expressions are preserved also on their abstract uses as partitive markers and numeral modifiers. The robustness of the crosslinguistic marking patterns (also across modalities) indicates that it is not improbable that linguistic representations of space and partitivity share a common component. We submit that a mereotopological perspective on parthood as a relation that is not primitive but rather derived from a more general topological notion of enclosure might offer a framework to better understand the relationship between space and partitivity in natural language.

Still, more research needs to be conducted in the future to fully understand the semantic relationship between spatial prepositions, partitive markers and numeral modifiers and to inform the theoretical modeling of space and part-whole representation in natural languages. Likewise, any and all research into the promising field of sign languages is certain to provide us with enticing new discoveries and potentially expand the typological categories employed in linguistics.

REFERENCES

Asher, R. E., T. C. Kumari, 1997, *Malayalam*, London, Routledge.

Atoyebi, J. D., 2010, *A reference grammar of Oko: A West Benue-Congo language of North-Central Nigeria*, Cologne, Rüdiger Köppe.

Bahan, B. J., 1996, *Non-manual realization of agreement in American Sign Language*, Boston, Boston University.

Barberà, G. A., 2015, *The Meaning of Space in Sign Language: Reference, Specificity and Structure in Catalan Sign Language Discourse*, Berlin, München, Boston, De Gruyter Mouton.

Barberà, G. A., 2020, "Pragmatics: 1.1.4.1. Manual marking", in: J. Quer, G. A. Barberà (ed.), *A Grammar of Catalan Sign Language (LSC)*, SIGN-HUB Sign Language Grammar Series, 230–237.

Barker, C., 1998, "Partitives, double genitives and anti-uniqueness", *Natural Language & Linguistic Theory* 16(4), 679–717.

Besnier, N., 2000, *Tuvaluan: A Polynesian language of the Central Pacific*, London, Routledge.

Blok, D., 2016, "The semantics and pragmatics of directional numeral modifiers", *Semantics and Linguistic Theory* 25, 471–490.

Bosworth, J., 2014, "of", in: T. N. Toller, C. Sean, O. Tichy (eds.), *An Anglo-Saxon Dictionary Online*, Prague, Charles University. URL: https://bosworthtoller.com/23978.

Casati, R., A. C. Varzi, 1999, *Parts and places: The structures of spatial representation*, Cambridge, MA, MIT Press.

Champollion, L., M. Krifka, 2016, "Mereology", in: M. Aloni, P. Dekker (eds), *Cambridge handbook of formal semantics*, Cambridge, Cambridge University Press, 369–388.

Clark, R., 1973, "Transitivity and case in eastern Oceanic languages", *Oceanic Linguistics*, 12, 559–606.

Clarke, B. L., 1981, "A calculus of individuals based on 'connection'", *Notre Dame Journal of Formal Logic*, 22, 204–218.

Corver, N., J. Zwarts, 2006, "Prepositional numerals", *Lingua*, 116, 6, 811–836.

de Hoop, H., 1997, "A semantic reanalysis of the partitive constraint", *Lingua*, 103, 2–3, 151–174.

de Hoop, H., 2003, "Partitivity", in: L. Cheng, R. Sybesma (eds), *The Second Glot International State-of-the-Article Book: The Latest in Linguistics*, Berlin, Mouton de Gruyter, 179–212.

Dictio: Multilingual Online Dictionary, 2024, Brno, Masaryk University.

Enç, M., 1991, "The semantics of specificity", *Linguistic Inquiry*, 22, 1, 1–25.

Falco, M., R. Zamparelli, 2019, "Partitives and partitivity", *Glossa: a journal of general linguistics*, 4, 1, 1–49.

Givón, T., 2011, *Ute reference grammar*, Amsterdam, John Benjamins.

Gréa, P., 2023, "*Quelques* in French: A clustered plural", *Journal of Semantics*, 40, 2–3, 427–482.

Grimm, S., 2012, *Number and Individuation*, Ph. D. thesis, Stanford University, California.

Grimm, S., M. Dočekal, 2021, "Counting aggregates, groups and kinds: Countability from the perspective of a morphologically complex language", in: H. Filip (ed.), *Countability in natural language*, Cambridge, Cambridge University Press, 85–120.

Hoeksema, J., 1996, "Introduction", in J. Hoeksema (ed.), *Partitives: Studies on the Syntax and Semantics of Partitive and Related Constructions*, Berlin, Walter de Gruyter, 1–24.

Holes, C., 1990, *Gulf Arabic*, London, Routledge.

Igel, M., 2021, "Part-whole-modifiers and the *-operator", in: L. Martí, H. Pearson, Y. Sudo (eds), *Proceedings of Sinn und Bedeutung 25*, London, University College London & Queen Mary University of London, 430–447.

Ionin, T., O. Matushansky, E. G. Ruys, 2006. "Parts of speech: Toward a unified semantics for partitives", in: C. Davis, A. R. Deal, Y. Zabbal (eds), *Proceedings of the North East Linguistic Society 36*, Amherst, MA, GLSA, 357–370.

Jackendoff, R., 1977, *X-bar syntax: A theory of phrase structure*, Cambridge, MA, MIT Press.

Kagan, O., 2024, "The Slavic suffix *-in/-yn* as partition shifter", *Natural Language Semantics*, 32, 1, 35–63.

Koptjevskaja-Tamm, M., 2009, "A lot of grammar with a good portion of lexicon: Towards a typology of partitive and pseudopartitive nominal constructions", in: J. Helmbrecht, Y. Nishina, Y.-M. Shin, S. Skopeteas, E. Verhoeven (eds), *Language Typology and Syntactic Description 3: Grammatical Categories and the Lexicon*, New York, Cambridge University Press, 55–149.

Ladusaw, W., 1982, "Semantic constraints on the English partitive construction", in: D. Flickinger, M. Macken, N. Wiegand (eds), *Proceedings of the West Coast Conference on Formal Linguistics 1*, Stanford, CA, Stanford University, 231–242.

Lima, S., 2014, *The grammar of individuation and counting*, University of Massachusetts, PhD dissertation.

Link, G., 1983, "The logical analysis of plural and mass nouns: A lattice-theoretical approach", in: R. Bäuerle, C. Schwarze, A. von Stechow (eds), *Meaning, use, and interpretation of language*, Berlin, Mouton de Gruyter, 302–323.

Luraghi, S., S. Kittilä, 2014, "Typology and diachrony of partitive case markers", in: S. Luraghi, T. Huumo (eds), *Partitive cases and related categories*, Berlin, De Gruyter Mouton, 17–62.

Martí i Girbau, N., 2010, *The Syntax of Partitives*, Ph. D. thesis, Universitat Autonoma de Barcelona, Barcelona.

Moltmann, F., 1997, *Parts and wholes in semantics*, New York, NY, Oxford University Press.

Nouwen, R., 2008, "Directionality in numeral quantifiers: The case of 'up to'", in: T. Friedman, S. Ito (eds), *Proceedings from Semantics and Linguistic Theory* 18, Ithaca, CLC Publications, 569–582.

Nouwen, R., 2010, "Two kinds of modified numerals", *Semantics and Pragmatics*, 3, 1–41.

Nouwen, R., 2016, "Making sense of the spatial metaphor for number in natural language", unpublished manuscript, available online on LingBuzz.

Perniss, P., 2012, "19. Use of sign space", in: R. Pfau, M. Steinbach, B. Woll (eds), *Sign Language: An International Handbook,* Berlin, Boston, De Gruyter Mouton, 412–431. https://doi.org/10.1515/9783110261325.412

Pianesi, F., 2002, "Friederike Moltmann, 'Parts and Wholes in Semantics'", *Linguistics and Philosophy*, 25, 1, 97–120.

Roeper, P., 1997, "Region-based topology", *Journal of Philosophical Logic*, 26, 3, 251–309.

Rutkowski, P., 2007, "The syntactic structure of grammaticalized partitives (pseudo-partitives)." *University of Pennsylvania Working Papers in Linguistics*, 13, 1, 337–350. URL: https://repository.upenn.edu/pwpl/vol13/iss1/26.

Schlenker, P., J. Lamberton, M. Santoro, 2013, "Iconic variables", *Linguist and Philos,* 36, 91–149. https://doi.org/10.1007/s10988-013-9129-1

Schvarcz, B. R., K. Wohlmuth, 2021, "An MSSC-approach to Hungarian classifiers", *Acta Linguistica Academica*, 68, 3, 257–273.

Scontras, G., 2014, *The semantics of measurement*, Harvard University, PhD dissertation.

Selkirk, E. O., 1977, "Some remarks on noun phrase structure", in: P. Culicover, T. Wasow, A. Akmajian (eds), *Formal syntax*, New York, NY, Academic Press, 285–316.

Seržant, I. A., 2021, "Typology of partitives", *Linguistics*, 59, 4, 881–947.

Smith, B., 1996, "Mereotopology: A theory of parts and boundaries", *Data & Knowledge Engineering*, 20, 3, 287–303.

Solt, S., 2015, "Measurement scales in natural language", *Language and Linguistics Compass*, 9, 1, 14–32.

Stevens, S. S., 1946, "On the theory of scales of measurement." *Science*, 103, 677–680.

Tang, G., F. Y. B Sze, 2002, "Nominal expressions in Hong Kong Sign Language: Does modality make a difference?", in R. P. Meier, K. Cormier, D. Quinto-Pozos (eds), *Modality and Structure in Signed and Spoken Languages*, Cambridge, Cambridge University Press, 296-320.

Tănase-Dogaru, M., 2017, "Partitive constructions", in: M. Everaert, H. C. van Riemsdijk (eds), *The Wiley Blackwell Companion to Syntax*, Hoboken, NJ, Wiley, 1–30.

Tănase-Dogaru, M., 2018, "On the partitive uses of 'de', 'din' and 'dintre' in Modern Spoken Romanian. The demonstrative partitive", in M. Burada, O. Tatu, R. Sinu (eds), *Language sustainability in a changing world*, Newcastle upon Tyne, Cambridge Scholars Publishing, 165–186.

Terrill, A., 2003, *A grammar of Lavukaleve*, Berlin, Mouton de Gruyter.

Varzi, A. C., 2007, "Spatial reasoning and ontology: Parts, wholes, and locations", in: M. Aiello, I. E. Pratt-Hartmann, J. van Benthem (eds), *Handbook of spatial logics*, Berlin, Springer, 945–1038.

von Heusinger, K., J. Kornfilt, 2017, "Partitivity and case marking in Turkish and related languages", *Glossa: a journal of general linguistics*, 2, 1, 1–40.

Wągiel, M., 2019, "Partitives, multipliers and subatomic quantification", in: M. T. Espinal, E. Castroviejo, M. Leonetti, L. McNally, C. Real-Puigdollers (eds), *Proceedings of Sinn und Bedeutung 23*, Barcelona, Autonomous University of Barcelona, 445–462.

Wągiel, M., 2021a, "Slavic derived collective nouns as spatial and social clusters", in: M. Dočekal, M. Wągiel (eds), *Formal approaches to number in Slavic and beyond*, Berlin, Language Science Press, 175–205.

Wągiel, M., 2021b, *Subatomic quantification*, Berlin, Language Science Press.

Wągiel, M., 2022, "A typology of proportional quantifiers: Evidence from Polish partitives", *Acta Linguistica Academica*, 69, 1, 128–159. URL: https://doi.org/10.1556/2062.2022.00449

Wągiel, M., 2023, "Acts, occasions and multiplicatives: A mereotopological account", in: J. Kim, B. Öney, Y. Zhang, F. Zhao (eds), *Proceedings of Semantics and Linguistic Theory 33*, Washington, DC, Linguistic Society of America, 276–297.

Wągiel, M., Shlikhutka, N., 2023, "Clustering and declustering things: The meaning of collective and singulative morphology in Ukrainian", in: J. Kim, B. Öney, Y. Zhang, F. Zhao (eds), *Proceedings of Semantics and Linguistic Theory 33*. Washington, DC, Linguistic Society of America, 194–214.

Whitehead, A. N., 1929, *Process and reality*, New York, NY, MacMillan.

Zamparelli, R., 1998, "A theory of kinds, partitives and *of/z* possessives", in: A. Alexiadou, C. Wilder (eds), *Possessors, predicates and movement in the determiner phrase*, Amsterdam, John Benjamins Publishing, 259–304.

Zwitserlood, I., 2012, "Classifiers", in R. Pfau, M. Steinbach, B. Woll (eds), *Sign Language: An International Handbook,* Berlin, Boston, De Gruyter Mouton, 158–186. https://doi.org/10.1515/9783110261325.158