Research Article

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# The role of case and animacy in bi- and monolingual children's sentence interpretation in German: a developmental perspective

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**Abstract:** German-speaking children appear to have a strong N1-bias when interpreting non-canonical OVS-sentences. During sentence interpretation, especially unambiguous accusative and dative case markers (*den* 'the-ACC' and *dem* 'the-DAT') weaken the N1-bias and help building up sentence interpretation strategies on the basis of morphological cues. Still, the N1-bias prevails beyond the age of five (Brandt et al. 2016, Cristante 2016, Dittmar et al. 2008) and remains until puberty (Lidzba et al. 2013). This paper investigates whether prototypical case-animacy coalitions ($den_{ACC}$ + $N_{INANIMATE}$ and $dem_{DAT}$ + $N_{ANIMATE}$ ) strengthen a morphologically based sentence interpretation strategy in German. The experiment discussed in this paper tests for effects of such case-animacy coalitions in mono- and bilingual primary school children. 20 German monolinguals, 12 Dutch-German and 17 Russian-German bilinguals with a mean age of 9;6 were tested in a forced-choice off-line experiment. Results indicate that case-animacy coalitions weaken the N1-bias in OVS-conditions in German monolinguals and Dutch-German bilinguals, while no effects were found for Russian-German bilinguals. Together with an analysis of individual differences, these group-specific effects are discussed in terms of a developmental approach that represents a gradual cue strength adjustment process in mono- and bilingual children.

**Keywords:** sentence interpretation, L2 German, case-animacy

## 1 Introduction

From a cross-linguistic perspective, languages offer various linguistic and non-linguistic cues like constituent order, case marking, prosody, and animacy to encode semantic role relations within syntactic constructions.[1] Within the framework of the Competition Model (Bates & MacWhinney 1989), cues may vary in terms of their validity. For example, in English or Dutch constituent order is a highly reliable cue (Bates et al. 1982, Kilborn & Cooreman 1987), while in morphologically richer languages like Russian and German case marking is ranked higher than constituent order (Kempe & MacWhinney 1999). Cue interaction frequently results in cue coalition and, ultimately, competition.

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For first language (L1) development, numerous studies show that children tune their sensitivity to the most valid cues at the age of three or four (e.g., Bates et al. 1984, Chan et al. 2009, McDonald 1986, McDonald 1987 for English and Dutch, Pléh et al. 1987 for Russian, Slobin & Bever 1982 for Turkish). For example, English speaking monolingual children rely on word order to determine AGENT-PATIENT relations around the age of 3;0 (Bates et al. 1984, Chan et al. 2009), while Turkish-speaking children around the same age rely on case marking (Slobin & Bever 1982). In German, the cue strength adjustment (McDonald 1987) from a syntactically-based (= N1-bias) to a morphologically-based (= case markers) interpretation strategy is initiated much later in development, namely between the age of five and seven (Schaner-Wolles 1989, Schipke et al. 2012, Cristante 2016, Dittmar et al. 2008). Adult-like competence is reached only after puberty (Lidzba et al. 2013). Thus, although case marking cues are high in cue validity, cue strength is adjusted to case marking surprisingly late in L1 German.

A similar cue strength adjustment process can be found in second language (L2) development in bilingual adults (e.g., Heilenmann & McDonald 1993, McDonald 1987, Sasaki 1994). Here, adjustment processes seem to be heavily influenced by L1 transfer (e.g., Hopp 2010, Jackson & Dussias 2009, Kempe & MacWhinney 1998, MacWhinney 1998), with learners coming from a case-marking language turning to a morphological strategy much earlier in development than learners with an L1 that favors constituent order cues. Such forward transfer effects have been documented for adult learners in several studies; bilingual children with typologically different L1s have not been investigated yet.

Generally, cue strength adjustment is typical for both L1 and L2 development. For German, the main question is why it occurs so late in development (at least in L1 speakers). One possible reason is that case markers in German are highly ambiguous. Only the accusative *den*$_{ACC}$ and the dative *dem*$_{DAT}$ are unambiguous; they differ in terms of case-animacy coalitions. *Den* and *dem* can therefore be used to help investigate the role animacy plays in cue strength adjustment processes.

This paper attempts to answer two questions. First, I will shed light on the role of case-animacy coalitions in general and unambiguous case markers (*den* + [-ANIMATE] and *dem* + [+ANIMATE]) in particular. The main hypothesis is that animacy functions as an additional or supportive cue during sentence interpretation and thus facilitates cue strength adjustment in German. Second, it examines whether L1-specific cues are transferred to sentence interpretation in German.

These research questions are addressed through an experiment with mono- and bilingual German-speaking children. 20 German monolinguals, 12 Dutch–German and 17 Russian–German bilingual primary school children were tested in a forced-choice experiment in which they had to determine the AGENT in two-participant sentences. The design comprises canonical and non-canonical NVN-sentences with the N1 varying according to morphological case marking and animacy values.

## 2 Animacy and case morphology

In general, case markers and constituent order patterns share – among others – one function: they mark "a relation between two entities" (Croft 1988: 173; note that this is only one function of case marking and constituent order). At the same time, these two phenomena bear specific semantic (and non-linguistic) features that lay the ground for correlations between case marking and animacy.

Sentences consisting of two noun phrases and a finite verb (NVN) often display two-participant events with two dichotomous semantic roles: an AGENT and a NON-AGENT with the AGENT usually encoded as a subject and the NON-AGENT as an object (see, for example, Lamers & de Hoop 2014 for Dutch). NVN-constructions thus tend to have canonical subject-verb-object order (SVO). In such canonical conditions, AGENTS and NON-AGENTS differ in terms of semantic features, with a prototypical AGENT being maximally and volitionally involved in an action which usually applies to [+ANIMATE] participants (Dahl & Fraurud 1996, Dowty 1991, Langacker 1991). For NON-AGENTS, animacy features are less straightforward. Whereas PATIENTS tend to be [-ANIMATE], RECIPIENTS (or related semantic roles like BENEFACTIVE or ADDRESSEE, which are combined within the concept of a Proto-Recipient in Primus 1999) are more likely to be [+ANIMATE] (cf. Dahl & Fraurud 1996 for corpus data from Swedish and Bader & Häussler 2010 for German). According to

both Dowty (1991) and Langacker (1991) as well as Primus (2006), such animacy features reflect participants' varying involvement in an action: while prototypical PATIENTS are minimally involved in an action and are dependent on and/or affected by the action of an AGENT, RECIPIENTS are classified as being more involved in an action. Langacker defines a RECIPIENT as "an active participant [...] that functions as an original source of energy and thereby *initiates* an interaction" (1991, 327). The varying properties of involvement of RECIPIENTS and PATIENTS result in varying animacy values with PATIENTS being more likely to be [-ANIMATE] and RECIPIENTS [+ANIMATE].

While animacy in this context can be viewed as a non-linguistic feature reflecting real-world participant relations, formal linguistic cues like constituent order or case marking are used to denote those relations (another formal feature fulfilling the same function is, for example, prosody; cf. Grühnloh et al. 2011). In consequence, they are intertwined with animacy features. In terms of constituent order in NVN-constructions, the first noun (N1) prototypically encodes a (necessarily volitional and animate) AGENT and the second (N2) a (not necessarily animate) NON-AGENT (Dahl & Fraurud 1996). In languages like English, the position of a constituent within a sentence is a cue for its function in the sense that that the combination of two nominal phrases (N>N) usually encodes the semantic role sequence 'AGENT > NON-AGENT'. The reordering of constituents within a sentence leads to a change of semantic role relations, especially in reversible sentences.

Apart from constituent order, case marking is a further formal cue for semantic role relations in languages that have a case marking system. Such languages usually have flexible constituent order (McFadden 2003). Take Russian as an example:

(1) a) *brat* *vid-it* *mal´čík-a*
brother.NOM see-3SG boy-ACC
N1 = AGENT/subject N2 = NON-AGENT/object
'The brother sees the boy'

b) *mal´čík-a* *vid-it* *brat*
boy-ACC see-3SG brother.NOM
N1 = NON-AGENT/object N2 = AGENT/subject
'The brother sees the boy'

As can be seen from (1), constituent order is a less relevant cue for semantic role relations in Russian than in English or Dutch, where N>N almost always refers to the semantic role order 'AGENT > NON-AGENT'. The same constituent order can depict either an 'AGENT > NON-AGENT' (1a) or a 'NON-AGENT > AGENT' (1b) sequence in Russian.

Despite this language-specific difference, Russian – like English and Dutch – uses the semantic role sequence 'AGENT > NON-AGENT' as the most frequent and pragmatically unmarked variety, encoded as SVO sentences (corpus data showing the high frequency of SVO come from Bouma 2008 for Dutch, Schlesewky et al. 2000 and Bader & Häussler 2010 for German and Hentschel 1992 for Russian). Although the reversed order (i.e., 'NON-AGENT > AGENT') is possible in Russian, its usage depends on specific pragmatic features like fore- and backgrounding of information (Bailyn 2012). Of all possible non-canonical sentence structures, OVS sentences occur most frequently in usage – in spontaneous speech (Kay Billings 2015), in elicitation (Kallestinova 2007) and in L1 development (Dyakonova 2004). The Russian example shows that case markers make flexible constituent order patterns possible. This is a general tendency across languages: the more overt case marking a language has, the more flexible its constituent order usually is (e.g., McFadden 2003).

Another tendency that can be found across languages is the correlation between semantic roles, animacy values, and case marking. With regard to the correlation between case and animacy, example (1) shows that a prototypical AGENT is realized in the nominative, while the PATIENT receives accusative marking. RECIPIENTS are usually (not exclusively) realized in the dative (Aristar 1997). Because accusative and dative markers tend to be morphologically distinct from the nominative (Comrie 1991), they can be

labeled as marked case forms, while the nominative belongs to an unmarked case class. The semantic role distinction between AGENTS and NON-AGENTS is thus reflected in terms of two opposing case classes: the unmarked nominative for AGENTS and the marked accusative or dative for NON-AGENTS.

Since semantic roles carry prototypical animacy features, the case classes used to mark those semantic roles also correlate with specific animacy features. Given the fact that an AGENT is prototypically used with [+ANIMATE] nouns and realized in the nominative, we can assume a correlation between the nominative and the feature [+ANIMATE]. The opposite applies to the accusative, which is prototypically used to mark inanimate PATIENTS and thus correlates with the feature [-ANIMATE]. Consequently, the dative as the prototypical case for RECIPIENTS correlates with the feature [+ANIMATE].

So far, we have seen three important things: first, two-participant events often depict semantic role relations carrying prototypical animacy values. Second, languages can use constituent order patterns or case markers (or both) to depict the semantic dichotomy between AGENTS and NON-AGENTS. Third, because AGENTS and NON-AGENTS carry prototypical animacy values, there is a correlation between these semantic role features, constituent order, and case classes. In sum, an AGENT is usually [+ANIMATE], occurs in the nominative, and is the N1 of the sentence. Prototypical PATIENTS are [-ANIMATE], accusative-marked, and realized as N2. RECIPIENTS are also usually the N2 constituents, but they carry the value [+ANIMATE], and occur in the dative case.

## 3 Case-animacy coalitions in German

Section 2 demonstrated that animacy is reflected in both constituent order patterns and case classes. The correlation between case class and animacy is not language specific and also applies to German, where – due to the existence of case marking – constituent order variation is possible. Take again the above example *The brother sees the boy*.

(2) (a) *D-er* *Bruder* *sieh-t* *d-en* *Junge-n*
DET-NOM.MASC brother see-3SG DET-ACC.MASC boy-ACC.MASC
'The brother sees the boy'

(b) *D-en* *Junge-n* *sieh-t* *d-er* *Bruder*
DET-ACC.MASC boy-ACC.MASC see-3SG DET-NOM.MASC brother
'The brother sees the boy'

While the canonical constituent order 'AGENT > NON-AGENT' in (2a) is pragmatically unmarked in German, the semantic role sequence can be changed to 'NON-AGENT > AGENT' as in (2b) without semantic role relations being changed. Like in Russian, this is due to the overt accusative marker *den* as well as the nominative article *der*. Although non-canonical constituent order is possible in German, it rarely occurs in usage and depends on specific pragmatic functions like topic and focus. According to a corpus study by Schlesewsky et al. (2000), non-canonical sentences with the object preceding the subject make up only 10% of all transitive constructions in spoken and 5-8% in written German. The fact that German speakers rarely make use of non-canonical structures might be due to a high degree of syncretism within the German case system, which also leads to the problem that prototypical case-animacy correlations as sketched out in section 2 are difficult to detect.

In German, case marking predominantly occurs on the article (as the empirical study in section 5 deals with definite articles, the following description will be focusing on definite articles only; case marking further occurs on pronouns, inflected adjectives, and – in single cases – on nouns). Articles in German are multifunctional: they not only mark case but also gender, number, and definiteness. In addition, there are only six distinct definite article forms for 24 possible functions (three gender classes, two number forms and four case classes). The German article system is therefore highly syncretic, with the single forms being multifunctional in several ways. Table 1 gives an overview of the different case forms within the German definite article system. As the focus here is on the non-agentive roles PATIENT and RECIPIENT, and therefore on the case classes accusative and dative, the genitive will be left aside.

**Table 1:** Case-marked singular articles and respective prototypical animacy values in German

| | MASCULINE | NEUTER | FEMININE |
|---|---|---|---|
| NOMINATIVE [+ANIMATE] | *der* | *das* | *die* |
| ACCUSATIVE [-ANIMATE] | *den* | | |
| DATIVE [+ANIMATE] | *dem* | | *der* |

Table 1 shows that, due to gender distinctions, there are three nominative ($der_{MASC}$, $das_{NEUT}$ and $die_{FEM}$), three accusative ($den_{MASC}$, $das_{NEUT}$ and $die_{FEM}$) and two dative ($dem_{MASC/NEUT}$ and $der_{FEM}$) articles. Three of these six forms fulfill quite opposing functions. First, the forms *das* and *die* can each be used as either nominative or accusative markers and can thus encode both AGENTS and PATIENTS. In terms of case-animacy coalitions, they can both co-occur either with the feature [+ANIMATE] or [-ANIMATE]. Second, the form *der* is both a nominative marker in masculine and a dative (and genitive) marker in feminine nouns. Ultimately, *der* is used to mark different semantic roles, namely AGENT and RECIPIENT. The syncretic forms *das*, *die* and *der* can all potentially mark AGENTS and NON-AGENTS. Furthermore, for *das* and *die*, there is no clear tendency towards a correlation with particular animacy values (note, however, that in both L1 and L2 acquisition *der* is used as one of the first and most dominant AGENT markers, especially in combination with animate nouns; cf. Bittner 2006, Binanzer 2015, Kaltenbacher & Klages 2006, Wegener 1995).

Since *der*, *das* and *die* can all be used as markers for AGENTS and NON-AGENTS (and, in the case of *die*, for all semantic roles in the plural), there is no reliable case marker for an AGENT in German. Consequently, the only unambiguous forms are *den* and *dem*: they are both exclusively used in non-nominative cases and therefore only mark NON-AGENTS; in addition, they both only mark a single case function. Corpus results from both Schlesewksy et al. (2000) and Bader & Häussler (2010) suggest a coalition between the accusative *den* and [-ANIMATE] on the one hand and the dative *dem* and [+ANIMATE] on the other. Schlesewsky et al. (2000) find that dative-marked objects occur in only 15% of all analyzed OVS sentences; more than 80% are accusative-marked fronted objects. In terms of animacy features, Bader & Häussler (2010: 731) show that fronted objects in OVS sentences are most likely to be [-ANIMATE] (and the subject [+ANIMATE]). For sentences with a dative-marked object, the contrary is true: such objects are usually [+ANIMATE]. Taken together, these corpus results show that not only does the accusative form occur more often in OVS conditions, it also is mostly used with inanimate nouns. The opposite is true for the dative-marked OVS sentences: they occur less often (or to be more precise: they are more restricted to specific constructions and lexical items, cf. Bader & Häussler 2010) and are more likely to be used with animate nouns.

The high degree of ambiguity in the German case system poses a problem for semantic role interpretation. Take (3) as an example.

(3) a) *Das* *Mädchen* *sieh-t* *die* *Frau*
DET.NEUT girl see-3SG DET.FEM woman
'The girl sees the woman'

b) *Die* *Frau* *sieh-t* *das* *Mädchen*
DET.FEM woman see-3SG DET.NEUT girl
'The woman sees the girl'

(3) contains the article forms *das* for the neuter noun *Mädchen* ('girl') and *die* for the feminine noun *Frau* ('woman'). Since both forms can either denote an AGENT or a PATIENT, semantic role relations change whenever constituent order is altered as in (3b) (note that both 3a and 3b could be interpreted as OVS sentences when respective prosodic cues were available). Since case marking alone is not reliable in sentences that use only feminine and neuter nouns, constituent order is the most important formal cue for

semantic role relations here. German behaves very much like English or Dutch in such instances. This is reflected in terms of reliability levels based on corpus data: according to Brandt et al. (2016), constituent order is a reliable cue in more than 85% of NVN-sentences in child directed speech (CDS) in German. Moreover, analyses of CDS by Dittmar et al. (2008) show that case marking is rarely available on full NPs but usually occurs on pronouns (only 4% of OVS sentences have a full NP as N1). Taken together, the NVN-sentences German-speaking children are confronted with are likely to be canonical SVO sentences while non-canonical conditions rarely contain overtly case-marked, full NPs. Both factors lead to the fact that case marking is a less reliable cue in German than, for instance, in Russian (Kempe & MacWhinney 1999).

To sum up, we have seen that the German case system is highly ambiguous and does not provide 1:1 relations between single semantic roles and specific case-marked articles. Only the two articles *den* and *dem* are unambiguously used to mark PATIENTS (*den*) or RECIPIENTS (*dem*) and therefore correlate with these roles' prototypical animacy values. Thus, *den* forms a coalition with [-ANIMATE] while *dem* correlates with [+ANIMATE]. A low availability of unambiguous case markers, a high degree of form ambiguity, and a generally scarce amount of non-canonical sentences with full NPs strengthen the status of constituent order over morphological case cues in German.

## 4 Sentence interpretation strategies in German – a developmental perspective

We have seen in sections 2 and 3 that animacy values are prototypical properties of specific semantic roles. These values are reflected in both constituent order and morphological case marking. Despite this fundamental similarity, languages can differ in terms of how exactly semantic role relations are formally encoded and to what extent these formal codes are reliable cues to underlying semantic role relations.

Such typological differences in form-function relations affect language-specific sentence interpretation strategies. According to studies within the Competition Model framework (Bates & MacWhinney 1989), adult speakers of languages like English or Dutch determine semantic roles on the basis of constituent order. In NVN-sentences, they have a strong tendency to choose N1 as AGENT (cf. Kilborn & Cooreman 1987 for Dutch and Bates et al. 1982 for English) and use a syntactic interpretation strategy. In contrast, adult speakers of languages like Russian predominantly choose the nominative-marked constituent as AGENT – regardless of its syntactic position (Kempe & MacWhinney 1999) and therefore adopt a morphological interpretation strategy.

Adult German speakers also tend towards using a morphological interpretation strategy. However, according to Kempe & MacWhinney (1999), reaction times during the processing of non-canonical OVS sentences are significantly higher for German than for Russian speakers. Thus, the morphological strategy for adult German speakers seems to be weaker in cue strength than for Russian speakers. German speakers generally seem to have a stronger syntactic interpretation strategy (or N1-bias) than expected from speakers coming from morphologically rich languages (see also Bader & Meng 1999, Gorrell 2000, Hemforth 1993 and Schlesewsky et al. 2000 highlighting the strong N1-bias found in German adults).

In language acquisition, reaching adult-like interpretation strategies is a developmental goal. Before adopting the target-like morphological interpretation strategy, German-speaking children seem to rely on constituent order for a long time. Chan et al. (2009) show that constituent order gains in cue strength at the age of 3;6. It continues to dominate sentence interpretation at least until the age of 5;4 (Schaner-Wolles 1989), most likely even longer (for example, until the age of 6 or 7 in Cristante 2016, Dittmar et al. 2008, Lindner 2003, Schipke et al. 2012). Speakers of German appear to reach adult-like competence only after puberty (Lidzba et al. 2013). Case marking cues seem only to be strengthened when additional cues are available. Such additional cues can be prosodic marking (Grühnloh et al. 2011), construction-specific usage (Brandt et al. 2016) or the availability of two case-marked elements (Roesch & Chondrogianni 2015). Whenever such supporting cues are not available, case markers are outcompeted by constituent order, which means that a syntactic interpretation strategy is preferred. In comparison, children acquiring languages with a more transparent case system rely on morphological case cues much earlier in development than German-

speaking children, in some cases by the age of two or three (Slobin & Bever 1982). At the same time, on-line studies suggest that children are sensitive to case-marking information in non-canonical object-fronted sentences, but seem to struggle with integrating this information into a final sentence interpretation (Adani & Fritzsche 2015, Cristante 2016, Schipke et al. 2012). Although 'recognizing' an overt object marker, children stick to a constituent order-based sentence interpretation strategy.

In general, German speaking children gradually modify individual cue strength by moving from a syntactic to a morphological interpretation strategy throughout development. They not only seem to struggle with this adjustment, but also make use of 'supportive' cues when processing case marking. Similar strategies in adjusting individual cue strength can be found in L2 learners, but have so far only been found in adults. Younger learners, especially children, have not been investigated yet. During the L2 acquisition process, adult learners tend to rely on L1 interpretation strategies before they identify and make use of L2-specific reliable cues. For example, Sasaki (1994) shows that English-speaking learners of Japanese first rely on the N1-bias they are familiar with before they start using case markers to determine semantic role relations in Japanese, while Japanese-speaking learners of English are sensitive to case-marked elements (like prepositions or pronouns) early in L2 development and turn to a stronger N1-bias with increasing L2 proficiency in English. Both learner groups thus initially transfer their L1-specific relative cue strength, which they gradually drop in favor of reliable L2-specific cues (see also Heilenmann & McDonald 1993, McDonald 1987).

Studies addressing processing strategies in bilingual children have not, at least to our knowledge, addressed the question of cue adjustment. Instead, focus has been laid on group-specific differences either between L1 and L2 (Cristante 2016) or between different types of bilingual children (i.e., children differing in terms of age of onset) and monolingual peers (Roesch & Chondrogianni 2015). The studies show that, in non-canonical conditions with case marking cues, bilingual children generally show a poorer performance and seem to adopt a stronger syntactic interpretation strategy than their monolingual peers. Roesch & Chondrogianni (2015) argue that such performance differences may be due to different lengths of exposure to the target language and consequently due to developmental differences in the acquisition of case marking.

Further factors that might produce an asymmetry in performance between L1 and L2 children can be found in studies with adult L2 speakers. One such factor is the transfer of L1-specific cue strengths (see Papadopolou & Clahsen 2006 arguing against L1-specific effects on the basis of evidence from neuroimaging). The closer the cue-related relations between the L1 and L2, the faster learners begin to use L2-specific interpretation strategies. On the other hand, learners seem to struggle longer with a cue adjustment process when cue validity values differ. Take a study by Hopp (2010) as an example. He shows that non-canonical sentences are interpreted correctly 42% of the time by Russian-speaking learners of German, but only in 22% of the time by Dutch-speaking learners. The Dutch-speaking learners tend to interpret non-canonical NVN-sentences as canonical, a strategy they seem to have transferred from their L1 Dutch. Only later in development do they turn to the target-like morphological strategy. Russian learners, on the contrary, focus on case markers much earlier in L2 development. Before finding out which elements function as case markers in the target language, they temporarily adopt a syntactic interpretation strategy. Both learner groups may thus start off with a syntactic interpretation strategy. Later in development, respective L1-specific cues determine how and when the syntactic strategy is adjusted in favor of a morphological one.

In sum, cue strength adjustment seems to be a typical feature of language development. What is not clear, however, is the question of how exactly this adjustment is carried out. A detailed look at the studies outlined above shows that there might be varying factors initiating adjustment processes. One such factor is employing additional cues like prosody (Grünloh et al. 2011), specific constructions (Brandt et al. 2016) or a double case marking cue (Roesch & Chondrogianni 2015). The results found in those studies support the assumption that sentence interpretation may be easier whenever cue coalition is available. Another facilitating factor is the level of ambiguity of single case markers. Numerous studies carried out with German-speaking children show that OVS sentences starting with the unambiguous forms *den* and *dem* are more likely to be interpreted as non-canonical than those starting with the ambiguous markers *das* and *die* (e.g., Cristante 2016, Lidzba et al. 2013, Schaner-Wolles 1989). In terms of a possible interaction between cue coalition and form ambiguity,

Grünloh et al. (2011: 415) show that prosodic cues seem to strengthen case marking cues in unambiguous conditions only. Unambiguous *den* and *dem* thus seem to be higher in cue strength earlier in development and more prone to being strengthened by other cues. In general, unambiguous markers like *den* and *dem* seem to provide an entrance to a morphologically-based sentence interpretation strategy.

Animacy also seems to fulfill an entrance-like function, but much earlier in development. Studies dealing with the role of animacy predominantly focus on the relation between constituent order and animacy contrast. For example, Lindner (2003) shows that in transitive constructions with competing sentence-animacy cues, e.g., in NVN-sentences with an inanimate AGENT and an animate PATIENT, younger children at the age of 2;0 seem to rely on animacy when identifying the AGENT. This is supported by the findings of Chan et al. (2009). Both studies show that younger children tend to choose the animate constituent as AGENT (regardless of its syntactic position) while older children ignore animacy and strongly prefer an N1-bias. Lindner concludes that a semantic strategy based on animacy cues seems to precede the development of a grammatical strategy (in this case a syntactic one). Chan et al. (2009: 292) add that as soon as constituent order gains high cue strength, it is overgeneralized to conditions where animacy contrasts point to a non-canonical sentence interpretation. Animacy in this respect seems to be a precursor strategy and lays the ground for relying on grammatical cues like constituent order.

The idea of animacy as a gateway to grammatical interpretation strategies also implicitly underpins Sasaki's (1994) study with Japanese and English L2 learners. Sasaki shows that both learner groups go through a cue adjustment process with L1-specific interpretation strategies as the onset and L2-specific strategies the 'developmental goal' for sentence interpretation. The study shows that during this adjustment process, both groups temporarily turn to animacy as a reliable cue. Animacy cues (with AGENTS being associated with the value [+ANIMATE]) seem to function as a fill-in at the time when L1-specific strategies are dropped and L2-specific strategies are built. So, like in L1 German, animacy again functions as a gateway to the emergence of a new sentence interpretation strategy.

So far, we can draw two basic conclusions. L1 and L2 learners of German go through a process of cue adjustment in which a syntactic interpretation strategy is replaced by a morphological one. In general, cue strength adjustment processes seem to be initiated by animacy cues. They open up the possibility to leave one strategy behind and turn to a more reliable one instead. In addition, the unambiguous case markers *den* and *dem* seem to facilitate German-speaking children's shift from relying on a N1-bias to morphological cues in non-canonical sentence interpretation in German. Both animacy and unambiguous forms are features that can shape cue strength adjustment processes during language development. Prototypical coalitions between case markers and animacy values might help overcome the N1-bias in German.

The shift in cue strength can not only be observed in L1 development, but also in adult L2-learners. The timing of the shift may depend on the learners' L1-specific cue strength. It is not clear whether bilingual German-speaking children also go through a cue strength adjustment process. The question is whether the case-animacy interplay described in section 3 is also important for bilingual children in helping them transition from a syntactic to a morphological sentence interpretation strategy. As L1-specific form-function relations can additionally determine the timing of cue strength adjustment, a further question is whether L1-specific form-function relations might influence sentence interpretation strategies in the target language. Regarding the role of the L1, it is helpful to contrast languages that have contrasting cues to denote semantic role relations. One such pair of languages is Russian, which heavily relies on case marking cues (Kempe & MacWhinney 1999), and Dutch, which uses constituent order instead (Kilborn & Cooreman 1987). Russian and Dutch do not only differ in terms of varying cue validities, but also stand in contrast to cues in German: case marking in Russian is ranked higher in validity than in German (Kempe & MacWhinney 1999) and constituent order in German lower in validity than in Dutch (Kilborn 1989). To be able to assess the potential influence of L1-specific cue validities, an experiment was carried out with Russian–German and Dutch–German bilingual children.

# 5 Experimental design

Section 4 showed that cue strength adjustment processes can especially be found in speakers who have not yet reached a target-like morphological interpretation strategy in German. This predominantly applies to children. As shown by Lidzba et al. (2013), only adolescents above the age of 14 are fully capable of interpreting non-canonical OVS sentences on the basis of morphological case cues. As children under the age of 14 are not fully target-like, the following study was carried out with mono- and bilingual German-speaking children under the age of 14. For the bilinguals, L1-specific differences were taken into consideration.

The main question guiding the experimental study is what role case-animacy coalitions play in the interpretation of non-canonical NVN-sentences and in the strengthening of a morphological interpretation strategy. As shown in section 4, the two unambiguous article forms *den* and *dem* seem to be the basis for a morphological interpretation strategy. Since case markers are especially reliable cues whenever additional cues are available, it is hypothesized that animacy may fulfill a supportive function. More precisely, a coalition between [*den* + $N_{INANIMATE}$] and [*dem* + $N_{ANIMATE}$] may support the interpretation of non-canonical NVN-conditions as OVS sentences. In sum, a coalition between unambiguous case markers and prototypical animacy values might weaken the dominant syntactic interpretation strategy which is often observed in German children, and strengthen a morphological strategy instead.

This effect is expected to occur in both mono- and bilingual German-speaking children. For the bilinguals, L1-specific differences will be taken into account, since they might affect individual cue strength. In particular, speakers coming from a language with a rich inflectional case system (i.e., Russian) might have a generally stronger preference for a morphological interpretation strategy and rely less on case-animacy coalitions than learners coming from a language without any case marking and a rigid constituent order instead (i.e., Dutch).

To address these questions, an experimental test was conducted with mono- and bilingual German children at an average age of 9;6. Subjects varied according to L1 (German, Russian, Dutch). The test design as well as the testing conditions are outlined below.

## 5.1 Method

The experiment was carried out in German. Participants were asked to read and interpret transitive NVN-sentences that varied according to constituent order (SVO vs. OVS), grammatical gender opposition between subject and object (the oppositions were: $S_{MASC}/O_{FEM}$, $S_{MASC}/O_{NEUT}$, $S_{FEM}/O_{NEUT}$ and vice versa for each opposition, i.e. $S_{FEM}/O_{MASC}$, $S_{NEUT}/O_{MASC}$, $S_{NEUT}/O_{FEM}$), object case marking (accusative vs. dative), and animacy opposition. Gender opposition was included in order to be able to include conditions with ambiguous and unambiguous case markers (e.g., $der_{SUBJ}$ vs. $die_{OBJ}$, $die_{SUBJ}$ vs. $den_{OBJ}$, $dem_{OBJ}$ vs. $das_{SUBJ}$) and to be able to assess whether those forms determined sentence interpretation strategies. Strictly speaking, gender opposition is relevant for the test design and does not function as a variable that might determine processing strategies.

The participants' task was to determine the AGENT of the NVN-sentence. The design was a forced choice experiment carried out on a laptop. With the help of the program *Affect 4* (Spruyt et al. 2010) subject choice and reading times were measured.

## 5.2 Participants

17 Russian–German bilinguals (mean age = 9;6, age range = 8;8-11;2, SD = 0.66, 6 boys and 11 girls), 12 Dutch–German bilinguals (mean age = 9;7, age range = 8;6-10;9, SD = 0.74, 4 boys and 8 girls) and 20 monolingual German children (mean age = 9;7, age range = 8;9-10;7, SD = 0.57, 11 boys and 9 girls) participated in the study. Three children were excluded due to dyslexia (1) and multilingualism with languages other than Russian or Dutch (2). Participants were recruited from five primary schools (3rd and

4th grade) in western Germany. The Russian–German group was originally much larger, with a total of 35 children tested. However, individual linguistic competence in Russian varied enormously, with some of the children being literate in Russian, some having spoken competence and some having only partial receptive competence in Russian. Those varying competence levels were made visible with the help of interviews and elicited narratives carried out with the children in Russian. At the same time, the Dutch–German bilinguals lived near the Dutch–German border and frequently made trips to the Netherlands. The amount of exposure to Dutch monolinguals was therefore much higher than the Russian–German bilinguals' exposure to Russian. Also, the schools the children were tested at offer single schooling lessons in Dutch. Most of the children were visiting this additional schooling offer. In order to control for such individual linguistic backgrounds, only those children were compared who had similar access to and a comparable competence level in the respective L1 (i.e., Russian and Dutch). Among the Russian children, these were the participants showing productive competence in Russian. Competence differences were assessed by interviews and story-telling (Reich & Roth 2004) which were both conducted in Russian. On the basis of the children's performance, the Russian–German bilinguals were split into three groups: those who were fluent speakers with additional writing skills in Russian, those who were fluent speakers without writing skills, and those who were able to understand but neither speak nor write Russian. The first two groups were combined into one larger participant group according to their productive competence in Russian.

Interviews with children, caretakers, and – when possible – parents were conducted in order to assess the age of onset for the acquisition of German. The interviews revealed that the bilingual children acquired German from kindergarten on, i.e., before the age of 4;0, which is defined as early L2 acquisition (Meisel 2009). With respect to the children's mean age during testing, length of exposure to German was thus between five and six years.

The children were matched according to their average competence in German, which was measured with a standard cloze test designed for primary school children in third and fourth grade (Baur & Spettman 2009). As competence levels did not have a main effect ($F = 0.085$, $p = 0.771$), they will not be taken into consideration for the data analysis.

## 5.3 Materials

The test design consisted of 96 NVN-sentences with five verbs requiring an accusative and five a dative object (see Appendix I for a list of verbal and nominal items). Test sentences were designed according to the following principle: noun pairs were combined with an accusative (e.g., *Der*$_{\text{NOM}}$ *Mann sieht das*$_{\text{ACC}}$ *Fahrrad* 'The man sees the bike') and a dative verb (*Der*$_{\text{NOM}}$ *Mann folgt dem*$_{\text{DAT}}$ *Fahrrad* 'The man follows the bike'). Each accusative and dative condition occurred in a canonical SVO and non-canonical OVS condition (e.g., *Das*$_{\text{ACC}}$ *Fahrrad sieht der*$_{\text{NOM}}$ *Mann, Dem*$_{\text{DAT}}$ *Fahrrad folgt der*$_{\text{NOM}}$ *Mann*). In sum, the article forms *der*, *die*, *das*, *den*, *dem* occurred as N1s, each varying according to animacy.

With respect to the ambiguity of article forms, both SVO and OVS conditions contained ambiguous (*das*, *die*) and unambiguous (*den*, *dem*, *der*) N1-forms. Ambiguous forms are those which are fully multifunctional and do not reveal any information about the form's function. A nominal phrase like *die Frau* ('the woman') can either be a nominative or accusative and thus either mark a subject or an object. Disambiguation is only possible with the help of an opposing phrase. For example, in a sentence like *Die*$_{\text{ACC}}$ *Frau sieht der*$_{\text{NOM}}$ *Mann* ('The man sees the woman'), the second (unambiguous, nominative-marked) constituent reveals that *die* in this sentence has to be interpreted as an accusative and thus marks the object of the sentence. In contrast, in a sentence starting with a *den*- or *dem*-marked phrase, the first constituent clearly points to the object of the sentence. Both forms are thus unambiguous. For *der*, the matter is a bit more complicated. Although *der* is multifunctional in the sense that it can both be a nominative in masculine (e.g., *der*$_{\text{NOM}}$ *Mann*) or a dative marker in feminine nouns (e.g., *der*$_{\text{DAT}}$ *Frau*), its function can be disambiguated as soon as the noun is encountered. Therefore, *der* was labeled as an unambiguous marker.

In sum, N1-forms in SVO and OVS conditions varied according to case form ambiguity (ambiguous vs. unambiguous) and animacy for each case form (animate vs. inanimate). The eight conditions resulting from that are summarized in Table 2.

**Table 2:** Examples of SVO and OVS test sentences varying according to N1 case marking and animacy

| constituent order | N1 | | test sentences (examples) |
|---|---|---|---|
| SVO | ambiguous case marker | [+ANIMATE] | DIE$_{NOM}$ SCHWESTER SIEHT DEN$_{ACC}$ BUS<br>'The sister sees the bus' |
| | | [-ANIMATE] | DAS$_{NOM}$ FAHRRAD FOLGT DER$_{DAT}$ FRAU<br>'The bike follows the woman' |
| | unambiguous case marker | [+ANIMATE] | DER$_{NOM}$ SCHÜLER MALT DAS$_{ACC}$ KIND<br>'The student paints the child' |
| | | [-ANIMATE] | DER$_{NOM}$ BUS SUCHT DAS$_{ACC}$ FAHRRAD<br>'The bus searches for the bike' |
| OVS | ambiguous case marker | [+ANIMATE] | DAS$_{ACC}$ KIND MALT DER$_{NOM}$ SCHÜLER<br>'The student paints the child' |
| | | [-ANIMATE] | DAS$_{ACC}$ AUTO HÖRT DER$_{NOM}$ MANN<br>'The man hears the car' |
| | unambiguous case marker | [+ANIMATE] | DEN$_{ACC}$ SCHÜLER SIEHT DIE$_{NOM}$ FRAU<br>'The woman sees the student' |
| | | [-ANIMATE] | DEN$_{ACC}$ BALL SIEHT DAS$_{NOM}$ MÄDCHEN<br>'The girl sees the ball' |
| | | [+ANIMATE] | DEM$_{DAT}$ SCHÜLER HILFT DIE$_{NOM}$ FRAU<br>'The woman helps the student' |
| | | [-ANIMATE] | DEM$_{DAT}$ BALL FOLGT DAS$_{NOM}$ MÄDCHEN<br>'The girl follows the ball' |

Since there is no available corpus data for bilingual children in German, lexeme frequencies were determined according to the following principle for the test sentences: to make sure that verbs and nouns were part of the child lexicon and that neither lexical gaps nor gender classification issues influence processing strategies, frequencies were determined by evaluating word lists of the six most widely used German primary school textbooks. Only those nouns (both animate and inanimate) and verbs (both accusative and dative) were included that occurred in at least five of the six word lists. The chosen items were also cross-checked with absolute word frequencies of primary school children's vocabulary (Pregel & Rickheit 1987). Only those verbs and nouns were incorporated into the test design that were listed as part of the spoken or written child lexicon for third- and fourth-graders. In all, 18 nominal items were included in the design (see Appendix I). Sentence length was limited to six syllables.

As the examples in Table 2 show, not all sentences were prototypical transitives, mainly due to the verb frequencies relevant for the child lexicon. In consequence, not all conditions contain prototypical AGENTS, PATIENTS or RECIPIENTS but rather agent-related and non-agentive roles. Also, due to noun frequencies and respective combinations between verbs and nouns, some test sentences are semantically nonsensical. This was accounted for during the familiarization phase (see PROCEDURE). Test conditions were thus simple NVN sentences in which children had to determine the AGENT of the sentence.

## 5.4 Design

The test sentences were split up into three sections, each section containing 32 test sentences. For each section, test sentences were selected manually, in order to ensure that every condition was balanced in each test section. During the testing procedure, the test sentences appeared in a randomized order.

The participants were sitting in front of a laptop on which the testing was carried out. Every test sentence appeared on the laptop screen with all lexemes presented in capital letters. The two nominal

constituents were colored red (N1) and green (N2). To make responding easier, the keys F and J on the keyboard were masked in the constituents' respective colors. The time-out for reading the test sentence was set to 12 seconds. If the participants wanted to proceed earlier they could indicate this by pressing the space bar, which was colored white. Whenever the time ran out or the space bar was pressed, the test sentence disappeared from the screen. In its place, the participants saw a matching question asking who performed the action (e.g., for the test sentence 'The man sees the bike' → 'Who sees?') and two possible answers, namely the two lexical items from the test sentences (i.e., 'man' and 'bike' in the given example). The nouns appeared without the articles to make sure that focus was not drawn to single article forms. The two nouns as possible answers were again colored in red and green. The participants' task was to pick one of the colored lexemes as a matching answer to the question. The question/answer task was again limited with a time-out set to 6 seconds. After a red or green key was pressed, the next test sentence appeared on the screen. The colors of the nominal constituents were swapped together with the key colors in every new section.

### 5.5 Procedure

There were three test sessions that took place over a period of six weeks (April to June 2012). A break of about 2 weeks was taken between the sessions. Participants were tested individually in separate quiet rooms in the children's schools. In every session, the children performed a warm-up test with a limited amount of test items under the exact same conditions outlined above. The six training sentences did not include any of the verbal or nominal test items. The training was repeated if required by the child. There was a short review after the training in which the children were told that some sentences were "a bit funny" (this was the case for semantically nonsensical sentences). They were also told that they were free to choose whichever answer option seemed right for them and that there were neither correct nor wrong answers.

## 6 Results

Since the aim of the paper is to highlight the role of case and animacy in sentence processing, the following results section is split up into three parts. Part I focuses on overall within-group effects of constituent order, case marking and animacy of the N1. The aim is to determine which cues generally influence children's interpretation strategies. Part II highlights a subset of the test design and focuses on non-canonical OVS sentences starting either with *den* or *dem* with both forms occurring either with an animate or an inanimate noun. The third part will highlight individual differences.

### 6.1 Part I: Overall effects of case and animacy

In order to determine which cues govern sentence interpretation, we first calculated the proportion of N1 choices in all eight testing conditions (see Table 2). 64 out of 4704 trials had to be excluded due to missing responses. N1 proportions were determined separately in SVO and OVS sentences with ambiguous or unambiguous N1 case marking varying according to differing animacy features. The results for each participant group (monolingual German, L1 Dutch, L1 Russian) are presented in Figure 1.

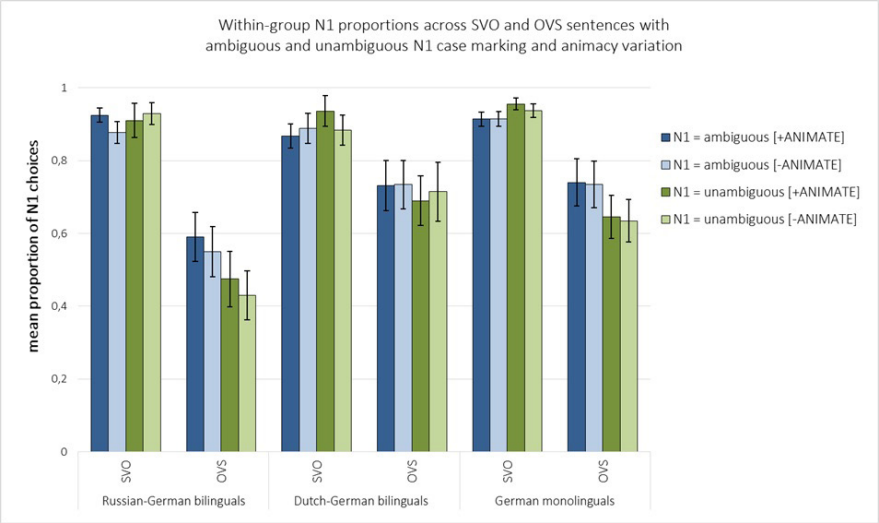


**Figure 1:** Within-group N1 proportions across SVO and OVS sentences with ambiguous and unambiguous N1 case marking and animacy variation

**Table 3:** GLM within-group main effects and interactions. N1 proportions in NVN-sentences (SVO vs. OVS) with ambiguous vs unambiguous case marking and animate vs inanimate N1

| participant group | Parameter | Estimate | Std. Error | z-stat. | p-value |
|---|---|---|---|---|---|
| Russian-German bilinguals | Intercept | 2.55680 | 0.28077 | 9.106 | <0.0001 |
| | constituent order | -2.70419 | 0.29332 | -9.219 | <0.0001 |
| | N1 animacy | -0.18544 | 0.30658 | -0.605 | 0.5453 |
| | const. order:case ambig. | 0.71979 | 0.30721 | 2.343 | <0.05 |
| | N1 animacy:case ambig. | -0.20051 | 0.27348 | -0.733 | 0.4634 |
| Dutch-German bilinguals | Intercept | 2.3998 | 0.3191 | 7.520 | <0.0001 |
| | constituent order | -1.5346 | 0.3398 | -4.517 | <0.0001 |
| | N1 animacy | -0.1646 | 0.3596 | -0.458 | 0.647 |
| | const. order:case ambig. | 0.4795 | 0.3595 | 1.334 | 0.182 |
| | N1 animacy:case ambig. | 0.2189 | 0.3414 | 0.641 | 0.521 |
| German monolinguals | Intercept | 2.96189 | 0.30125 | 9.832 | <0.0001 |
| | constituent order | -2.34720 | 0.31085 | -7.551 | <0.0001 |
| | N1 animacy | -0.15723 | 0.31614 | -0.497 | 0.61896 |
| | const. order:case ambig. | 0.96835 | 0.32230 | 3.005 | <0.01 |
| | N1 animacy:case ambig. | 0.10686 | 0.27776 | 0.385 | 0.70046 |

As can be seen from Figure 1, average N1 proportions range around 90% in all three participant groups in SVO conditions. Neither case marking ambiguity nor animacy have an impact on the results. Although N1 proportions drop in all three groups in OVS conditions, they remain surprisingly high in both German monolingual and Dutch–German bilinguals. Also, they are only slightly below chance in the Russian–German bilinguals. In terms of case marking and animacy, animacy never seems to affect N1 proportions. In contrast, there are slight indications of case marking effects in the German monolinguals and Russian–German bilinguals in the OVS condition. In both groups, N1 proportions are slightly lower in unambiguous (i.e., sentences starting with *den*, *dem* or *der*$_{\text{DAT}}$) than in ambiguous sentences (i.e., sentences starting with

*das*$_{ACC}$ or *die*$_{ACC}$). However, despite case-specific differences, N1 proportions are at chance or higher in both groups.

The tendencies observed in Figure 1 were analyzed with separate Generalized Linear Models (GLM) within the lme4 package (Bates et al. 2015) in R (R core team 2018) for the three participant groups. The models tested for main effects (constituent order, N1 animacy, N1 case ambiguity) and respective two-way interactions. The significance of each model was confirmed with the help of a Likelihood Ratio Test ($p <$ 0.0001 for German monolinguals, $p < 0.0001$ for Russian–German bilinguals, $p < 0.0001$ for Dutch–German bilinguals). As indicated in table 3, a main effect was found for constituent order in all three groups as well as a significant interaction of case marking ambiguity and constituent order in the monolingual German and the German-Russian group. No such interaction was found in the German-Dutch bilinguals. There were no effects for animacy or case-animacy interaction in either group.

In sum, the overall data analysis suggests that all participants adopt a rather strong syntactic interpretation strategy in non-canonical conditions. Even in OVS sentences with unambiguous case marking, N1 proportions are surprisingly high in all participant groups. The highest N1 proportions in non-canonical conditions were found in the Dutch–German group, the lowest in the Russian–German bilinguals. These tendencies point towards an L1-specific effect. The German monolinguals are in between these two. The results additionally point to the fact that N1 proportions tend to drop in unambiguous case marking conditions only. At the same time, animacy does not affect sentence interpretation at any time. Animacy alone, then, does not function as a cue for sentence interpretation.

Generally, despite the surprisingly high N1 proportions in all three groups, the results so far are as expected. We would predict high N1 proportions in canonical SVO sentences and, respectively, lower N1 proportions in non-canonical conditions with unambiguous N1 case marking. Also, L1-specific influences, with Dutch–German bilinguals having a stronger N1-bias in non-canonical OVS conditions than Russian–German bilinguals, could be expected since comparable L1-specific cue strength transfer has been observed in adults (e.g., Hopp 2010). However, contrary to the hypotheses of the current study, the overall analysis does not show any interaction between case and animacy. Again, a missing animacy effect in the canonical SVO condition is not surprising. Animacy cues are replaced by constituent order cues around the age of 3;6 (Brandt et al. 2016) in canonical sentences. The fact that participants adopt the syntactic strategy without paying attention to animacy could thus be expected for older children. More surprising is the missing animacy effect in non-canonical OVS conditions. Such test sentences are generally harder to process, as is reflected in the high N1 proportions in all three groups. At the same time, animacy does not seem to facilitate the interpretation of non-canonical conditions. However, this might be due to a neutralization effect. Recall that the accusative *den* was labeled as frequently co-occurring with inanimate nouns, while *dem* tends to form a coalition with animate entities. It might be, thus, that participants did abandon their generally strong N1 bias in conditions with case-animacy coalitions. Since the unambiguous case forms imply opposing animacy features, possible effects of case-animacy cues might not be reflected in the data when both conditions are collapsed. This is why we will take a closer look at *den* and *dem* separately in the following section.

## 6.2 Part II: Animacy effects in OVS sentences

The following data analysis will exclusively focus on a subset of the data and highlight OVS conditions with sentence-initial *den*- and *dem*-NPs varying according to case-animacy coalition ([*den* + $N_{INANIMATE}$] and [*dem* + $N_{ANIMATE}$]) and competition ([*den* + $N_{ANIMATE}$] and [*dem* + $N_{INANIMATE}$]). For each of these four conditions, relative N1 proportions were determined. Results for each participant group are displayed in Figure 2.

Again, the tendencies displayed in Figure 2 were analyzed with a Generalized Linear Model carried out separately for each participant group. The Likelihood Ratio test proved each model's goodness of fit ($p < 0.05$ for German monolingual, $p < 0.0001$ for Russian–German bilinguals, $p < 0.05$ for Dutch–German bilinguals). The model checked for main effects according to N1 case marking (*den* vs. *dem*) and N1 animacy (animate vs. inanimate) as well as a two-way-interaction.

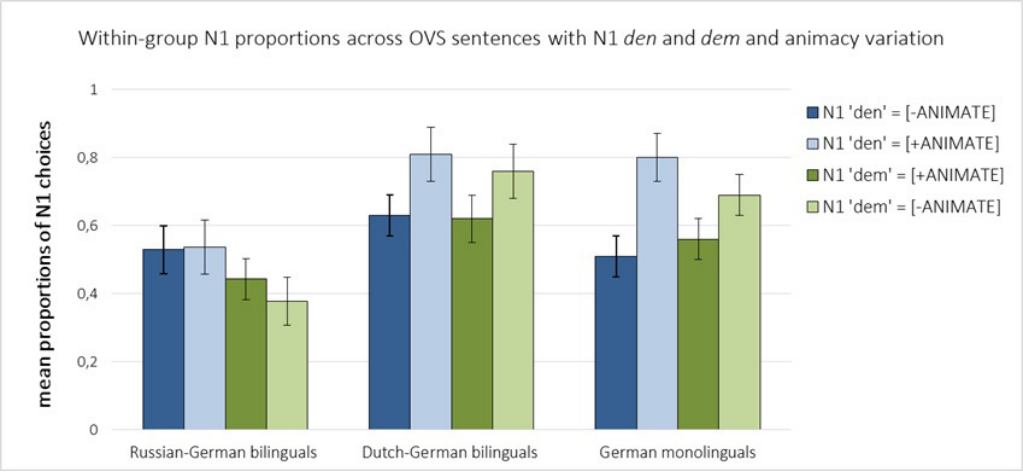


**Figure 2:** Within-group N1 proportions across OVS sentences with N1 *den* and *dem* and animacy variation

**Table 4:** GLM within-group main effects and interactions. N1 proportions in OVS sentences with N1 *den* or *dem* and animate vs inanimate N1

| participant group | Parameter | Estimate | Std. Error | z-stat. | p-value |
|---|---|---|---|---|---|
| Russian-German bilinguals | Intercept | 0.14953 | 0.24502 | 0.610 | 0.542 |
| | N1 case (den vs. dem) | -0.37606 | 0.30083 | -1.250 | 0.211 |
| | N1 animacy | -0.03175 | 0.34506 | -0.092 | 0.927 |
| | N1 case:N1 animacy | -0.23642 | 0.42629 | -0.555 | 0.579 |
| Dutch-German bilinguals | Intercept | 1.4663 | 0.3698 | 3.965 | <0.0001 |
| | N1 case (den vs. dem) | -0.9496 | 0.4286 | -2.216 | <0.05 |
| | N1 animacy | -0.9555 | 0.4750 | -2.012 | <0.05 |
| | N1 case:N1 animacy | 1.5938 | 0.5743 | 2.775 | <0.01 |
| German monolinguals | Intercept | 1.4351 | 0.2873 | 4.995 | <0.0001 |
| | N1 case (den vs. dem) | -1.1773 | 0.3296 | -3.572 | <0.001 |
| | N1 animacy | -1.3851 | 0.3641 | -3.804 | <0.001 |
| | N1 case:N1 animacy | 1.9684 | 0.4348 | 4.527 | <0.0001 |

No effects were found in the Russian–German bilinguals. However, there were main effects for N1 case marking and N1 animacy as well as a significant interaction between case and animacy in the Dutch–German bilinguals and German monolinguals. In order to check whether the observed effects are only limited to the unambiguous case conditions (*den* vs. *dem*) or indicate a general processing strategy within the Dutch–German bilinguals and German monolinguals, equivalent tests were performed with a data subset containing only OVS sentences starting with $das_{ACC}$ and $die_{ACC}$ for each participant group. Due to its ambiguous status, $der_{DAT}$ was excluded from analysis (see Gamper 2016 for details on the processing of *der*). No group showed main effects for N1 case form ($p$ = 0.154 for Russian–German bilinguals, $p$ = 0.371 for Dutch–German bilinguals, $p$ = 0.414 for German monolinguals), N1 animacy ($p$ = 0.458 for Russian–German bilinguals, $p$ = 0.680 for Dutch–German bilinguals, $p$ = 1 for German monolinguals) or an interaction between case marker and animacy ($p$ = 0.106 for Russian–German bilinguals, $p$ = 0.584 for Dutch–German bilinguals, $p$ = 0.9686 for German monolinguals) in OVS sentences with ambiguous N1 case marking. These results show that significant case-animacy interactions are exclusively found for the unambiguous case forms *den* and *dem* and do not apply to OVS sentences starting with $das_{ACC}$ or $die_{ACC}$.

As can be seen in Figure 2, N1 proportions are again surprisingly high in all conditions and in all groups. This generally hints at strong syntactic interpretation strategies in all participant groups. At the same time, the Russian–German bilinguals are less influenced by a syntactic strategy. They select the nominative-marked NP (in this case N2) in 50% of all OVS sentences, whereas the other participants do so in only 30% (Dutch–German) and 35% (monolingual German) of all instances. Still, as N1 proportions never drop below chance, cue strength of case marking is not yet well established.

When it comes to animacy, we see that N1 proportions in the German monolinguals and Dutch–German bilinguals drop in two conditions: whenever the article *den* occurs with an inanimate and *dem* with an animate noun. In both case-animacy coalition conditions N1 proportions drop to 60% or below. Whenever the combination between case form and animacy values is in conflict (i.e., for [*den* + $N_{ANIMATE}$] and [*dem* + $N_{INANIMATE}$]), the participants maintain a syntactic interpretation strategy and choose N1 as the subject of the sentences in 70-80% of all instances. NVN-sentences with case-animacy competition are thus basically interpreted as SVO sentences. Such case- and animacy-related variation never occurs in the Russian–German bilinguals.

Based on these results we can say that case-animacy coalitions do influence sentence interpretation strategies, but only in specific OVS conditions and only in some participant groups. Within the scope of such restrictions, animacy seems to function as a supportive or additional cue for unambiguous case forms. At the same time, animacy becomes relevant only in interaction with specific morphological case forms and never affects sentence interpretation alone. The results also indicate L1-specific differences in the two bilingual participant groups. The Russian–German bilinguals show a higher cue strength for case markers than the Dutch–German bilinguals, and they never turn to animacy to process non-canonical OVS sentences. The results from parts I and II together indicate that only those participants who generally tend toward a stronger N1-bias require the 'help' of animacy cues. Participants who show an emergent morphological strategy never integrate animacy cues into sentence interpretation. We will take a closer look at this conclusion through qualitative data analysis in the following section.

## 6.3 Part III: Individual differences

A number of studies (e.g., Roberts 2012, Tanner et al. 2013) highlight the need to take a closer look at individual behavior in order to assess individual differences. However, since it is difficult to describe each individual's decision-making process separately, it is more useful to look for similarities across participants.

The results presented so far have shown that the most striking differences between the three participant groups were found in OVS conditions with N1 *den* and *dem*. In order to make those differences visible, N1 proportions for each child within each participant group were measured according to the case-animacy conditions discussed in Part II. In this section we examine how often each child opted for N1 as subject in conditions with case-animacy coalition (i.e., [*den* + $N_{INANIMATE}$] and [*dem* + $N_{ANIMATE}$]) or competition (i.e., [*den* + $N_{ANIMATE}$] and [*dem* + $N_{INANIMATE}$]). This classification revealed that within each group, we find stark individual differences in terms of sentence interpretation strategies.

In every participant group, there are children who chose N1 as subject in all instances, thus adopting an exclusively syntactic strategy. At the same time, there are children who hardly ever selected N1 as subject. These children seem to adopt an adult-like sentence interpretation strategy: mean N1 proportions average around 20% in those children. However, such low N1 proportions are exclusively found in the German monolinguals and the Russian–German bilinguals. There is not a single child among the Dutch–German bilinguals who reaches such low N1 proportions in unambiguous OVS conditions. Between these two types (i.e., an exclusive syntactic interpretation strategy as type A vs. a dominant morphological interpretation strategy as type D), we find two further types of participants: those whose N1 proportions range between 60-70% (= type B) and those whose N1 proportions are around chance. The number of participants for each type is summarized in Table 5.

**Table 5:** Individual types of N1 proportions in OVS sentences: group-specific participant distribution

| | Russian-German bilinguals | Dutch-German bilinguals | German monolinguals |
|---|---|---|---|
| **type A**<br>N1 proportions ~100% | n = 2 | n = 3 | n = 3 |
| **type B**<br>N1 proportions 70-90% | n = 3 | n = 5 | n = 7 |
| **type C**<br>N1 proportions 50-70% | n = 4 | n = 4 | n = 7 |
| **type D**<br>N1 proportions <50% | n = 8 | n = 0 | n = 3 |

Since the number of participants within the type-specific subgroups is too small, the following data analysis will only look at descriptive statistics. The results given below should therefore be considered to represent tendencies and regarded as hypothetical.

In order to make the varying strategies that were found within the four types clearer, mean N1 proportions were counted for the four case-animacy conditions. The results are summarized in Figure 3. To make the figure more accessible and comprehensible, type A participants will be excluded since they all show N1 proportions at ceiling across all groups and conditions.

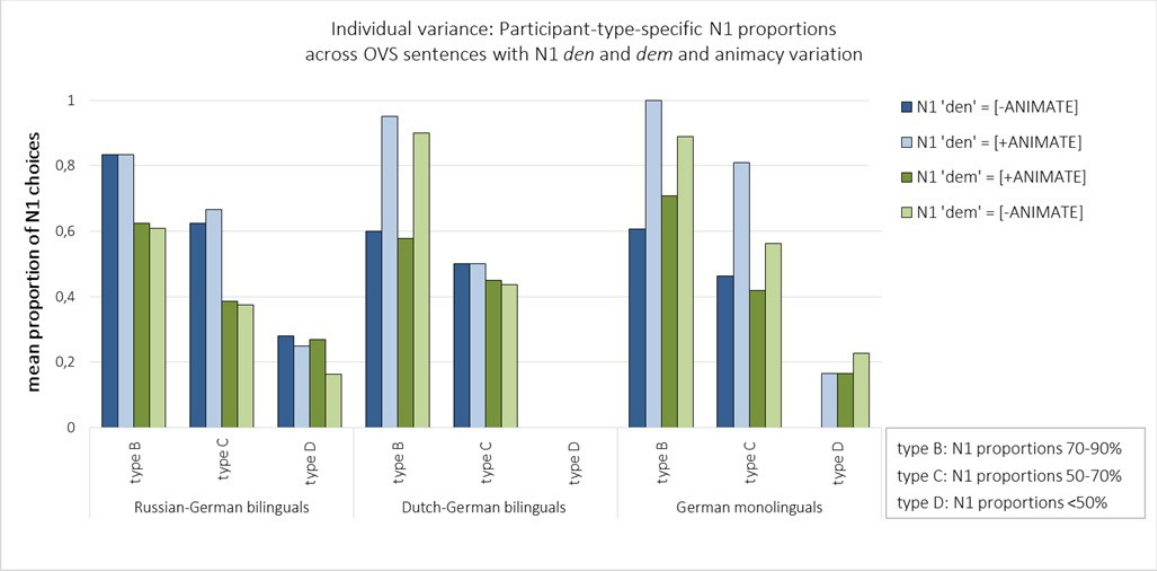


**Figure 3:** Individual variance: Participant-type specific N1 proportions across OVS sentences with N1 *den* and *dem* and animacy variation

As Figure 3 shows, indications for case-animacy effects found in the data in PART II can also be found among specific types of participants among the Dutch–German bilinguals and the German monolinguals. More specifically, type B participants (and to a much lesser extent type C) heavily distinguish between conditions with and without a case-animacy coalition. Whenever coalitions are available (i.e., [*den* + $N_{INANIMATE}$] and [*dem* + $N_{ANIMATE}$]), N1 proportions drop to approximately 60% in this group. They remain at ceiling in conditions without case-animacy coalitions. A further peculiarity is that in type D-participants, case-animacy effects disappear. However, such tendencies can only be observed in Dutch–German bilinguals and German monolinguals. In the Russian–German bilinguals, animacy does not seem to influence sentence interpretation strategies at all. Instead, we can see a constant decrease of N1 proportions

across the three types displayed in Figure 3. For the Russian–German bilinguals, the specific case form of the N1 constituent seems to be of more importance than its co-occurrence with specific animacy values.

The above analyses generally show that there is no single group-specific strategy. Instead, we find varying strategies in the interpretation of unambiguous OVS sentences. These strategies can be represented by classifying the participants into four types with each type representing a unique approach to the interpretation of non-canonical conditions. Those four types range from an exclusively syntactic to a dominantly morphological (and ultimately adult-like) interpretation strategy. In between those two, we find participants who tend to abandon a N1 bias under specific conditions, one of them being sentences with N1 case-animacy coalitions. Along with the results from PART II, type-specific case-animacy effects can again only be found in Dutch–German bilinguals and German monolinguals. Russian–German bilinguals never rely on animacy during sentence interpretation.

# 7 Discussion

The aim of the paper was to determine whether prototypical case-animacy coalitions influence the interpretation of non-canonical sentences in German. Based on the prediction that German-speaking mono- and bilingual children might not yet have reached an adult-like morphological interpretation strategy, the study examined whether animacy functions as a supportive cue when it comes to processing overtly case-marked articles in German. Results from a forced-choice experiment showed four general tendencies: first, despite group-specific differences, all participants struggled with the correct interpretation of OVS sentences. Second, animacy cues alone never impact the interpretation of NVN-constructions. Third, animacy seems to function as a cue only in non-canonical conditions and only in coalition with unambiguous case forms (i.e., $den_{ACC}$ + [-ANIMATE] and $dem_{DAT}$ + [+ANIMATE] nouns). Fourth, such case-animacy effects are both group-specific and limited to specific participant types: only Dutch–German bilinguals and German monolinguals seem to rely on case-animacy coalitions; within the two groups, only participants with a generally stronger syntactic interpretation strategy make use of case-animacy cues. No animacy effects were found in the Russian–German bilinguals.

In general, the fact that all participants struggled with the processing of OVS sentences – especially in conditions with ambiguous object marking – is in line with earlier studies with German-speaking children (Brandt et al. 2016, Cristante 2016, Dittmar et al. 2008, Lidzba et al. 2013, Schaner-Wolles 1989). The results thus confirm the finding that children show a stronger N1-bias than adults. Differences with studies with children are found with regard to age levels: since participants in the study at hand show a strong N1-bias at a mean age of 9;6, the results confirm Lidzba et al.'s (2013) observation that German-speaking children seem to retain an N1-bias until puberty. On the other hand, the results contradict findings by Cristante (2016) and Dittmar et al. (2008) who argue that monolingual children at least start to rely on morphological case cues around the age of 7. One possible explanation for these differences may lie in different methodological approaches. For example, both Cristante (2016) and Dittmar et al. (2008) adopted pointing tasks. Recall that test sentences in the study at hand had to be read. Method-inherent factors like reading abilities and verbal memory might have strengthened the (probably well established) N1-bias. Also, a number of nonsensical test sentences and partly atypical AGENTS, PATIENTS and RECIPIENTS may have influenced all participants' behavior. In addition, studies comparing on-line and off-line performance show that children are capable of processing overt case marking but are unable to integrate this information into a non-canonical sentence interpretation (Adani & Fritzsche 2015, Cristante 2016, Schipke et al. 2012). Off-line results thus generally show poorer performance than on-line measures.

In terms of group-specific differences, the Russian–German bilinguals performed better on the task than the Dutch–German bilinguals and the German monolinguals. The latter two groups showed quite similar overall performance and only differed on an individual level. Such group-specific effects point towards an L1-specific transfer of relative cue strengths that has already been observed in adults (Hopp 2010, Jackson & Dussias 2009, Kempe & MacWhinney 1998, MacWhinney 1998, Sasaki 1994). At the same

time, the fact that no observable differences were found between the Dutch–German bilinguals and German monolinguals contradicts previous findings that report rather strong differences between mono- and bilingual children (Cristante 2016 for Turkish–German and Roesch & Chondrogianni 2015 for French–German children). Since those two studies tested for performance differences in different non-canonical conditions (OVS sentences in Cristante 2016 and *wh*-questions in Roesch & Chondrogianni 2015), results regarding the potential influence of participants' respective L1s are only comparable to Cristante (2016). The Turkish–German bilinguals she tested (mean age = 6;9) interpreted N1 as subject in 70% of all unambiguous OVS conditions. This corresponds to the N1 proportions observed in the Dutch–German bilinguals and German monolinguals. Of all bilingual groups, the Russian–German bilinguals in the study at hand thus perform best and even outperform the German monolinguals.

The fact that the Turkish–German bilinguals in Cristante's study show a poorer performance in a picture-choice task than the Russian–German bilinguals in our study poses a challenge on L1 transfer as a possible explanation for performance differences. Both Turkish and Russian have overt case marking, with Turkish having a 1:1-relation between case form and function (Ketrez & Aksu-Koç 2009) which is a result of agglutinative morphology. In Russian, case markers are highly reliable cues in non-canonical conditions despite their high degree of multifunctionality and dependence on gender and number classes, especially in comparison with German (Kempe & MacWhinney 1998). In comparison with Turkish, case marking in Russian probably has a lower cue reliability, which is why Turkish–German bilinguals should have an advantage in the processing of OVS sentences in German. However, this advantage has not been found. One explanation for this might be the fact that both Russian and German have many:many-relations in their respective case systems, with case forms being dependent on other morphological categories like gender and number. From a typological perspective, there are more similarities between Russian and German than between Turkish and German. It might be easier for Russian–German bilinguals to transfer the reliability of case marking from their L1. Turkish–German bilinguals might struggle longer with disentangling the functions of the varying article forms in German, since they need to build a concept of gender classification first and then link gender to case marking. Turkish–German bilinguals might ultimately need a longer period of time to strengthen case marking cues in German. In Dutch, overt case marking is a rarely available and thus unreliable cue; Dutch–German bilinguals thus need to adjust relative cue strengths between constituent order and case marking cues for German. Despite varying L1-specific cues and respective cue strengths, Turkish–German and Dutch–German bilinguals both ultimately seem to turn to a syntactic interpretation strategy in German before gradually adopting a target-like morphological strategy.

Although the assumption that some of the results can be explained by L1 transfer needs to be examined in further detail by taking into account internal (e.g., developmental stages, L1 competence levels) and external speaker variables (e.g., speakers' socio-economic background, input quantity and quality, methodological approach), the transfer hypothesis is strengthened when looking at the group-specific effects of case-animacy cues. While animacy never affects sentence interpretation in Russian–German participants, it does so in Dutch–German participants and German monolinguals. Russian–German bilinguals thus not only show a stronger morphological interpretation strategy, but also a different approach to animacy cues. This leads to the following hypothesis: the stronger a speaker's reliance on the syntactic strategy (found in the Dutch–German bilinguals and German monolinguals), the more likely it is that participants will integrate animacy into sentence interpretation. By the same token, the stronger a morphological strategy becomes, the less relevant animacy cues are.

In general, the fact that case markers alone do not seem to be strong enough to outcompete constituent order cues supports previous findings. For example, Brandt et al. (2016) found that case marking cues promote a morphological interpretation strategy in specific constructions only. German-speaking children seem to rely more on overt case markers in non-canonical structures when they occur in a mid-sentence position (e.g., VOS) and not sentence-initially (which is the case for OVS sentences). Brandt et al. argue that this effect is due to the frequency distribution of overt case markers in CDS. Case marking and constituent order thus form a cue coalition that helps children interpret non-canonical sentences. The same applies to results from a study by Grühnloh et al. (2011). Here, case-prosody coalitions strengthen case markers or – as Roesch & Chondrogianni (2015) argue – constitute a double

cue condition. In Roesch & Chondrogianni's study, children seem to struggle less with the interpretation of non-canonical *wh*-questions whenever case marking is made available twice (i.e., on the *wh*-element and the noun). All three studies suggest that (at least temporarily) children look for cue coalitions that support a non-canonical sentence interpretation. Animacy, in consequence, might be labeled as a further additional cue forming a double cue condition with case markers. However, the supportive function of animacy is only made use of in unambiguous conditions (i.e., for *den* and *dem*). This form-specific effect was also found by Grühnloh et al. (2011) for case-prosody coalitions and might be due to a general form-based effect. Recall that children seem to process OVS sentences with ambiguous case-marked objects (i.e., $das_{ACC}$ and $die_{ACC}$) as canonical. The morphological interpretation strategy does not seem to be activated in such conditions at all, but is entirely outcompeted by constituent order cues. This is why no interaction effects with other potential cues are found here.

The developmental interpretation suggested above may also explain the individual differences observed in PART III. Those revealed that there are three different strategies that individuals within each group may turn to: these strategies are syntactic, morphological and morpho-semantic. From a cross-sectional perspective, which will be adopted here, these three strategies might represent sequential steps within a longer process of cue strength adjustment. Assuming that speakers focus on constituent order cues first and systematically move to a morphological strategy, the morpho-semantic strategy might be regarded as a gateway to a morphologically based interpretation approach (see Figure 4).

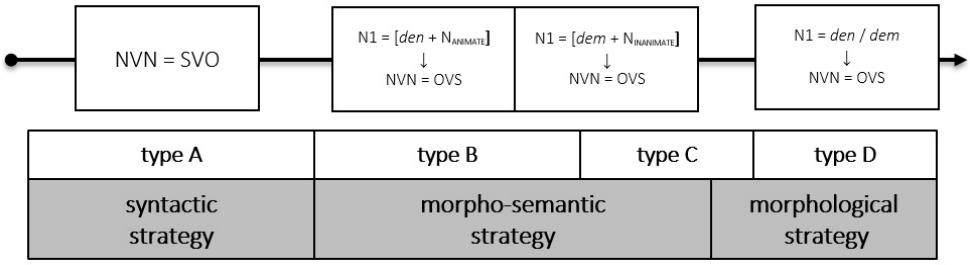


**Figure 4:** Developmental steps during cue strength adjustment processes

As Figure 4 suggests, some of the participants seem to be highly sensitive to the systematic correlation of single case forms and animacy. They differentiate between prototypical PATIENT (*den*) and RECIPIENT markers (*dem*) and map them onto these roles' prototypical animacy features. Note that it is especially this coalition, and not animacy values or case markers on their own, which is decisive for the observed effects. Whenever this coalition is not available, the N1 bias functions as a sort of default strategy. At this point of development, morphological cues are not strong enough to outcompete syntactic cues on their own and require a double cue condition (case and animacy) to outcompete word order cues.

If learners transition from a more syntactic to a more morphological interpretation strategy during development, the three types identified in the above study represent different degrees of cue strength during the adjustment process. Type D participants come closest to an adult-like interpretation strategy, types A, B, and C represent transitional steps towards the developmental goal. The L1-specific effects found above might be viewed in the same light. Russian–German bilinguals already have abstract knowledge about the function of case marking in general. They thus might reach a morphological strategy sooner than learners without any 'morphological background'. This might be the reason why Russian–German bilinguals come closer to adult-like behavior and ultimately tend to ignore animacy as a whole. Dutch–German bilinguals, on the other hand, generally stick to a syntactic interpretation strategy for a long time and only tentatively turn to case markers as the most valid cue type in German. Animacy helps them with this transition.

Although the interpretation of both group-specific and individual differences may account for the results observed, further factors need to be addressed in future research to be able to assess the behavior of both the monolingual and bilingual German-speaking children. Both individual factors like socio-economic

status and corresponding differences in language competence, as well as external factors like input quantity and quality, cue distribution in the bilingual input and task-specific factors might influence individual cue strength levels. In order to make individual differences visible, contrastive methodological approaches and better control for individual prerequisites need to be adopted. The developmental perspective proposed in this paper should also be tested in younger children. It might be the case that case-animacy effects are even more important for younger children than those of primary school age. Also, to be able to link individual differences to input features, we need a thorough account of the input – or, to be more precise, the different inputs – bilingual children are exposed to. Since corpus data are not yet available for bilingual children (at least not for German) and input for bilingual children might be more variable, it is hard to tell which cues are actually available and reliable in the bilinguals' input. Last but not least, it is not quite clear why the Russian–German bilinguals skip the morpho-semantic strategy entirely. Studies with younger children might reveal that animacy cues can also be crucial for this group at a younger age.

# 8 Conclusion

The aim of this study was to show how case-animacy coalitions can influence sentence interpretation and help strengthen a morphological interpretation strategy in German. It was shown that case-animacy coalitions weaken the N1-bias in children who generally rely on a syntactically based interpretation strategy. When case markers occur with atypical animacy values, non-canonical sentences are interpreted as canonical two-participant events (i.e., as SVO sentences). Both L1 and individual differences may influence the cue strength of such morpho-semantic information. To account for individual and group-specific differences, a developmental view on varying sentence interpretation strategies was proposed. Varying cue strength effects were interpreted as an emergent cue system in German-speaking children. Further research is needed to validate this hypothesis.

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# APPENDIX

**Lexical items used for test sentences**

| **accusative-verbs** | | **dative-verbs** | |
|---|---|---|---|
| *fragen* | 'ask' | *danken* | 'thank' |
| *hören* | 'hear' | *fehlen* | 'lack'/'miss' |
| *malen* | 'paint' | *folgen* | 'follow' |
| *sehen* | 'see' | *glauben* | 'believe' |
| *suchen* | 'look for' | *helfen* | 'help' |

| **animate nouns** | | **inanimate nouns** | |
|---|---|---|---|
| *Mann* | 'man$_{\text{MASC}}$' | *Ball* | 'ball$_{\text{MASC}}$' |
| *Bruder* | 'brother$_{\text{MASC}}$' | *Bus* | 'bus$_{\text{MASC}}$' |
| *Schüler* | 'student$_{\text{MASC}}$' | *Bleistift* | 'pencil$_{\text{MASC}}$' |
| *Kind* | 'child$_{\text{NEUT}}$' | *Dorf* | 'village$_{\text{NEUT}}$' |
| *Pferd* | 'horse$_{\text{NEUT}}$' | *Auto* | 'car$_{\text{NEUT}}$' |
| *Mädchen* | 'girl$_{\text{NEUT}}$' | *Fahrrad* | 'bicycle$_{\text{NEUT}}$' |
| *Frau* | 'woman$_{\text{FEM}}$' | *Stadt* | 'town$_{\text{FEM}}$' |
| *Kuh* | 'cow$_{\text{FEM}}$' | *Schule* | 'school$_{\text{FEM}}$' |
| *Schwester* | 'sister$_{\text{FEM}}$' | *Klasse* | 'class$_{\text{FEM}}$' |