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Differential object marking in DGS (German Sign Language): A prominence-based account of the use of PAM based on naturalistic data

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This paper examines the nature of object marking in DGS (German Sign Language), providing an account of the behavior of the sign glossed as PAM, previously analyzed as an agreement auxiliary (person agreement marker) and more recently as a differential object marker (Bross 2020). We investigate the influence of animacy and definiteness (object individuation) and the affectedness of the object as properties that have been claimed to be relevant for differential object marking, in general, and for DGS, in particular. We provide an account of object-marking based on the notion of linguistic prominence, specifically on how the use of PAM in DGS may be interpreted as providing additional information (marking) that brings the object into the center of attention. We suggest that the use of PAM is triggered through object prominence in three ways: being highly individuated (animate, definite); being a stimulus/causer rather than a patient; not being (very) affected by the verbal action. In addition, we find that an association with negative intent by the subject as well as the selectional constraints on verbs occurring with PAM are captured very well for DGS by the account proposed by Meir (2003) for ISL (Israeli Sign Language), a sign language historically related to DGS.

1 Introduction

Many accounts of the morphosyntactic realization of arguments are related to referential prominence. Prominence can be characterized by the degree to which a linguistic element (e.g. a phoneme, syllable, or word) becomes centered in attention in relation to other elements of the same nature (Himmelmann & Primus 2015; von Heusinger & Schumacher 2019). Arguments of verbs compete with each other for prominence in this way, and their prominence can be measured based on their morphosyntactic behavior and semantic characteristics. Semantically, it is the thematic role of agent that presents itself as an inherently prominent element. In both cognitive and functional terms, agents are considered to be natural centers of attention. As Himmelmann & Primus (2015: 47) note, "the human cognitive system seems to have developed a special sensitivity to those natural objects that are potential agents". In this sense, language evolution has conditioned linguistic structures to conventionalize agents as centers of attention. However, the center of attention can be modified or displaced. That is, the agent is not the center of attention in any given context. There is a competitive relationship between it and other elements, and it must be possible for other roles besides the agent to become more prominent and to become the center of attention. A non-agent argument can signal linguistic prominence, for example, by assuming the initial position in the sentence (as with passive constructions) or by receiving morphosyntactic marking (e.g. differential object marking). In this paper, we explore the nature of differential object marking as signaling prominence in DGS (German Sign Language).

The fundamental idea behind differential object marking (DOM) is that objects in transitive constructions receive some special marking when they have what are considered to be non-object-like properties, i.e. when they are particularly prominent or agent-like. On this account, the subject of a transitive clause is animate and definite, while the object is inanimate and indefinite (Comrie 1989). When the object, however, is itself animate and definite (i.e. highly individuated and thus agent-like in its prominence), additional marking is triggered. This is exemplified, for example, in Spanish where the preposition *a* is used in conjunction with human referents (as in example 1a), but not with inanimate referents (as in example 1b). The phenomenon of DOM is one way in which the notion of linguistic prominence reveals itself as a structuring factor in languages.

(1) *Spanish* (García García 2018: 211)

a. *Pepe ve *ø/a la actriz.*
Pepe see[3SG] ø/to the actress
'Pepe sees the actress.'

b. *Pepe ve ø/*a la película.*
Pepe see[3SG] ø/to the film
'Pepe sees the film.'

In sign languages, morphological marking does not typically occur on the arguments themselves. Rather, who does what to whom is indicated through constituent order, spatial modification (i.e. directional movement) of verbs, or through pragmatic inference (Cormier et al. 2012; Johnston 2019). However, there is evidence that argument marking – and, in particular, object marking – plays a role in sign languages. Verbs that move through space to indicate their arguments have been argued to show a tendency to favor object marking over subject marking (Rathmann & Mathur 2002 for DGS: Fenlon et al. 2018 for BSL (British Sign Language)) and the use of dedicated object-markers has been described for a number of sign languages, notably ISL (Israeli Sign Language) (Meir 2003), SSL (Swedish Sign Language) (Börstell 2019), and DGS (Bross 2020; see also Proske 2020; Steinbach 2022). For DGS, Bross (2020) analyses the sign glossed as PAM (based on its previous analysis as a Person Agreement Marker, Rathmann 2003; Steinbach & Pfau 2007) as a differential object marker whose use is triggered by animacy, definiteness, and affectedness. In this paper, we use naturalistic corpus data to test these claims made by Bross (2020) regarding the use of PAM.

2 Theoretical Framework

2.1 Linguistic Prominence

Seeing prominence as a general organizational principle of language, the notion of focusing or concentration of attention is especially important. Himmelmann & Primus (2015) call the focus on one object or entity among other simultaneously available objects attentional centering. The attentional center is then the focused entity that stands out with respect to linguistic properties – i.e. is given more prominence in linguistic structures. Agents (acting out of volition and with control) are taken to be attentional centers by default, with convergent arguments coming from evolutionary, psychological, and linguistic perspectives. As humans, we are especially sensitive to properties of agents, as entities able to act and move of their own volition and control. In evolutionary terms, this special sensitivity, evident e.g. in the animate monitoring bias (New et al. 2007), would have been important for detecting changes in the environment with potentially life-threatening consequences. From a processing perspective, it is equally important that we can quickly and unambiguously identify the entity in control (Alday et al. 2015). Evidence for this is provided by agent-first advantages in processing, and conversely, by processing difficulties when prototypical agent referents do not appear in first position (Bornkessel-Schlesewsky & Schlesewsky 2009). The grammars of languages reflect this by giving agents more prominence, or privileged status, in linguistic structures (Himmelmann & Primus 2015). Importantly, however, our attention centering is dynamic, and thus grammars must also have means by which to mark shifts in attention, such that non-agent participants may become the center of attention, as observable in case-marking and argument displacement patterns (Himmelmann & Primus 2015).

Grammars offer speakers and signers different ways of signaling shifts in attentional centering. An object that is agent-like attracts attention and thus marking, with the passive alternation

and differential object marking being clear examples of the shift in attentional center between agent and patient. On a prominence account of differential object marking, the morphosyntactic marking of a human object (as in Spanish) reflects the interaction of linguistic structure with the dynamics of attentional centering. This differs from an account of differential object marking in terms of markedness, where an animate, definite object is considered subject-like and thus atypical and morphologically marked (to distinguish it from the subject) (Comrie 1989). On a prominence account, the two event participants are both candidates to be the center of attention, generating competition for prominence between elements of equal status. Bringing the object referent into attentional centering in this case triggers (or grammatically requires) additional information through morphological marking or displacement. In this paper, we apply this notion of prominence to argument marking, in particular object marking, in a sign language, specifically DGS. What structural means exist in DGS to highlight or mark patient referents that attract attentional centering? Conversely, what properties must a patient referent exhibit in order to be treated as an attentional center? In the next section, we provide a brief overview of argument marking in sign languages.

2.2 Argument marking in sign languages

A main organizing principle of the grammar of sign languages is the use of space to indicate arguments. Notably, pronominal signs point to referents in space and a subset of verbs called indicating verbs (Liddell 2003; traditionally called agreement verbs, Padden 1990), move between locations in space associated with event participants. The DGS verb ASK is an example of an indicating verb; in **Figure 1a-b**, its beginning and end points indicate the agent/subject and patient/object arguments, respectively. In **Figure 1a**, the sign moves from the signer's body, associated with first person reference, to a location associated with a third person referent (*I ask her/him*); in **Figure 1b**, the sign moves from a third person location to first person (*S/he asks me*). Other verbs, like THANK (**Figure 1c**) always start at the signer's body, regardless of the subject/agent referent, and move only to indicate their object/patient argument (*X thanks him/her*). Finally, some indicating verbs, e.g. the DGS sign TRUST, exhibit partial subject agreement.[1] In these verbs, the subject is marked in space only when the object argument is first person; in **Figure 1d**, the sign moves toward the signer's body to indicate a first person object (*X trusts me*).[2]

[1] This has also been called optional subject agreement (Lillo-Martin & Meier 2011), though it is not clear that the subject agreement is actually optional. This may vary between sign languages.

[2] Throughout the article, all DGS examples are taken from the Public DGS Corpus (Konrad et al. 2020). Examples are accompanied by a label of the form "dgscorpus_[city]_[dyad] | [age group][gender]" (e.g. dgscorpus_nue_08 | 18–30f), which links directly to the timestamp of the video in the corpus, such that all examples may be viewed. See the Appendix for full versions of the links.

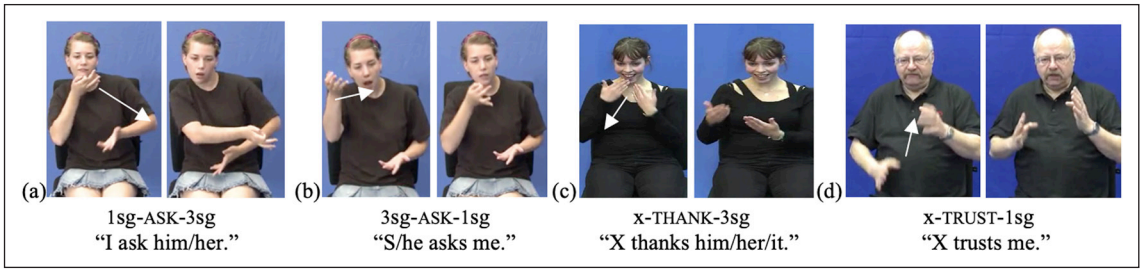

Figure 1: DGS examples showing the spatial modification for subject and object with the indicating verb ASK moving from (a) 1st person to 3rd person (dgscorpus_nue_08 | 18-30f) and (b) 3rd person to 1st person (dgscorpus_nue_08 | 18-30f). In (c), the movement of the DGS verb THANK spatially indicates only the object argument (dgscorpus_koe_01 | 18-30f). In (d), the verb TRUST shows spatial marking of the subject only with a 1st person object argument (dgsdorcus_mvp_06 | 61 + m). (Translations for these examples are our own.)

This brief overview of the typology of indicating verbs suggests that spatial marking is more common for the patient/object argument than for the agent/subject argument, and indeed a preference for object marking over subject marking has been claimed for a number of different sign languages (Morgan 2006; Quadros & Lillo-Martin 2007; Lillo-Martin & Meier 2011).[3] However, as Meir et al. (2007) argue, this "long standing typological puzzle" (p. 3) is explained through the frequent use of the body as subject, particularly for body-anchored verbs that express the subject in the lexical form of the verb, where a first person subject is implicit in the sign form. Such body-anchored verbs belong to the subset of verbs called plain verbs (Padden 1990). These verbs do not move through space and thus cannot indicate their arguments through spatial modification. Their place of articulation is on or near the body (body-anchored plain verbs) or in neutral space (the sign space in front of the signer's body; neutral plain verbs) (Steinbach 2022). When verbs cannot move to indicate their arguments, argument structure is indicated through word order or interpreted based on event semantics. In addition, some sign languages have so-called agreement auxiliaries that indicate verb arguments through spatial modification (see Sapountzaki 2012 for an overview). DGS has been traditionally analyzed as having such an agreement auxiliary, called a person agreement marker (PAM) (Rathmann 2003; Steinbach & Pfau 2007). **Figure 2a** shows a sentence from the Public DGS Corpus with the body-anchored plain verb LOVE in which the object argument is indicated through spatial modification of PAM post-verbally. Neutral plain verbs, e.g. DIE in DGS (see **Figure 2b**), can be localized in space to indicate (or agree with) arguments, in particular the sole argument of intransitive verbs (Oomen 2021). Steinbach (2022) implies that the occurrence of PAM with neutral verbs is possible, though an example is not provided.

[3] Under an agreement analysis, the movement of the verbs agrees with person features, thus the initial location of the verb agrees with the subject and the final location of the verb agrees with the object (see Schembri et al. 2018 for an overview). An exception are so-called backwards verbs, e.g. INVITE in DGS, which move from object to subject. In all cases, however, movement is from agent to patient, or from source to goal in Meir's (1998) terms.

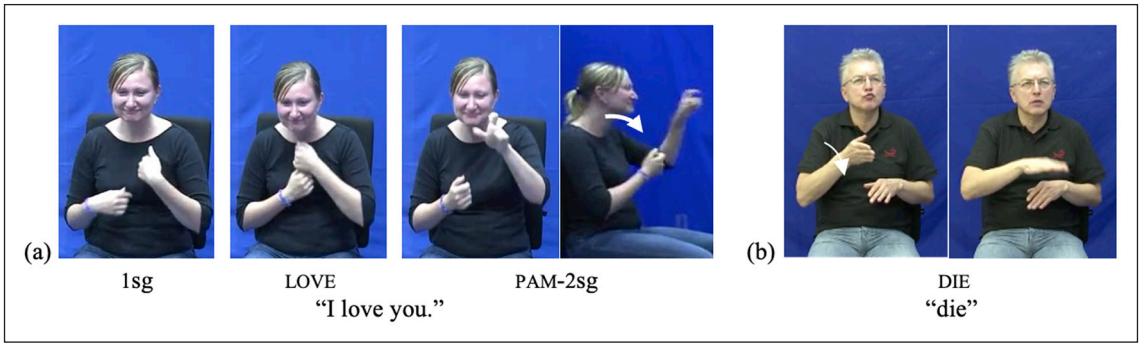

Figure 2: (a) Use of the DGS body-anchored plain verb LOVE with the sign PAM indicating a 2nd person patient/object (dgscorpus_ber_09 | 18-30f). (b) The neutral plain verb DIE in DGS (dgscorpus_fra_05 | 46-60m).

The status of DGS PAM (and similar signs in other sign language) as an (agreement) auxiliary comes from its role in marking arguments in conjunction with plain verbs (Sapountzaki 2012). The auxiliaries mark arguments in the same way as indicating (or agreement) verbs, but without contributing verb semantics. However, it has been noted that agreement auxiliaries occur not only with plain verbs, i.e. when the verb itself cannot move to indicate its arguments, but also together with indicating verbs (e.g. Rathmann 2003, Steinbach & Pfau 2007 for DGS; Krebs et al. 2020 for ÖGS (Austrian Sign Language); Costello 2015 for LSE (Spanish Sign Language). This suggests that these signs do more than "overcome the 'agreement gap' created by plain verbs" (Pfau & Steinbach 2013: 195). This double agreement (Krebs et al. 2020) has been described as functioning as a pragmatic marker of emphasis (e.g. Steinbach & Pfau 2007; Costello 2015). In addition, for DGS, Rathmann (2003) has suggested that double agreement contributes to an episodic, definite reading (marking a specific period of time) in contrast to a generic reading.

2.3 Differential Object Marking (DOM)

Recent analyses have pointed to evidence for the phenomenon of differential object marking in sign languages, or at least to the existence of dedicated object pronouns in a number of sign languages. In this section, we first describe the phenomenon of differential object marking in more detail, relating it specifically to the notion of prominence and then provide an overview of accounts of (differential) object marking in sign languages. We give special attention to accounts of differential object marking in DGS, as the language under investigation in the present study.

2.3.1 Differential object marking as a marker of prominence

As noted above, differential object marking (DOM) refers to special marking of patient arguments triggered by certain properties of the referents. These properties are typically linked to referential prominence, especially animacy, definiteness, specificity, and topicality (Moravcsik 1978; Comrie

1989; Bossong 1991; Aissen 2003). The more animate (particularly human), definite, or topical a patient referent is, the more agent-like and prominent it is, and thus the more likely it is to receive overt case marking, compared to other – less animate, less definite, less topical – patients. In Comrie's (1989) terms, overt marking of the object serves to distinguish between subjects and objects, precisely when there is a potential for confusion between subject and object. Similarly, Aissen (2003) describes that the properties we expect of subjects are the inverse of what we expect of objects. Assuming that subjects are prototypically defined human agents, animacy and definiteness would thus confer prominence to objects but not to subjects. The active attention caused by a definite animate referent as patient motivates the appearance of additional marking on the direct object.

A related concept relevant to the discussion of DOM is that of individuation. Highly individuated objects are animate (human), agentive, definite, specific, concrete, countable and, as such, more likely to be prominent (or salient, Comrie 1989) and at the center of attention. The more individuated a direct object is, the more likely it is to receive special formal marking. For both Comrie (1989) and Aissen (2003), animacy and definiteness are central to the notion of prominence (and salience). For Comrie (1989), salience is related to the notion of attentional centering (Himmelmann & Primus 2015) in that it refers to agents as the default focus of attention for humans, whereby less salient – less individuated – arguments are given attention secondarily. Relating prominence to grammatical marking, Aissen (2003) considers case-marked objects to be more prominent than those not marked with case. Animate and definite objects, as prominent individuated referents, receive case marking as a highlighting feature, whereas inanimate and indefinite objects are left unmarked because they are not prominent. This corresponds nicely to the (asymmetric) marking shown for Spanish in example 1.

The picture regarding case-marking and DOM across languages is not as clear-cut, of course. For Aissen (2003), the tension between the forces of iconicity (whereby prominent substance is reflected in prominent structure) and economy (which discourages the use of additional material) results in different marking behavior across languages. In a large-scale typological investigation, Sinnemäki (2014) shows that there is no systematic relationship between animacy and definiteness properties of the object and case-marking across languages, though there is a general preference for some kind of differential marking of objects. The marking can be symmetric, such that all objects are marked, with alternations between different markers depending on properties of the object, or asymmetric, where only a subset of objects is formally marked (Iemmolo 2013). These differences in formal systems align with different approaches or explanations for DOM (Iemmolo & Klumpp 2014; de Swart 2014). Central to the discriminatory approach – exemplified by Comrie (1989) and Aissen (2003) – is the idea that overt (asymmetric) marking is needed to distinguish the object from the subject. This approach is associated with a syntagmatic explanation of DOM because marking on the object serves correct identification of grammatical relations when the

two arguments may not be distinguishable based on their semantic properties. In the highlighting approach, DOM functions to highlight certain semantic features of objects as different from other objects based on differences in their semantic features. As such, DOM marking on this approach is more paradigmatically motivated, and is often associated with symmetric systems, where objects are always differentiated from subjects through marking, but different kinds of objects are marked in different ways (de Swart 2014).

In addition to properties of the object, DOM has also been related to properties of the verb, and more specifically, to the interaction between the lexical semantics of the verb and properties of the object. The notion of object affectedness, that is, the degree to which the object undergoes a change due to the event, figures prominently here. How affectedness is construed depends to a considerable extent on assumptions regarding the defining features of transitive clauses and the arguments participating in them. According to Hopper & Thompson (1980), the prototypical transitive clause has a volitional agentive subject and a highly individuated object. Note that this stands in opposition to the markedness approach advanced by Comrie (1989) and Aissen (2003), where a typical, unmarked object is assumed to be inanimate and indefinite, very low in individuation (Næss 2007). Tsunoda (1985) proposes a verb class hierarchy of formal object case-marking based on the degree of transitivity of the clause. The higher the semantic transitivity (following Hopper & Thompson 1980), the higher the likelihood of (prototypical) formal marking of the object (e.g. through accusative case-marking), and this correlates with affectedness. Highest on Tsunoda's scale are verbs of effective action (where the action physically impinges on the patient) (e.g. *kick*), followed by verbs of perception (e.g. *see*), pursuit (e.g. *search*), knowledge (e.g. *know*), feeling (e.g. *love*), relationship (e.g. *resemble*), and ability (e.g. *proficient*) (see **Figure 3** in section 2.3.3). The patient is more likely to be affected in prototypical transitive clauses, and indeed, an animate patient – as a prototypical patient on this analysis – should best reflect transitive case-marking of the object. More individuated objects are thus more likely to be affected by their verbs, in the sense of undergoing a change due to the event. For this reason, Næss (2004) argues that it is not individuation that favors the use of DOM but rather the degree of verb affectedness, and that affectedness should in fact be seen as the central notion motivating differential object marking. Kizilkaya et al. (2022), for Turkish and Uzbek, find evidence that the degree of affectedness can be linked to the use of DOM. Specifically, their results indicate that affectedness and animacy are related to the use of DOM, supporting Næss's proposal (2004) that animacy of the object increases the degree to which the verb affects the object, thereby making the object more prominent. Kizilkaya et al. (2022) base their analysis on the affectedness scale developed by Beavers (2011). While Tsunoda's (1985) verb hierarchy is based on case-marking behavior in languages, Beavers' scale is based on a semantic notion of affectedness. Beavers (2011) defines four categories ranging from high to low in affectedness based on the notion of change undergone by the patient: quantized change with a specific result

state (e.g. *break*); non-quantized change with a non-specific result state (e.g. *widen*); potential change and thus a potentially affected object (e.g. *hit*), and underspecified for change and thus a non-affected object (e.g. *see*).

2.3.2 Differential object marking in sign languages

The first explicit analysis of a sign functioning as a dedicated object marker was provided by Meir (2003) for ISL. She describes the use of a case-marked pronoun ($\text{PRO}_{[\text{bC}]}$)[4] that stands in a paradigmatic relationship with the general pronominal point (INDEX). $\text{PRO}_{[\text{bC}]}$ can be used only with human objects (in contrast to INDEX), and is moreover restricted in its use to certain classes of verbs. These verb classes are identified as being (1) "experiencer subject" psych verbs, i.e. verbs that have an experiencer subject, and whose object is what the emotions are directed at or concerned with (e.g. *hate, worry*); (2) verbs of negative effect, i.e. denoting an action that negatively affects the object (e.g. *lie (to), insult*); and (3) verbs that take a "content" object (e.g. *talk (about someone), write (about someone)*). Meir notes that these verb classes are united in that they relate to qualities of the object referent as a person, and she posits an animacy constraint on their subjects: verbs which appear with $\text{PRO}_{[\text{bC}]}$ require experiencers or volitional agents. In addition, she reports that the use of $\text{PRO}_{[\text{bC}]}$ implies a special connection and high degree of familiarity between the subject and object referents compared to the use of INDEX, as in REMEMBER + INDEX with a neutral meaning (e.g. in a question 'Do you remember him?') vs. REMEMBER + $\text{PRO}_{[\text{bC}]}$ with a long-lasting connection implied (e.g. 'I remember him, we grew up together' or 'I remember her well, she was my best teacher') (Meir 2003: 119 for examples and meanings).

Börstell (2017, 2019) similarly describes a dedicated object pronoun for Swedish Sign Language, and specifically links its use to the phenomenon of differential object marking (a link not made by Meir 2003 for ISL). Börstell (2019) describes the pronoun as marking only objects and only human referents. In contrast to the form described by Meir (2003), the Swedish Sign Language object pronoun is not restricted to specific verb classes and may be used for plural referents (by means of a horizontal sweep of the hand), but only for 1st and 2nd person forms in the plural. Börstell (2019) takes the restrictions on animacy and person to support a differential object marking analysis based on prominence. Though detailed descriptions are lacking, Börstell (2017, 2019) describes similar forms with similar functions across the sign languages of Scandinavia – including DSL (Danish Sign Language[5]), FinSL (Finnish Sign Language), NSL (Norwegian Sign Language), and FinSSL (Finland-Swedish Sign Language).

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[4] The gloss reflects the use of the so-called "baby-C" (bC) handshape (L) used in the sign and its function as a pronoun (PRO). The form of $\text{PRO}_{[\text{bC}]}$ looks very similar to the DGS sign PAM.

[5] But see Vermeerbergen & Engberg-Pedersen (2024), who argue (in Note 4) against the existence of such a form for Danish Sign Language based on occurrences of PERSON in monologic texts from the online Dictionary of Danish Sign Language.

2.3.3 Differential object marking in DGS

A differential object marking analysis of a sign very similar in form to the signs described by Meir (2003) and Börstell (2019) has been proposed for DGS for the sign PAM (Bross 2020; Steinbach 2022). As one of our main aims is to test the claims made by Bross (2020), we give a detailed description of his account here. Bross (2020) rejects an analysis of PAM as an agreement auxiliary or simple person agreement marker (Rathmann 2003, Pfau & Steinbach 2007), and posits that PAM is a preposition exhibiting DOM triggered by the semantic parameters of animacy, definiteness, and affectedness. On his analysis, PAM is used exclusively with animate objects, with a strong tendency toward human animate referents, and also shows restrictions with respect to verb classes. Taking Tsunoda's (1985) transitivity/affectedness hierarchy as a basis (see **Figure 3**), Bross (2020) claims that marking with PAM is obligatory with verbs of Pursuit, Knowledge, and Feeling (in the middle of the scale), and optional with verbs of Effective Action and Perception (i.e. verbs with high(er) degrees of object affectedness). The optional use of PAM is modulated by definiteness effects: PAM-marked animate objects receive a definite reading, while unmarked animate objects can be definite or indefinite (see example 2 below). Verbs with low degrees of object affectedness (verbs of Relationship and Ability on Tsunoda's scale) do not receive marking with PAM.

(2) *DGS* (Bross, 2020)

a. YESTERDAY PAUL_{3a} $\text{POLICE\#PERSON}_{3b}$ SEE_{3b}
'Yesterday Paul saw a/the policeman.'

b. Context: Do you remember the policeman that Paul talked about?
YESTERDAY PAUL_{3a} PAM_{3b} $\text{POLICE\#PERSON}_{3b}$ SEE_{3b}
'Yesterday Paul saw the policeman.'

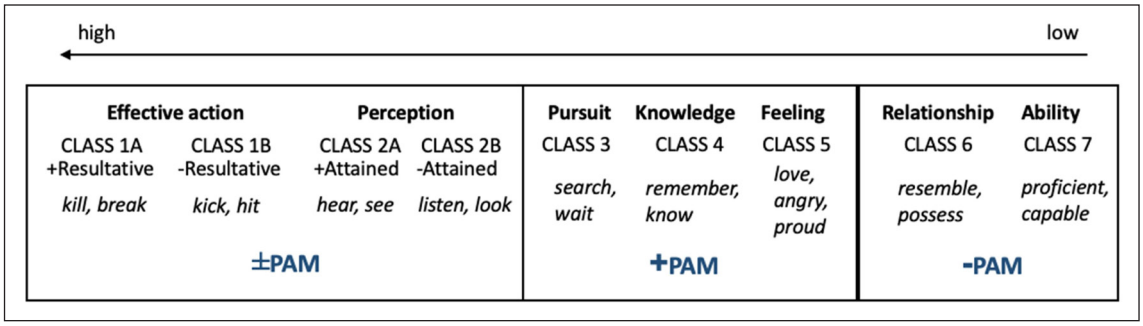

Figure 3: Tsunoda's (1985) verb hierarchy, adapted by Bross (2020), showing the effect of verb class on the use of PAM.

Previous analyses of the behavior of PAM by Murmann (2012), using an acceptability judgment paradigm, and Macht (2016), using task-based elicitation data from (non-public) DGS Corpus (Nishio et al. 2010), also find strong animacy effects, though both note that PAM is not used

exclusively with animate object referents. Based on a sentence repetition task, in which signers repeated sentences from memory and which resulted in instances of spontaneous insertion of PAM, Proske (2020) also finds good support for animacy restrictions associated with PAM, as well as weak support for a tendency for PAM to be subject to definite constraints, leading her to agree, in general, with the differential object marking analysis for PAM by Bross (2020). Proske (2020) did not explicitly investigate the effect of verb classes, but a list of DGS verbs that occurred with PAM in her data is provided (LOVE/LIKE, TEASE, ACCEPT, SHOW, PICK-UP, HELP, INFORM, ASK, INVITE, REPEAT and WAIT). These verbs all seem to correspond to medium-affected objects (primarily class 3) according to Tsunoda's (1985) scale, consistent with Bross's (2020) assumption of PAM-marking with these verbs. However, it does not seem from Proske's (2020) data that PAM occurred obligatorily with these verbs.

In a review of literature on argument marking in DGS, Steinbach (2022) proposes that DGS has an agreement marker, glossed as $_{x}$PAM$_{y}$ (which marks both subject and object arguments), and a differential object marker, glossed as PAM$_{x}$ (which marks only the object). Steinbach (2022) moreover notes a syntactic difference between the forms, with PAM$_{x}$ being a preverbal and $_{x}$PAM$_{y}$ being a postverbal marker. On this analysis, all occurrences of PAM as a differential object marker by Bross (2020) should be preverbal. This is not the case, however, as Bross's DOM analysis clearly includes both clause-internal and clause-final (his terms) uses of PAM. Crucially, the clause-internal, non-final pattern does not entail a preverbal position of PAM. The sentences in example (3), given by Bross (2020), both exemplify the clause-internal pattern; PAM precedes the object in both (a) and (b), but is preverbal only in (a).

(3) *DGS* (Bross, 2020)

a. PAUL$_{3a}$ PAM$_{3b}$ MARIA$_{3b}$ ANGRY
"Paul is angry at Maria."

b. PAUL$_{3a}$ ANGRY PAM$_{3b}$ MARIA$_{3b}$
"Paul is angry at Maria."

Finally, Bross (2020) (like Börstell 2017, 2019) explicitly links PAM to prominence based on a markedness-based definition of differential object marking. In the present study, as outlined in the following section, we investigate how the concept of prominence as a structuring principle of language (Himmelmann & Primus 2015) can be related to the use of PAM in DGS based on an analysis of naturalistic corpus data.

3 Present study

In this section, we describe the methodology used and motivate our test of the specific claims made by Bross (2020) for DGS PAM. We describe our process of data selection in the following section. The analysis of PAM by Bross (2020) is based on a translation task and grammaticality

judgments conducted with 13 DGS signers from Southern Germany. Participants were presented with German sentences and asked to provide translations of these sentences into DGS. With respect to the use of PAM, participants were asked if the sentences could be signed with or/and without PAM and if this resulted in any changes in meaning or sentence acceptability. Based on his analysis, Bross (2020: 30) formulated two generalizations with respect to object-marking with PAM in DGS (for the variant of DGS investigated), repeated below:

> **Generalization 1:** PAM is obligatorily used with transitive verbs with a mentally/emotionally affected animate object. Examples include KNOW, ADVISE, LOVE, HATE, BE-ANGRY, BE-PROUD, TRUST, WORRY, BE-PLEASED, BE-JEALOUS, BE-DISAPPOINTED, BE-NICE, ACCUSE, INSULT.

> **Generalization 2:** PAM is optionally used with transitive verbs which are high on Tsunoda's hierarchy. Similar to Turkish, differential object marking is related to definiteness effects in these cases. Examples include BEAT, HIT, KILL, KISS, SEE.

In the present study, we test these claims using naturalistic data from the Public DGS Corpus (Konrad et al. 2020). The use of naturalistic data to is an important contribution to our understanding of the distribution and function of PAM. Corpus data reflects actual language use – and the variability of language use – in a way that cannot be captured through grammaticality judgements and translation tasks. The objectives are as follows: (1) to determine the use of PAM in relation to animacy and definiteness and (2) to test the influence of affectedness of the object on the use of PAM. In addition, we aim to relate the use of PAM to linguistic prominence, specifically to how the use of PAM in DGS may be interpreted as providing additional information (marking) that moves the agent from its place as the natural center of attention.

4 Methodology

4.1 Data: Public DGS Corpus

Our analysis is based on naturalistic data from the Public DGS Corpus (www.sign-lang.uni-hamburg.de/meinedgs/ling/start_de, University of Hamburg). The corpus data includes participation from German deaf individuals from the whole of Germany and was collected in major cities across all federal states. For the corpus as a whole, of which the Public DGS Corpus is a part, a total of 330 deaf individuals participated in the data collection, balanced for gender (male, female) and age groups (18–30, 31–45, 46–60, and 61 + years old), resulting in about 550 hours of recordings. The corpus data was collected in rooms with a blue background and with cameras capturing interlocutors from different angles (see **Figure 4**). The textual genres used in the recordings ranged from elicited narratives and stimulus descriptions to free conversations.

The Public DGS Corpus comprises about 50 hours of recordings that are available on the corpus website. All videos from the public corpus can be downloaded together with ELAN files containing data annotations (see **Figure 5**).

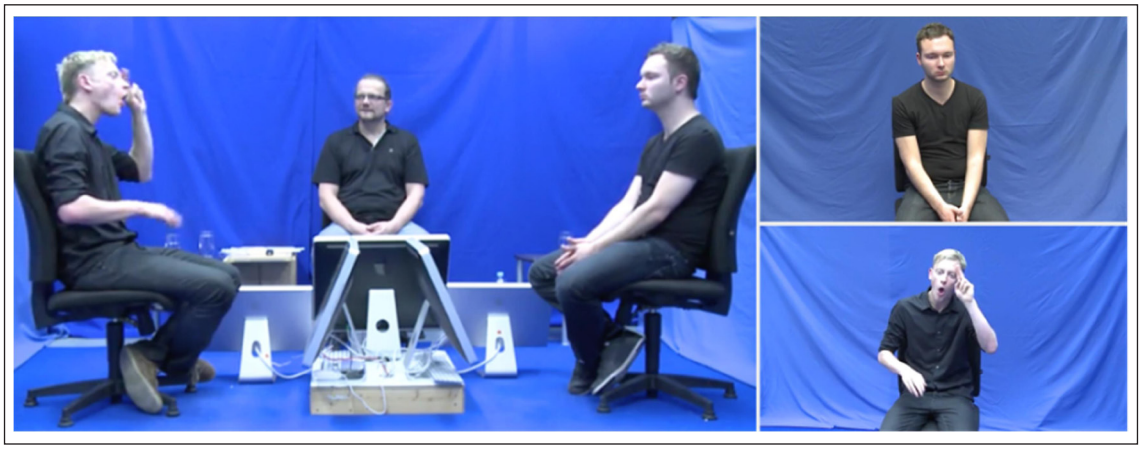

Figure 4: Images from the Public DGS Corpus showing the set-up for video recording of a participant dyad (dgscorpus_ber_01 | 18–30m).

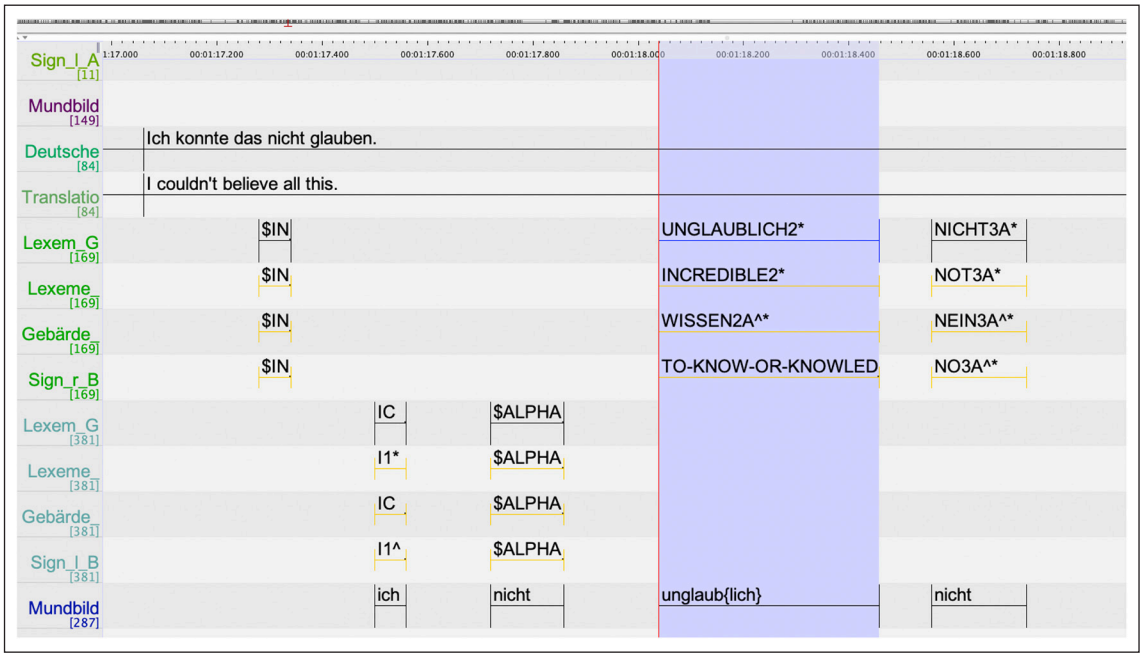

Figure 5: Annotation example of the Public DGS Corpus, as it is available for download. The annotation highlighted in blue corresponds to the sign production in Figure 4.

The Sign (Gebärde) tier contains glosses in English (German) that serve as identifying labels for the form (e.g. the sign glossed as TO-KNOW-OR-KNOWLEDGE2A (WISSEN2A) in **Figure 5**). The Lexeme_Sign (Lexem_Gebärde) tier presents an English (German) gloss with a conventionalized form-meaning association, and sign forms may be associated with multiple lexemes (e.g. the corresponding gloss INCREDIBLE2 (UNGLAUBLICH2).[6] There are separate Sign and Lexeme_Sign tiers for the right (r) and left (l) hands and for both signers (A and B). In addition, translations into English and German and information about mouthing (Mundbild) accompanying sign productions are provided on separate tiers.

4.2 Data selection and annotation for the first analysis

The first analysis uses the occurrences of PAM in the corpus to test the relationship of PAM to animacy, definiteness (and thus the level of object individuation; Aissen 2003) and affectedness. We expect that the individuation of the object is a factor that delimits the use of PAM in DGS, and that we should find PAM use in particular with objects high on the animacy and definiteness scales, supporting previous claims.

For the first analysis, we performed a structured multiple search using ELAN (2023, version 6.6) for PAM, which is glossed as ON-PERSON1^ (AUF-PERSON1^ in German), with (subtype) lexemes glossed as ON-PERSON1 (AUF-PERSON1), ON-OBJECT1^ (AUF-OBJEKT1^), and OVER-OR-ABOUT2 (ÜBER2) (see **Figure 6**). This search yielded 696 occurrences of PAM in the online corpus as a whole (675 tokens glossed as ON-PERSON1; 11 as ON-OBJECT1; 10 as OVER-OR-ABOUT2). All instances of PAM were individually checked by members of the research team, including two native DGS signers. This resulted in the exclusion of a substantial number of tokens glossed as ON-PERSON1^ in the corpus. Some of these (N = 10 ON-PERSON1) were identified as being personal pronouns, i.e. pointing signs typically produced with an extended index finger, but sometimes involving the index finger and thumb due to coarticulation effects (and thus looking phonologically similar to PAM). Other signs like SAY and COME, also phonologically similar to PAM especially in continuous signing, were also erroneously glossed as PAM (N = 33 ON-PERSON1; N = 2 ON-OBJECT1; N = 7 OVER-OR-ABOUT2), and some were excluded due to not being clearly recognizable as PAM (N = 4 ON-PERSON1). In addition, a large number of tokens (N = 188 ON-PERSON1; N = 2 ON-OBJECT1; N = 2 OVER-OR-ABOUT2) were identified as instead being (a version of) the sign PERSON (see **Figure 7**). The two signs are phonologically similar (with the same handshape, but a different path of movement, arc vs. straight), and PAM has been analyzed as being grammaticalized from PERSON (Pfau & Steinbach 2007). Alongside the more standard noun sign PERSON (**Figure 7**), there seems to be a version of PERSON that is also sensitive to semantic properties of the object. We show two examples of this version of PERSON

[6] Numbers following glosses indicate lexical variants; letters after the number indicate a phonological variant. The annotation conventions for the DGS corpus are available here: https://www.sign-lang.uni-hamburg.de/dgs-korpus/arbeitspapiere/DGS-Korpus_AP03-2018-01v02_en.pdf.

in **Figures 8** and **9**, noting the semantic context in the caption; we return to the relationship between PAM and PERSON in the discussion (section 6.5). Finally, in the other direction, we found (randomly) an additional 14 occurrences of PAM that were not glossed as such in the corpus. We relied on the judgment of native deaf signers to identify signs as being PAM. A total of 462 instances of PAM were used in the first analysis.

Figure 6: ON-PERSON1 (PAM) (dgscorpus_ber_09 | 18-30f).

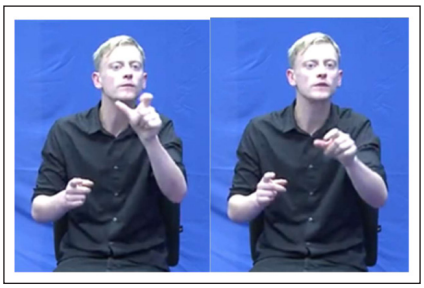

Figure 7: PERSON (dgscorpus_ber_01 | 18-30fm).

Figure 8: Example of a sentence with ON-PERSON1 (PAM) annotation in the corpus that was re-annotated as PERSON by the authors (dgscorpus_mst_13 | 46-60f). In this example, the signer is talking about a conflict with a teacher that went on for many years. The use of PERSON here reflects the association of the teacher's hatred with the attributes of the person, i.e. with the attributes of the signer that are the source of the conflict.

Figure 9: Example of sentence with ON-PERSON1 (PAM) annotation in the corpus that was re-annotated as PERSON by the authors (dgscorpus_fra_14 | 31-45f). In this example, the signer is talking about attending a talk and seeing a friend in the auditorium. The use of PERSON here reflects some distance and uncertainty regarding the situation.

For each occurrence of PAM included in the analysis, we coded the arguments of the clause in which it occurred. Clauses were identified on the basis of the presence of predicates, and the presence of one or more arguments. We coded arguments as A1 for subjects (agents and experiencers) and A2 for objects (patients and recipients). We coded for animacy, definiteness, and specificity as object-marking triggers typical of DOM. Animacy of A1 and A2 arguments was coded as animate (human), animate (non-human), or inanimate based on the animacy scale Human > Animals > Inanimate (Aissen 2003). Our coding of animate (human) referents included individual persons as well as groups of people (e.g., hearing people, family members) (Fenlon et al. 2018).

We operationalized definiteness and specificity in the sense of familiarity and uniqueness (Almeida-Silva 2019; Lyons 1999).[7] Referents that were previously mentioned – i.e. maintained across successive clauses or reintroduced (Ferrara et al. 2023; Perniss & Özyürek 2015) – in the discourse were considered familiar. Semantically unique referents (e.g. the President) and proper names (e.g. Kennedy) were considered definite based on the uniqueness criterion. Referents familiar to both participants were taken to be definite, referents familiar only to the signer were indefinite but specific, and referents unknown to both participants were considered indefinite and nonspecific (von Heusinger 2002). We coded introduced referents as indefinite when they were unknown to the interlocutor and as unspecified when they were introduced without a specific reference.

[7] Bross (2020) identifies object shift, i.e. the movement of the direct object into a structurally higher position, to be linked to definiteness of the object. This higher object position is a clause-internal position and thus aligns with the use of PAM in clause-internal position as being associated with definiteness effects. A syntactic analysis of object position in relation to definiteness was beyond the scope of the present paper.

Finally, for all analyzed occurrences of PAM in the corpus, we categorized the verb in the clause in which it occurred according to its level of affectedness. We did this based on Tsunoda's (1985) verb hierarchy, coding each verb as belonging to class 1, 2, 3, 4, 5, 6, or 7, with classes 1–2 representing verbs with highly-affected objects, classes 3–5 representing verbs with medium-affected objects, and classes 6–7 representing verbs with low-affected objects (cross-checking with Oomen 2018). We also categorized all verbs in clauses with PAM according to the affectedness hierarchy proposed by Beavers (2011), as adapted by Kizilkaya et al. (2022). We coded verbs as effecting in the object quantized change (class 1); non-quantized change (class 2); potential change (class 3), or no change (underspecified for change) (e.g. class 4). A comparison between the two scales shows that they diverge quite substantially in what would be considered high vs. low in affectedness (see **Figure 10**). What Beavers (2011) considers to be low in affectedness spans the high, mid, and low ranges in Tsunoda (1985) (and Bross 2020). Verbs high in affectedness according to Beavers (2011) overlap only with verbs of resultative effective action (class 1A) on Tsunoda's scale.

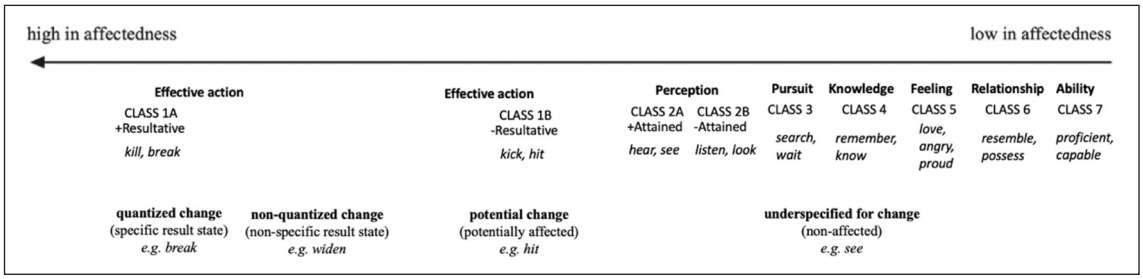

Figure 10: Correspondence between Tsunoda's (1985) and Beavers' (2011) scales of affectedness.

4.3 Data selection and annotation for the second analysis

The objective of the second analysis is to test the status of PAM with respect to differential object marking from the perspective of verb classes. Specifically, we test claims by Bross (2020) regarding the influence of object affectedness on the use of PAM, i.e. that PAM is obligatory for verbs of pursuit, knowledge, and feeling (classes 3–5 according to Tsunoda's 1985 hierarchy) and that the use of PAM with verbs of effective action and perception (classes 1–2) forces a definite reading of the object.

For this analysis, we searched the corpus for occurrences of all 29 verbs listed by Bross (2020) (and Tsunoda 1985) as belonging to these categories and being associated with the use of PAM (see **Figure 3** and Generalizations 1 and 2 above). We focused on data from six different cities around Germany (Berlin, Frankfurt, Cologne, Münster, Munich, Stuttgart), including data from Southern Germany (specifically Stuttgart and Munich), which corresponds to the dialect

of DGS reported on by Bross (2020). Table 1 lists these 29 verbs and assigns them to Tsunoda's (1985) verb classes, Bross's (2020) categorization of these classes according to affectedness, and Beavers' (2011) verb classes.

Verb	**N**	**Verb class (Tsunoda 1985)**	**Affectedness level (Bross 2020)**	**Verb class (Beavers 2011)**	**Affectedness level (Beavers 2011)**
KILL	38	Eff Act (+Res) (Class 1A)	High	Quantized (Class 1)	High
BREAK	0	Eff Act (+Res) (Class 1A)	High	Quantized (Class 1)	High
KICK	0	Eff Act (–Res) (Class 1B)	High	Potential (Class 3)	Medium
HIT	0	Eff Act (–Res) (Class 1B)	High	Potential (Class 3)	Medium
BEAT	65	Eff Act (–Res) (Class 1B)	High	Potential (Class 3)	Medium
KISS	9	Eff Act (–Res) (Class 1B)	High	Potential (Class 3)	Medium
SEE	39	Perc (+Att) (Class 2A)	High	Underspec (Class 4)	Low
HEAR	18	Perc (+Att) (Class 2A)	High	Underspec (Class 4)	Low
LOOK	67	Perc (–Att) (Class 2B)	High	Underspec (Class 4)	Low
LISTEN	11	Perc (–Att) (Class 2B)	High	Underspec (Class 4)	Low
WAIT	9	Pursuit (Class 3)	Medium	Underspec (Class 4)	Low
SEARCH	15	Pursuit (Class 3)	Medium	Underspec (Class 4)	Low
REMEMBER	4	Knowledge (Class 4)	Medium	Underspec (Class 4)	Low
KNOW	87	Knowledge (Class 4)	Medium	Underspec (Class 4)	Low
LOVE	15	Feeling (Class 5)	Medium	Underspec (Class 4)	Low

(Contd.)

Verb	N	Verb class (Tsunoda 1985)	Affectedness level (Bross 2020)	Verb class (Beavers 2011)	Affectedness level (Beavers 2011)
BE-ANGRY	7	Feeling (Class 5)	Medium	Underspec (Class 4)	Low
PROUD	11	Feeling (Class 5)	Medium	Underspec (Class 4)	Low
ADVISE	61	Pursuit (Class 3)	Medium	Underspec (Class 4)	Low
HATE	7	Feeling (Class 5)	Medium	Underspec (Class 4)	Low
TRUST	14	Feeling (Class 5)	Medium	Underspec (Class 4)	Low
WORRY	8	Feeling (Class 5)	Medium	Underspec (Class 4)	Low
BE-PLEASED	7	Feeling (Class 5)	Medium	Underspec (Class 4)	Low
BE-JEALOUS	6	Feeling (Class 5)	Medium	Underspec (Class 4)	Low
BE-DISAP-POINTED	4	Feeling (Class 5)	Medium	Underspec (Class 4)	Low
BE-NICE	7	Feeling (Class 5)	Medium	Underspec (Class 4)	Low
ACCUSE	0	Pursuit (Class 3)	Medium	Underspec (Class 4)	Low
INSULT	4	Pursuit (Class 3)	Medium	Underspec (Class 4)	Low
LOOK-AFTER	14	Pursuit (Class 3)	Medium	Underspec (Class 4)	Low
PUNISH	10	Pursuit (Class 3)	Medium	Underspec (Class 4)	Low

Table 1: Overview of verbs coded in the second analysis, based on Tsunoda (1985), Bross (2020), and Beavers (2011).

We used the structured multiple search function in ELAN to search for all occurrences of these verbs in the corpus, including subtypes and variants. For example, the gloss LOVE occurs in the variants LOVE1A, LOVE1B, and LOVE1C (**Figure 11**; see footnote 5 for annotation conventions). Since we could not know for sure which variant of each verb was analyzed by Bross (2020), we considered all variants of each of the verbs.

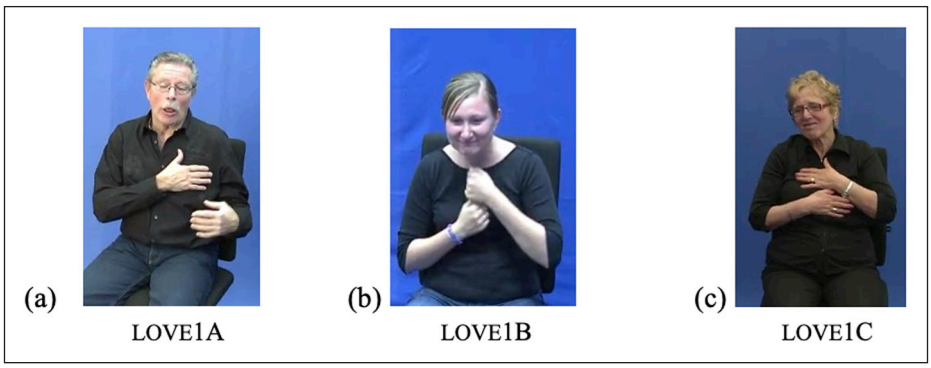

Figure 11: Variants of the sign LOVE in the DGS corpus, glossed as (a) LOVE1A (dgscorpus_koe_13 | 61+m), (b) LOVE1B (dgscorpus_ber_09 | 18-30f), and (c) LOVE1C (dgscorpus_stu_08 | 61+f).

Our initial search for these glosses in ELAN turned up 1730 occurrences across the six cities. We applied the following exclusion criteria: (1) verbs that occurred in clauses with non-human objects; (2) verbs with a clausal complement as object ; and (3) signs with verb glosses that were used in a different way (either attributively or nominally or used with a different meaning, e.g. SEE used to mean "to look like"). This resulted in the exclusion of 1193 tokens, such that 537 tokens remained for inclusion in the second analysis (see Table 1 for the number of tokens for each verb type). With respect to the distribution of these tokens across verb classes, about 60% belonged to Tsunoda's classes 3–5 (roughly split evenly across the classes), about 25% belonged to class 2, and the rest were categorized as highly affected class 1 verbs. By comparison, about 80% were verbs very low on Beavers' affectedness scale (underspecified for change), about 15% of verbs have objects with the potential for change, and the remaining 5% qualified as high on the scale (quantized change). We coded for the presence of PAM in all clauses with these verb tokens. Here, too, signs annotated as ON-PERSON in the corpus and identified as being PERSON through reliability coding within our team were excluded. We coded for the definiteness of the object, since definiteness is proposed by Bross (2020) to interact with affectedness.

5 Results

5.1 Results of the First Analysis

5.1.1 Animacy

We found a strong predominance of PAM with animate objects, in particular human objects (N = 423, 92%) and a very small number of non-human animate referents (N = 3, 1%). However, PAM was not used exclusively with animate objects. Though comparatively rare, PAM also occurred with some inanimate objects (N = 36, 7%). Upon closer examination of the inanimate objects, we observed that many were related to human referents. In some cases (N = 13), the object was a city, region, or country (e.g. Germany, Berlin), which signifies a strong connection with humans through the people living in that place or their governing representatives. There were also instances (N = 10) where the objects were institutions (e.g. bank, school, company),

and once again, the object may refer strongly to the individuals comprising or representing the institution. In two occurrences, the inanimate object represented something directly associated with a specific human (a person's lips; sentences written by a person), with PAM possibly assuming a kind of possessive pronominal function ("I can't see PAM(his) lips"; "I don't correct PAM(your) sentences"). Additionally, there were two cases in which the reference to humans was more contextual. For example, PAM occurred with the object SPORTS in a context in which playing sports is credited with paying for the subject's ability to travel around the world (see **Figure 12**). Similarly, PAM occurred with the object TELEVISION in a context in which people were yelling at the television while watching a football game (i.e. yelling at the players on the field).

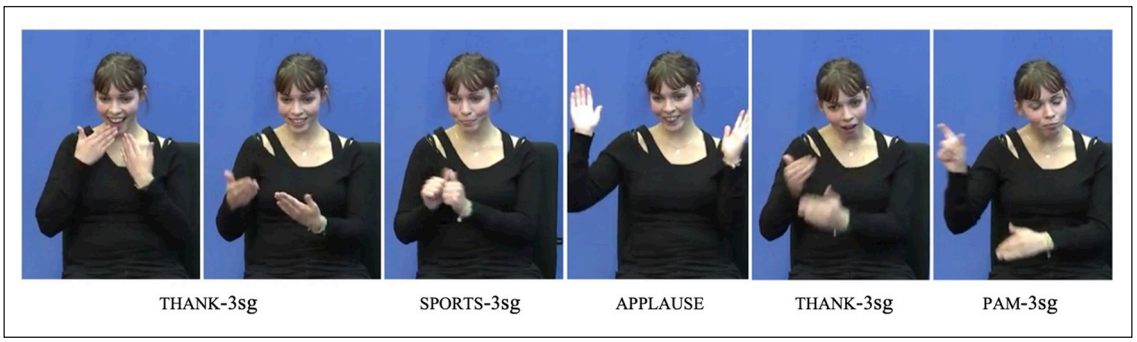

Figure 12: 'You owe a lot to sport' (dgskorpus_koe_01 | 18–30f).

However, not all cases exhibited a clear connection with humans (N = 9), either in a general sense or within the context (e.g. flooding, traffic sign), suggesting that the use of PAM is not fully restricted to an occurrence with animate objects. Despite this, these results suggest that animacy, specifically humanness, is a factor that clearly triggers the use of PAM to mark objects, consistent with claims by Bross (2020).

5.1.2 Definiteness

When we look at the relationship between definiteness and the use of PAM overall, the results indicate that PAM is used predominantly with definite objects (N = 433, 94%). There were few occurrences of PAM with indefinite objects, and these are equally divided between instances of indefinite specific (N = 14, 3%) and indefinite non-specific (N = 15, 3%) referents.

5.1.3 Individuation

When we look at the relationship between animacy and definiteness (Table 2), we see that the vast majority of PAM-marked referents are human and definite (N = 398, 86%). The table shows different levels of individuation, which correspond to different levels of object markedness on the dimensions of animacy and definiteness (Aissen 2003). It is clear that object marking with PAM is very infrequent with referents with a low degree of individuation. Of the total occurrences

of indefinite objects, both specific and non-specific (N = 29), the majority of these (N = 25, 86%) were human. There were thus only four occurrences in the entire corpus of objects marked with PAM that rank very low on the individuation scale (inanimate and indefinite).

	Definite	Specific	Non-specific
Human	398 (86%)	12 (2%)	13 (3%)
Animate non-human	3 (1%)	0 (0%)	0 (0%)
Inanimate	32 (7%)	2 (0.5%)	2 (0.5%)

Table 2: Distribution of use of PAM based on individuation (animacy and definiteness) of object referent.

5.1.4 Affectedness

For the occurrences of PAM in the corpus, the results are consistent with Bross's (2020) proposal in that the majority of verbs occurring with PAM were verbs with objects of medium affectedness (classes 3–5, Tsunoda 1985) (N = 391, 85%) (**Figure 13**). In contrast, verbs with highly affected objects (classes 1–2) were much less prevalent in clauses with PAM (N = 70, 15%) and there were no occurrences of PAM in clauses with low-affected objects (classes 6–7).

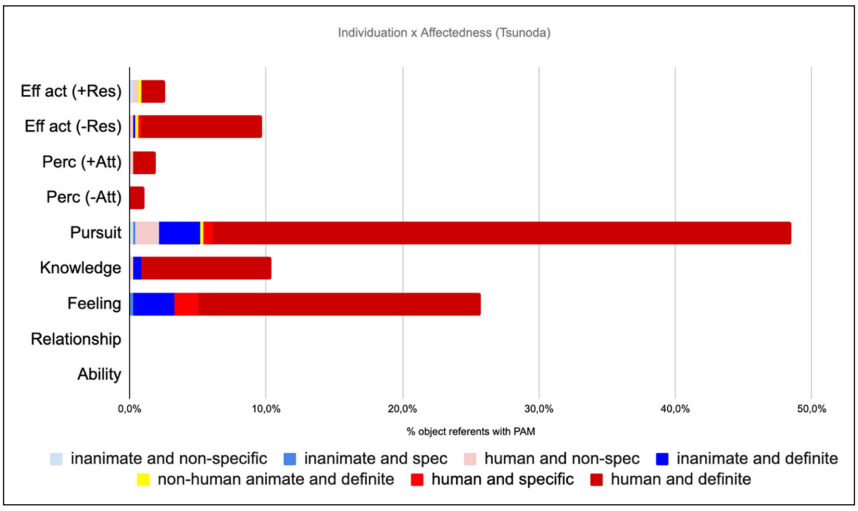

Figure 13: Occurrences of PAM based on Tsunoda's (1985) verb classes and different levels of object individuation.

When we code verbs based on Beavers' (2011) scale (based on a semantic notion of affectedness), we see that PAM occurred primarily in clauses with verbs considered to be low in affectedness (underspecified for change: N = 408, 89%) (**Figure 14**). Only a few cases were observed with verbs higher on the scale (potential change: N = 41, 9%; change with non-specific result state: N = 6, 1%; change with specific result state: N = 6, 1%). Recall from the

comparison of scales presented in **Figure 10** that verbs with a potential change of the object (e.g. hit; Beavers 2011) are high on Tsunoda's scale with respect to object affectedness (class 1B, non-resultative effective action, e.g. hit). The bump in PAM use high on Tsunoda's scale is seen on the scale by Beavers to reflect a continuous (though sudden) drop in the use of PAM as we move up the scale.

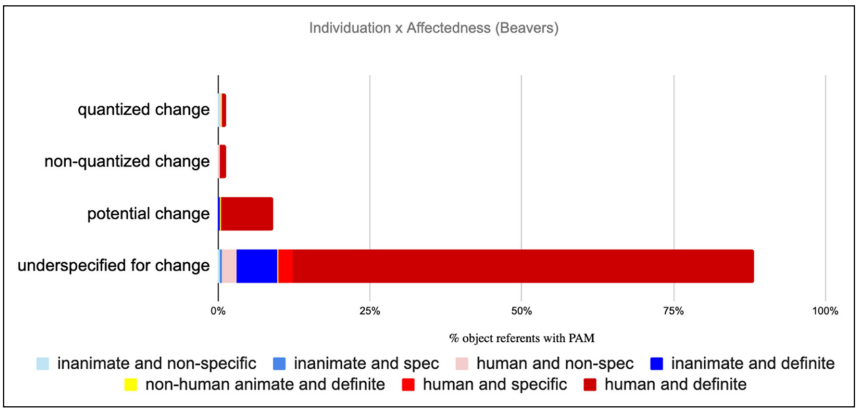

Figure 14: Occurrences of PAM based on Beavers' (2011) verb classes and different levels of object individuation.

In summary, the first analysis has shown that the use of PAM is highly motivated by animacy, with a very strong tendency to be used with human objects. However, PAM-marking is not fully restricted to animate objects, since inanimate objects, with various degrees of relationships to humans, were also marked with PAM. Moreover, the vast majority of objects marked with PAM were both animate and definite, and thus likely to be highly individuated. The results of coding for affectedness (differences between the two scales used notwithstanding) suggest that higher degrees of affectedness do not increase the likelihood of object marking with PAM. In the next section, we turn to the results of the second analysis, which provides further information regarding the behavior of different verbs, different levels of affectedness, and the use of PAM.

5.2 Results of the Second Analysis

5.2.1 Affectedness

In the second analysis, we look at the influence of object affectedness on the use of PAM and specifically test claims by Bross (2020) that PAM is obligatory for medium-affected verbs, i.e. with verbs of pursuit, knowledge, and feeling or, as alternately termed by Bross (2020), with verbs with emotionally/mentally affected animate objects. Here again, we investigated all verbs listed in Bross (2020) as falling into these categories (see **Table 1**), and categorized according to the scales by Tsunoda (1985) and Beavers (2011). as falling into these categories (see Table 1).

As in the first analysis, the results show that the use of PAM is more common with medium-affected verbs (classes 3–5) than high-affected verbs (classes 1–2) (**Figure 16a**). However,

looking here just at animate human PAM-marked objects, it is clear that the use of PAM with verbs in classes 3–5 (primarily mentally and emotionally affected objects) seem to be far from obligatory. Out of 290 sentences with medium-affected verbs and animate human objects, only a total of 41 objects were marked with PAM, representing only 14% of the occurrences, while the vast majority of sentences with these verbs did not have their human objects marked with PAM. **Figure 19** shows an example from the corpus with an emotion verb (class 5) that occurs with a human animate object and is not marked with PAM. When we look at the use of PAM as distributed across the affectedness levels defined by Beavers (2011), we see that almost all occurrences of PAM are with verbs that are underspecified for change, i.e. whose objects are essentially unaffected (**Figure 16b**).

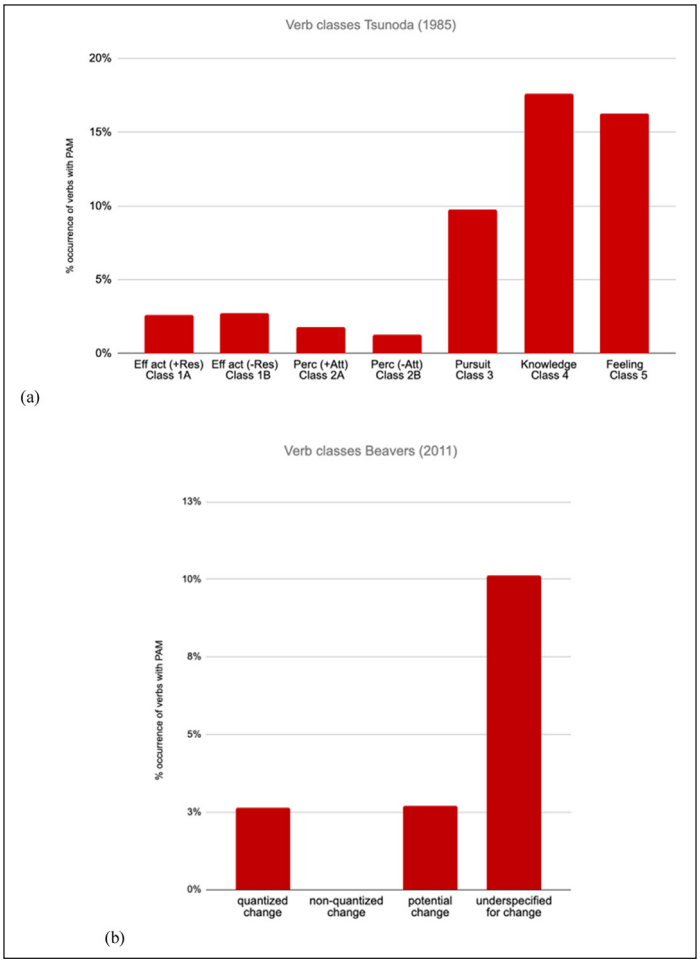

Figure 15: (a) Results for the presence of PAM with verbs in verb classes based on Tsunoda (1985). (Note that Relationship, class 6, and Ability, class 7, are not represented in the graph here, because verbs from these classes were not included in the data set.) (b) Results for presence of PAM with verbs with affectedness levels based on Beavers (2011).

Figure 16: Example of verb with an emotionally-affected (class 5, verb of feeling, Tsunoda 1985) human definite object not marked with PAM (dgskorpus_stu_08 | 61 + f).

5.2.2 Definiteness and affectedness

We also test Bross's claim that the use of PAM with verbs higher on Tsunoda's scale, i.e. verbs of effective action and perception, forces a definite reading of the object. Looking at the relationship between definiteness and affectedness, we should see the use of PAM to mark objects with verbs in these classes occurring only with definite objects. **Figure 17** shows the distribution of animate human definite vs. indefinite objects occurring with vs. without PAM-marking across Tsunoda's verb classes. As shown in **Figure 15**, the use of PAM to mark objects in clauses with these verbs is low overall. Of a total of 247 clauses with verbs in Tsunoda's effective action and perception classes, there were only five occurrences of PAM-marking on an animate human object, and four of these occurrences were with a definite object. For comparison, **Figure 18** shows the distribution of marking for definite vs. indefinite human objects for Beavers' levels of affectedness. The one example of the use of PAM with an indefinite object is shown in **Figure 19**.

Consistent with claims by Bross (2020), we see that animate human objects occurring without PAM can be definite or indefinite. We have one counterexample for the claim that verbs in Tsunoda's (1985) classes 1–2 force a definite reading with PAM. We see a similar pattern in verbs associated with classes 3–5, suggesting that verb affectedness does not have a strong role to play with respect to definite effects. We see, as already in the first analysis, that the majority of objects marked with PAM are definite. However, we also see that the majority of objects are definite overall, regardless of marking with PAM.

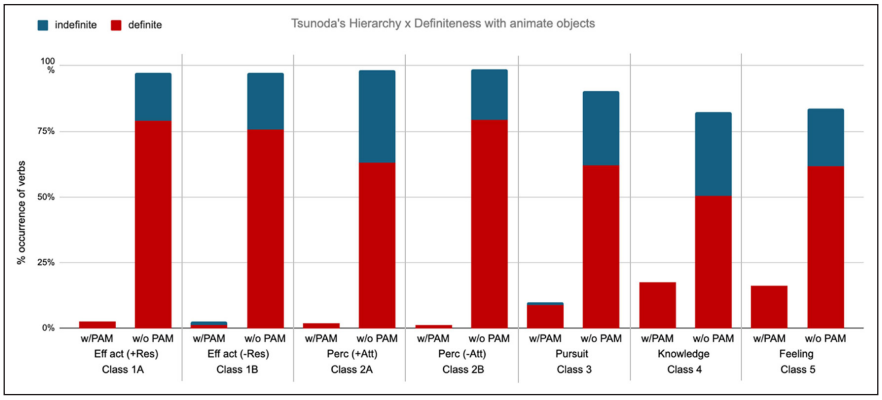

Figure 17: Definite vs. indefinite animate human objects occurring with and without PAM-marking across Tsunoda's (1985) verb classes (with high-affected, classes 1–2, and medium-affected, classes 3–5, objects).

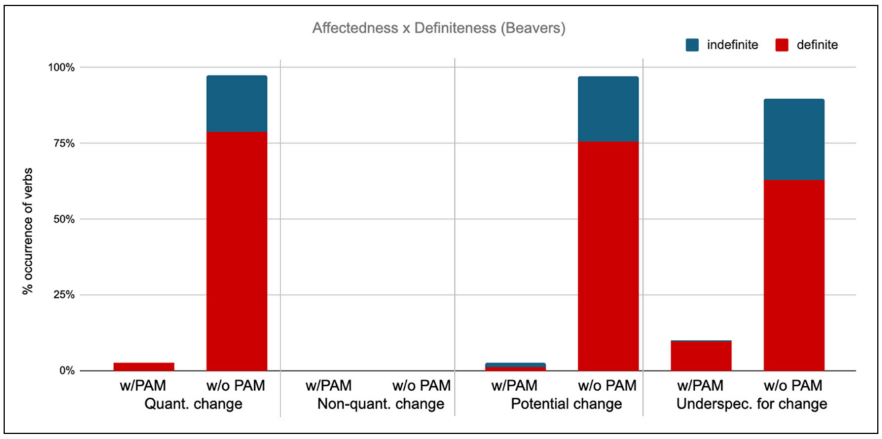

Figure 18: Definite vs. indefinite animate human objects occurring with and without PAM-marking across Beaver's (2011) levels of affectedness.

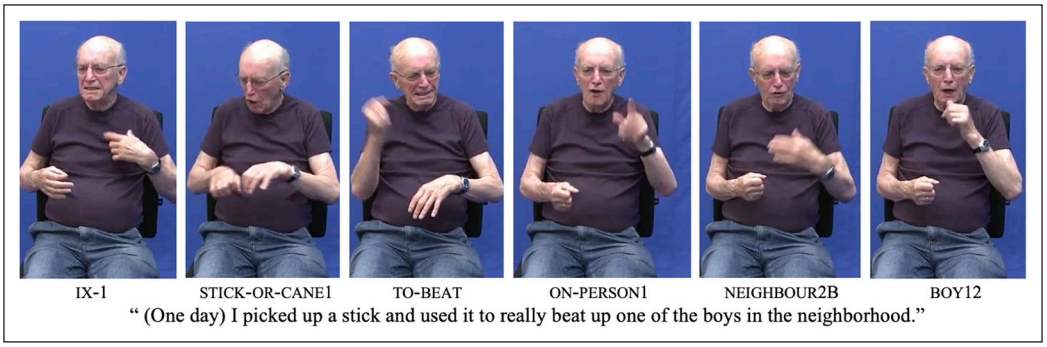

Figure 19: Example of an occurrence of PAM with an indefinite object with a Tsunoda class 1B verb (TO-BEAT) (dgskorpus_mst_11 | 61 + m). (The signs corresponding to the translation "one day" are not pictured; nor is a further representation of the verb TO-BEAT at the end, which contributes to the translation as "to really beat up".)

6 Discussion

In this paper, we have presented a corpus analysis of the use of PAM in DGS, testing claims made by Bross (2020) that PAM functions as a differential object marker, triggered by animacy, definiteness, and affectedness. We found that the use of PAM strongly favors both animate and definite objects, thus supporting marking of highly individuated objects. In addition, we found some evidence for a preferential use of PAM with verbs that have mentally and emotionally affected objects. This preference is in comparison to verbs with more highly affected objects. However, we found no obligatory marking of animate objects with verbs with mentally and emotionally affected objects, as suggested by Bross (2020). As such, we find little evidence that affectedness (as a verbal, semantic property) systematically influences object marking with PAM. Below, we expand on a discussion of our findings and relate them to an analysis of PAM as exhibiting differential object marking.[8] We also relate our findings and the behavior of PAM to the notion of prominence as a structuring principle of language.

6.1 Individuation

The findings presented in this study point to a close relationship between the animacy and definiteness of objects and PAM-marking, suggesting that object individuation affects the use of PAM. Referents with a high degree of individuation (i.e. animate and definite) occurred with PAM to a much greater extent than objects low in individuation. This result is consistent with previous descriptions of the use of PAM in DGS (Rathmann 2003; Pfau & Steinbach 2007; Murmann 2012; Macht 2016; Bross 2020). It is also consistent with descriptions of similar signs in other sign languages, notably Swedish Sign Language and other sign languages of Scandinavia (Börstell 2019) and ISL (Meir 2003). The findings are moreover in line with markedness or discriminatory approaches to DOM, where the grammatical marking (usually case-marking) of an object reflects its atypical and thus marked status as an object, i.e. an object exhibiting features typically associated with a subject (Aissen 2003; Comrie 1989). On this account, a prototypical subject is highly individuated (animate and definite) and moreover agentive, volitional, and in control, while a prototypical object is not this, and rather inanimate, indefinite and affected by the subject's action (Comrie 1989; Næss 2004). However, the DOM account is inconsistent with our finding that PAM marking also occurred – albeit to a small degree – with inanimate objects.

The use of PAM with inanimate objects was unexpected given previous accounts specifying its use with animate, mainly human arguments (see also Proske 2020, Steinbach 2022). However, results from Murmann (2012) on the acceptability of sentences with PAM with non-human animate and inanimate referents provides some indication that the use of PAM with inanimate

[8] We currently have no evidence that PAM may function as both an auxiliary and a differential object marker depending on it morphosyntactic behavior, as proposed by Steinbach (2022). We present an analysis of the behavior of PAM with respect to clause position and spatial modification (for subject and/or object arguments) in a separate paper.

objects is not impossible. Murmann (2012) asked participants to view sentences and to rate on a scale of 1–5 whether they could imagine that other signers (friends or acquaintances) might sign the sentence in this way. Non-human animate referents were tested on the assumption that human animate referents are known to be acceptable, and two types of inanimate referents were included: inanimate-personal and inanimate non-personal referents. Inanimate-personal objects were objects that were considered to be of particular interest to the subject and to exhibit a close relationship with the subject due to being of material and/or personal value. The category of inanimate-personal objects included things like a computer, a certificate, and a car, while inanimates of lower or no personal value included referents like a bottle, a box, and a candle. Assignment of objects to these two categories was based on the intuition of the author. The results of the study showed that participants accepted sentences with inanimate-personal objects marked with PAM as sentences they might see signed. In contrast, the use of PAM with non-personal inanimates was indicated as being much less, or not, acceptable. Similarly, in our analysis, we have seen instances of PAM production in the DGS corpus used to mark inanimate objects that have a close relationship to human referents in the sense of metonymically representing a group of people (e.g. the television representing the football players being watched on the screen) or being representative of the people at an institution (e.g. the people working at a bank or a school). This is different from the close personal or material relationship ascribed by Murmann (2012), but taken together the findings suggest that while the use of PAM shows a clear animacy bias, it is not fully restricted to animate objects (noted also by Macht 2016 with reference to a handful of counterexamples). Rather, the degree of connection between inanimate referents and humans may modulate the use and acceptability of PAM. Future research is needed to identify the precise nature of restrictions on the type and nature of inanimate objects that may be marked with PAM. The relationship between personal qualities of objects and marking with PAM is discussed again below with respect to the relationship between the signs PAM and PERSON (section 6.4).

The corpus analysis also showed a strong relationship between the use of PAM and definiteness. However, there were also occurrences of PAM-marking with indefinite referents, and more data and further analysis are needed to understand the influence of definiteness on the use of PAM. Our definition of definiteness was based primarily on familiarity and thus relied to a large extent on coreferentiality within the discourse. As such, definite object referents were mostly given (i.e. maintained from the previous utterance) and, for most occurrences of PAM, were not realized nominally. Marking of the object thus occurred only with PAM in most cases. Conversely, most cases of indefinite objects marked with PAM were newly introduced into the discourse and were realized nominally. We do not have a good explanation for this, but reference to the object with both PAM and a nominal may serve to highlight the object for pragmatic reasons, similarly to what has been suggested for agreement marker analyses of PAM (Steinbach & Pfau 2007 for DGS;

Krebs et al. 2020 for ÖGS, historically related to DGS, Abner et al. 2024, Power et al. 2020). In addition, we cannot exclude the possible influence from German for some uses of PAM. The example shown in **Figure 19** may indeed be such a case, as the German preposition "auf" may be used in the expression "auf jemanden einschlagen" (to beat somebody).

Overall, we can observe a relationship between the use of PAM and object individuation, since PAM is found predominantly with highly individuated objects. Taking into account the relative markedness of referents on the dimensions of animacy and definiteness (Aissen 2003), PAM shows a clear preference for occurrence at the higher – most marked for objects – end of the scale, i.e. occurrence with human, definite objects. There are some occurrences with human, indefinite (both specific and non-specific) objects and nearly no occurrence for inanimate, indefinite objects. As discussed above, the use of PAM with inanimate definites may be related to metonymic relationships with people or to personal qualities (see also Murmann 2012), and may explain the deviation in marking that would be expected from the hierarchy proposed by Aissen (2003). This also requires further research. In terms of a DOM analysis of PAM, the results suggest that the use of PAM with highly individuated or marked objects is not obligatory, however. Rather, its use seems to be optional, but with a clear tendency to be used the higher an object is on the scale of markedness.

6.2 Affectedness

The affectedness of the object – that is, the degree to which the object undergoes change due to the event – is a further parameter discussed in relation to the phenomenon of differential object marking. We have investigated it here as a verbal property, based on the semantics of verbs, relevant to DOM in conjunction with nominal properties of the object. Specifically, we tested claims made by Bross (2020) for the use of PAM in DGS. We found partial support for Bross (2020) in that PAM-marking of the object, across its instances of occurrence in the corpus (first analysis), was much more common with verbs in the mid-range of affectedness, specifically for verbs of Pursuit, Knowledge, and Feeling (Tsunoda 1985) – also called verbs with mentally and emotionally affected objects by Bross. The highest incidence of marking with PAM occurred with verbs categorized as Pursuit (Class 3) verbs, including *wait*, *search*, but also verbs like *thank*, *greet*, *advise*, *trust*, *accuse*, *insult* (alternatively classed as interaction verbs; Blume 1998, Malchukov 2005). This was followed by use of PAM with verbs of Feeling (Class 5), and then verbs of Knowledge (Class 4). However, as presented in the second analysis, the use of PAM with these verbs was far from obligatory; in fact, the majority of verbs in these classes occurred without PAM-marking of the object (over 80%).

We also did not find evidence in the data for Bross's (2020) claim that PAM serves as a definite marker in verbs high in object affectedness. The use of PAM with these verbs was very infrequent overall, with one instance (in the second analysis) of PAM-marking with an indefinite

object. It is possible that this is related to the low frequency of verbs with high affectedness in the corpus, in general, regardless of the nature and marking of their objects. We looked at a comparatively small number of verbs considered to be high in affectedness by Bross (2020); an even smaller subset of these fall into the category of high affectedness (quantized change) according to Beavers (2011) (see Table 1).

Overall, the analysis of corpus data presented here does not support Bross's (2020) claims regarding the influence of affectedness on object marking with PAM, nor claims regarding the interaction between affectedness and definiteness, specifically that the use of PAM marks definiteness in high affectedness verbs. Using Tsunoda's (1985) scale, the fact that the spike in the use of PAM is situated in the middle of the hierarchy is unexpected, and in itself points against a usage pattern determined by affectedness. Typologically, a differential object marking element is more likely to occur at the higher end of the affectedness scale, where verbs rank high in object affectedness. If marking occurs lower on the scale, then by hierarchical implication, it should occur also higher on the scale. (Bross 2020 does not offer an explanation for the typologically unexpected obligatory marking for verbs only in the middle of the scale.) However, as explained in section 2.3.1, Tsunoda's scale is a hierarchy developed to capture case-marking behavior across languages, a phenomenon not exhibited by DGS. Using a hierarchy more specifically targeting affectedness as the degree of change undergone by the patient (Beavers 2011), we see that the vast majority of verbs that appeared with PAM are low in affectedness (with objects unspecified for change and thus not affected). We may thus say that PAM is more likely to occur the less affected an object is by the verb's action. This is also in line with a markedness approach to DOM, where the grammatical marking with PAM reflects the atypicality (and thus marked status) of the object, i.e. as not being a typical patient affected by the agent's action.

6.3 Selectional constraints on verbs occurring with PAM: comparison with ISL

An affectedness account, with PAM marking for atypical unaffected patients, does not give a story that is fine-grained enough to capture the different nature of verb types that occur with PAM. It is interesting to compare our results for DGS with claims made by Meir (2003) for ISL. Recall that Meir also proposes restrictions on verbs classes for the use of the object-marking pronoun $\text{PRO}_{[bC]}$, identifying three categories of verbs: psych verbs (e.g. *worry*); negative effect verbs (e.g. *gossip about*); and content verbs (e.g. *tell*; effectively interaction verbs, Malchukov 2005). Meir also notes that the verbs taking $\text{PRO}_{[bC]}$ impose selectional restrictions not just on their objects, but also on their subjects. Both arguments must be human, and subjects are either non-agentive experiencers (with psych verbs) or volitional agents (with negative effect verbs, where the agent's intention is harm or negative impact, or content verbs).

Nearly 75% of PAM occurrences in our DGS data fit into Meir's (2003) classification. All of Meir's psych verbs fall into Tsunoda's classes 4 (Knowledge) and 5 (Feeling) and her verbs of negative effect and content verbs belong to class 3 (Pursuit).[9] This demonstrates a very similar semantic behavior between PAM and $\text{PRO}_{[bC]}$, especially when we also consider the object-related restrictions on PAM and $\text{PRO}_{[bC]}$ with respect to the nominal semantic parameter of animacy. Meir also notes considerable variability in the use of $\text{PRO}_{[bC]}$ with different verbs across her verb types. While a considerable proportion are indicated as taking $\text{PRO}_{[bC]}$ obligatorily, many are specified as occurring either with $\text{PRO}_{[bC]}$ or INDEX or as exhibiting inter-signer variability with respect to the use of $\text{PRO}_{[bC]}$. In the DGS data analyzed here, there seems to be no obligation to use PAM in any of the semantic contexts. However, further research is needed to understand both grammatical, individual, or regional variability.

It is striking that Meir's (2003) description of object-marking in ISL provides an account that captures object-marking with PAM in DGS so well. The potential relationship between the two forms has not been mentioned in previous literature. There is evidence, however, of a historical relationship between ISL and DGS (Meir & Sandler 2008). Based on a glottochronological comparison of signs from ISL and DGS, Meir & Sandler (2008) conclude that while ISL cannot be said to have developed from DGS, there is a clear impact of DGS on ISL, due to the fact that "most of the original leaders of the Israeli Deaf community either came from Germany or studied in Germany, and that the teachers at the first schools for the deaf also came from Germany" (Meir & Sandler 2008: 219). The vocabulary of ISL and DGS are thus clearly related, however, there has been no investigation of morphosyntactic similarities. The formal and functional similarities between $\text{PRO}_{[bC]}$ and PAM are considerable, however, and may indeed be due to the historical relationship between the two languages. Similar forms, with similar grammaticalization paths (from PERSON) and similar functions have also been described for other sign languages, e.g. for the sign languages of Scandinavia (Börstell 2019) and, notably, for ÖGS (Krebs et al. 2020, anaylzed as an agreement marker), which is also related to DGS. Further research is needed to understand the effects of convergent evolution vs. language contact in the existence and use of these forms (Börstell 2019). (Previous) analyses of these forms as agreement auxiliaries (Sapountzaki 2012) are motivated by the phonological properties of plain verbs, which cannot themselves move through space to indicate their arguments. Across sign languages, the iconic-metaphoric connection between mental processes with the (fore)head and emotions with the body means that psych verbs are likely to be plain verbs (see Oomen 2017 for a discussion of the influence of iconicity in psych verbs). This may be one factor, for example, driving convergent evolution across sign languages.

[9] See Malchukov (2005) for instructive commentary on the class of Pursuit verbs as involving verbs with an action directed at someone or something.

6.4 A prominence account of object-marking with PAM

The classes described by Meir (2003) for ISL thus seem fruitful for the description of the behavior of PAM in DGS. We use these insights to propose a theoretical path that relates the use of PAM to the concept of prominence. Recall that on a prominence account, the two event participants are both candidates to be the center of attention, generating competition for prominence between elements of equal status. We provide an overview of the semantic role properties and verb type/ class correspondences that characterize the occurrences of PAM in the present data set in Table 3.

Subject (semantic role)	**Object (semantic role)**	**Verb type (Meir)**	**Verb class (Tsunoda / Beavers)**	**Example of verb**	**% with PAM**
Experiencer	Stimulus (causer)	Psych verbs	Class 4, Knowledge & Class 5, Feeling / underspecified for change	*love*	38%
Agent (volitional)	Stimulus (causer)	Miscellaneous	Class 2B, Attained Perception & Class 3, Pursuit / underspecified for change	*listen; search*	9%
Agent (volitional)	Recipient	Content	Class 3, Pursuit / underspecified for change	*advise*	28%
Agent (volitional)	Patient	Negative effect	Class 3, Pursuit / underspecified for change	*insult*	10%
Agent (volitional)	Patient	na	Class 3, Pursuit / underspecified for change	*help*	3%
Agent (volitional)	Patient	na	Class 1A&B, (Non-) Resultative Effective Action / Quantized change, Potential for change	*kill; beat*	12%

Table 3: Overview of argument properties predominantly associated with the use of PAM.

Across all semantic role and verb type relationships, the object is predominantly highly individuated (human animate, definite, specific). On a markedness account, the individuation of the object makes it agent-like and brings it into (syntagmatic) competition with the subject. We can see that a large portion (47% in total) of objects marked with PAM function as a stimulus, causing or initiating the state that is brought about by the event. In the case of psych

verbs (38%), this state is brought about in the experiencer subject. That is, PAM is used in an experiencer-stimulus frame (Malchukov 2005), with the stimulus object causing a change in the mental/emotional state of a (non-volitional) experiencer subject (e.g. *love*, see **Figure 2a**). In a substantially smaller proportion of cases (9%), the stimulus object occurs in an agent-stimulus frame, with a volitional agentive subject whose action is in some way initiated by the object (e.g. *search for*). The attribute of causing (and thus in some sense controlling) the event is prototypically agentive (Dowty 1991). There is one interesting case of a psych verb, the verb glossed as sign type TROUBLE1^ in the corpus. The verb is special in allowing PAM-marking of the object both as the cause or stimulus of the event denoted by the verb (with the subject as the affected party) (**Figure 20a**, with the lexeme gloss ANNOYING1) and as the affected argument (**Figure 20b**, with the lexeme gloss EXHAUSTING1).

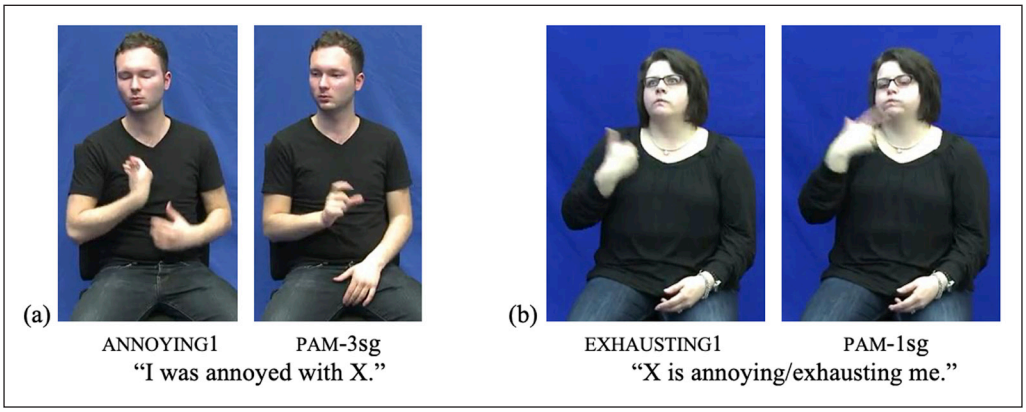

Figure 20: Example of the verb glossed as sign type TROUBLE1^ in the corpus exhibiting both PAM-marking patterns, in (a) with a non-agentive affected subject caused by a stimulus object (lexeme glossed as ANNOYING1) (dgscorpus_ber_01 | 18-30m) and in (b) with an affected object caused by an agentive subject (lexeme glossed as EXHAUSTING1) (dgscorpus_fra_06 | 31-45f). (Translations for these examples are our own.)

The next largest group of verbs with PAM corresponds to interactional or what Meir (2003) calls content, verbs (e.g. *recommend*), i.e. verbs that take a content theme object (28%). In these cases, it is the recipient object that is marked with PAM. These are thus ditransitive verbs where the competition for prominence lies not in the relationship between the subject and object, but between the direct (content) and indirect (recipient) object arguments. PAM marks the recipient as the typically more individuated and agent-like referent. The verb type that Meir (2003) calls negative effect is also represented in the DGS data (10%). Consistent with Meir's classification, these are verbs that have a non-physical negative impact on the object (e.g. *insult*). There is also a small group of verbs that have a non-physical positive (or neutral) effect (e.g. *help*) that we have classified separately in the table. Finally, though PAM is predominant with verbs that do not

impinge on their objects in the sense of affectedness, there are occurrences of PAM (12%) with verbs that are high in affectedness (verbs of effective action in Tsuonda's terms; verbs resulting in quantized change in Beavers' terms). Interestingly, the majority of this group (8%) can be characterized in terms of negative impact on the object (e.g. *beat*). If we combine verbs causing physical and non-physical negative impact, this increases the proportion of verbs of negative effect (in Meir's terms) to 18%. Like in ISL, there seems to be a connection in DGS between PAM and the subject argument's negative intent with respect to the action on the object. Meir (2003) describes the use of $\text{PRO}_{[bC]}$ in ISL as targeting the object argument's qualities as a person. In both languages, negative effect seems to favor attention centering of the object. This has some resemblance to the use of demonstratives to reflect a negative attitude of the speaker to the person referred to, as described e.g. for Scandinavian languages (Johannessen 2008) as well as for German (Patterson et al. 2022). Interestingly, Davis & Potts (2010) show that the affective use of demonstratives shows both a positive and negative bias, a pattern which may also be (at least weakly) reflected in DGS use of PAM.

Taken together, the properties that PAM-marked arguments exhibit in order to be treated as an attentional center can be summarized as: being highly individuated (animate, definite); being a stimulus/causer rather than a patient; not being (very) affected by the verbal action; and, in the case of affectedness, being negatively affected by the verbal action. There seems to be no obligation to use PAM in any of the semantic contexts analyzed here, which may reflect the dynamic nature of prominence relations in discourse. The individuation of the object is shared across all contexts, giving the object agent-like properties. Recall, however, from the results of the first analysis that not all objects are animate definite referents. Inanimate definite referents were most likely to occur with psych verbs in an experiencer-stimulus frame (e.g. love something, rather than someone) (10% of psych verb occurrences) and with content verbs (e.g. tell the insurance company something) (5% of content verb occurrences). Even with inanimate objects, the agent-like qualities of being a stimulus/causer and of being a recipient (rather than theme) may be strong enough to attract marking with PAM.

6.5 Animacy and the relationship between PAM and PERSON

The importance of animacy in determining object marking with PAM was discussed already above (section 6.1) in relation to individuation. It is worth highlighting the role of animacy specifically with respect to the relationship between PAM and PERSON. Assuming the grammaticalization of PAM from the sign PERSON (Pfau & Steinbach 2007), whose lexical meaning is clearly linked to animacy, it makes sense that animacy is the main factor correlated with the use of PAM. Meir (2003) notes for $\text{PRO}_{[bC]}$ in ISL, also assumed to have grammaticalized from a similar sign PERSON, that the object pronoun retains some of its original meaning. Specifically, Meir (2003) notes that $\text{PRO}_{[bC]}$ has retained the feature [+human] from its source

PERSON. This is evident, in particular, in the constraints on its use, i.e. its occurrence only with human objects and its restriction to verb classes whose object argument refers to qualities as a person.

We may see a similar effect in DGS. The grammaticalization of PAM from PERSON seems also to privilege the feature [+human], leading to a strong connection between PAM and animacy. As we have seen, the use of PAM does not seem to be fully restricted to human referents. There was some use of PAM with animate, non-human referents (animals), but more notably, also use of PAM with inanimate referents. When the use of PAM with inanimate referents is allowed, a strong connection to humans tends to be given, as discussed above. An expansion of the animacy feature, such that entities contextually related to human objects may be marked with PAM, may be unique to the grammaticalization of PAM from PERSON in DGS. However, exceptions may also be possible in ISL. Meir's (2003) analysis was not based on naturalistic data, so the full range of uses may not have been observed. Against the background of the historical relationship between ISL and DGS, with data collection not too far apart in time (Meir's data from roughly 2003; the DGS corpus data from 2010–2012), it is possible that $\text{PRO}_{[bC]}$ may also occur with inanimates with strong connections to humans. In general, the similarities between form and function here are interesting to consider.[10] The grammaticalization from PERSON to an agreement auxiliary or object marker is attested across a range of sign languages, independent of historical connections (Börstell 2019; Steinbach & Pfau 2007), and comparative investigation to understand similarities and differences in patterns of use is an important avenue for future research.

Finally, it bears mentioning that many of the forms that we excluded from analysis – i.e. that were annotated as ON-PERSON1 in the corpus, but identified by us as being PERSON instead – are probably not occurrences of the noun form PERSON (shown in **Figure 7**). Rather, there may be an additional form, which we may preliminarily gloss as $\text{PERSON}_{\text{dom}}$, also grammaticalized from the noun PERSON. If this is the case, DGS may exhibit an object-marking alternation depending on properties of the object. As described for the examples in **Figures 8** and **9**, the use of $\text{PERSON}_{\text{dom}}$ seems determined by two main factors that hinge centrally on the relationship between the subject and object arguments: an assessment of the attributes of the object referent; a perception of distance to the object referent, due either to reverence (e.g. a famous and respected person) or uncertainty. It is interesting in this respect that Meir (2003) also stresses the relationship between the subject and object and notes an alternation between the use of INDEX and $\text{PRO}_{[bc]}$ as being modulated by the degree of familiarity between the arguments (as described in section 2.3.2).

[10] We thank an anonymous reviewer for this suggestion.

7 Conclusion

This paper has sought to describe the behavior of PAM in DGS and to investigate how its use may be related to the concept of linguistic prominence. Proceeding from recent previous analyses, we examined whether the use of PAM is linked to object individuation and affectedness. Through a corpus analysis of the use of PAM, we have provided some support for and some evidence against previous claims for PAM (in particular, by Bross 2020). Specifically, we have found evidence that the use of PAM exhibits strong animacy and definiteness effects. From the perspective of object markedness – taking animate, definite objects to be marked in comparison to more typical inanimate, indefinite objects – we may conclude that PAM indeed contributes to marking linguistic prominence. The use of PAM serves as a contextual addition of information that can serve to distinguish the object from the subject by highlighting (or marking) the object. We also found that PAM occurs predominantly with verbs low on the affectedness hierarchy, and that we can further identify selectional constraints that PAM imposes on verb classes and on subject and object arguments with respect to semantic roles and properties.

Based on the types of verbs that PAM occurs with, we can assume contexts with animate (human) experiencer or agentive volitional subjects with PAM marking an agent-like, animate definite object, highlighting the prominence of the object with respect to the subject. By highlighting the object and bringing active attention to it, PAM in DGS may be described as marking linguistic prominence.

The findings of the present study with respect to object-marking with PAM can be summarized as follows:

1. The use of PAM is not mandatory in DGS in any of the contexts analyzed;
2. The use of PAM is strongly linked to the individuation (animacy and definiteness) of the object, as less prototypical patients, but the use of PAM with inanimate and indefinite objects is not prohibited;
3. The use of PAM can confer prominence to the (individuated) recipient with (ditransitive) content verbs;
4. The use of PAM confers prominence to the agent-like stimulus objects of psych verbs with (non-volitional, non-agentive) experiencer subjects;
5. The use of PAM can confer prominence to human, agent-like stimulus objects also in contexts where subjects are volitional agents, given the prototypical agentive, event-initiating properties of the object;
6. Finally, the use of PAM seems to lend prominence to highly individuated objects that are impacted negatively by a volitional agentive subject, whether the impact is physical or non-physical.

Taken together, our findings suggest that an analysis of PAM as a differential object marker is on the right track. In terms of Himmelmann and Primus (2015), highly individuated objects draw active attention, making them more prominent than agents because they exhibit behavior very different from inanimate objects. The exact criteria for its use, and the precise nature of its interaction with prominence remain to be more closely determined. In addition, it is necessary to understand what other syntactic phenomena contribute to marking linguistic prominence in DGS and how these influence the use or not of PAM. It may be, for example, that PAM does not mark all human objects because there are other ways of additionally marking the object in DGS, including spatial modification of indicating verbs, different orders of constituents, and the use of constructed action. For example, similar to the passive construction, the order of constituents may serve to give prominence to the object, alternative to the use of PAM. The use of constructed action, whereby an animate referent is mapped onto the signer's body, may influence the use of PAM due to its very different nature of representation (anonymous, in preparation). Constructed action involves complex and non-linear predicates, while PAM is a grammatical sign that aligns more clearly with more linearly ordered predicates (Jantunen 2017). The modification of indicating verbs, finally, may also influence the realization of PAM, as both types of modification serve to spatially indicate, and thus highlight arguments, and both may be influenced by relations of prominence (Fenlon et al. 2018).

Appendix

List of complete links for examples from the DGS Public Corpus. The number at the end of the link corresponds to the timestamp of the video. For example, in the link for **Figure 1a**, “t00134820” indicates a timestamp (t) of 13:48:20 (13 min : 48 sec : 20 msec).

Figure 1a: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1209495-10594836-11212321_en.html#t00134820

Figure 1b: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1209495-10594836-11212321_en.html#t00134633

Figure 1c: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1427158-11470746-12015917_en.html#t00110010

Figure 1d: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1250721_de.html#t00012107

Figure 2a: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1419265_en.html#t00050135

Figure 2b: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1212176_en.html#t00100022

Figure 4: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1413485_en.html#t00011802

Figure 6: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1419265_en.html#t00050211

Figure 7: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1413485_en.html#t00012537

Figure 8: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1292086_en.html#t00022443

Figure 9: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1246772_en.html#t00000722

Figure 11a: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1429781-13002707-13070302_en.html#t00045705

Figure 11b: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1419265_en.html#t00050142

Figure 11c: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1181397_en.html#t00010207

Figure 12: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1427158-11470746-12015917_en.html#t00110010

Figure 16: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1181397_en.html#t00010142

Figure 19: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1291636_en.html#t00002138

Figure 20a: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1413451-11105600-11163240_en.html#t00023116

Figure 20b: https://www.sign-lang.uni-hamburg.de/meinedgs/html/1212416_en.html#t00002205

Abbreviations

BSL = British Sign Language, DSL = Danish Sign Language, DGS = German Sign Language, FinSL = Finnish Sign Language, FinSSL = Finland-Swedish Sign Language, ISL = Israeli Sign

Language, LSE = Lengua de Signos Española (Spanish Sign Language), ÖGS = Österreichische Gebärdensprache (Austrian Sign Language), SSL = Swedish Sign Language.

Glosses conventions

GLOSS	glosses for signs given in capital letters
GLOSS#GLOSS	compound sign indicated by # between the two elements of the compound
1sg / 2sg / 3sg	first / second / third person singular reference
GLOSS3a	subscript indicates location associated with third person referent at location a
IX or INDEX	index, i.e. pointing sign, with pronominal meaning
PAM	acronym stemming from Person Agreement Marker

Metadata conventions

ber	Berlin
fra	Frankfurt
goe	Göttingen
koe	Cologne (Köln)
mst	Münster
nue	Nuremberg (Nürnberg)
stu	Stuttgart
m	male
f	female
18–30	age group for signers aged 18–30 years old
31–45	age group for signers aged 31–45 years old
46–60	age group for signers aged 45–60 years old
61 +	age group for signers aged over 61 years old

Ethics and consent

The study obtained ethical consent from the University of Cologne, Germany (ref: PPHF00065). Analyses are based entirely on data from the DGS Public Corpus, which was collected with the informed consent of the participants and in compliance with the appropriate ethical guidelines.

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Competing interests

The authors have no competing interests to declare.

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