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## Semantic-role prominence is contingent on referent prominence in discourse: Experimental evidence from impersonals and passives in Polish

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The present paper reports two acceptability-rating experiments and a supporting corpus study for Polish that tested the acceptability and frequency of five verb classes (WATCH, SEE, HATE, KNOW, EXHIBIT), entailing different sets of agentivity features, in different syntactic constructions: a) the personal passive (e.g. *zachód słońca był oglądany* ‘the sunset was watched’), b) the impersonal *-no/-to* construction (e.g. *oglądano zachód słońca* ‘people/they/one watched the sunset’), and c) the personal active construction (e.g. *niektórzy oglądali zachód słońca* ‘some (people) watched the sunset’). We asked whether acceptability ratings would show identical acceptability clines across constructions affected by agentivity, as predicted from Dowty’s (1991) prototype account of semantic roles with feature accumulation as its central mechanism, or whether clines would vary depending on syntactic construction, as predicted from Himmelmann & Primus’ (2015) prominence account that uses feature weighting to describe role-related effects. In contrasting the applicability of these two accounts, we also investigated whether previous research findings from German replicate in Polish, thereby revealing cross-linguistic stability or variation. Our results show that the five verb classes yield different acceptability clines in all three Polish constructions and that the clines for Polish and German passives show cross-linguistic variation. This pattern cannot be explained by role prototypicality, so that the experiments provide further evidence for the prominence account of role-related effects in sentence interpretation. Moreover, our data suggest that experiencer verbs interact differently with the animacy of the subject referent, yielding different results for perception verbs (SEE), emotion verbs (HATE), and cognition verbs (KNOW).

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## 1 Introduction

The present paper investigates how agentive properties of semantic roles and the type of syntactic construction (passive, impersonal, and active) the roles appear in determine native speakers' judgements about sentence acceptability. We conducted two acceptability-rating experiments and a supporting corpus analysis, focusing on the Polish impersonal *-no/-to* construction and the personal passive. Our research question is as follows: Which theoretical account of semantic role-related effects in sentence interpretation can capture role-related acceptability clines better, the prototypicality account proposed by Dowty (1991) or the prominence account proposed by Himmelmann & Primus (2015)? The prototype account relies on feature accumulation (i.e., the number of features matters) as a mechanism for role selection and predicts that a prototypical role (agent or patient) should be privileged for various argument selection operations vis-à-vis more peripheral roles. The prominence account relies on feature weighting (i.e., the kind of feature matters) as a mechanism for role selection and predicts that depending on the discourse function of a syntactic construction certain roles or role properties are made more accessible or prominent than others for argument selection operations. Consequently, according to the prototype account, we can expect a prototype (e.g. a prototypical agent) to license some operations, whereas for other operations prototypicality might be irrelevant, but the account does not foresee a category (e.g. agent) to have different prototypes at different points in the discourse. By contrast, prominence is dynamic by definition, so that different elements of the same category (e.g. different agentive roles) can be prominent at different points in the discourse.

To vary agentivity we use different classes of sentence verbs (= psych verbs, = experiencer verbs) and volitional perception verbs, examining especially whether subjects assigned the experiencer role are treated as agentive arguments and whether this is modulated by the type of sentence verb under investigation, e.g. cognition, perception, or emotion verbs. This endeavour seems worthwhile in light of the different accounts for the experiencer role in the linguistic literature and given partly diverging cross-linguistic findings on sentence acceptability with different experiencer verbs.

We focus on Polish, a language that exhibits both a variety of passives and (among others) the impersonal *-no/-to* construction, encoding them via verb morphology. This allows us to directly and quantitatively estimate differences between constructions with partly overlapping discourse functions within one and the same language and to compare our results for the Polish passive (in descriptive terms via cross-experimental observation) to results already obtained for the German passive, while keeping the study design constant in both cases.

The paper is structured as follows: In Section 2 we will introduce the feature-based role definition of Dowty (1991), which we use to define the critical verb classes in our study, and motivate its use by briefly discussing its commonalities and differences to other feature-based

definitions. Then, we describe the prototypicality and prominence accounts in more detail and how they differ in their treatment of role features and discourse flexibility. Section 3 gives an overview of passives and impersonals in Polish. Section 4 presents our experimental predictions derived from the research literature. Experiment 1 (Section 5) examines the personal passive vs. active, while Experiment 2 (Section 6) examines the *-no/-to* construction vs. active and is complemented by a corpus study (Section 7). The findings are finally reviewed in the general discussion (Section 8).

## 2 Defining agentivity: Role properties, prototypicality and prominence

### 2.1 Role prototypicality

A common assumption in the literature on the discourse function of passives and impersonals is that in order to be ‘worthy’ of demotion, an agent has to be sufficiently agentive (see Primus 2011b: 299f. with further references). This implies that there is not just one monolithic agent role but, rather, a range of more or less typical agent(ive) roles, which can be ranked according to the degree of agentivity they are associated with. This in turn directly touches on the ongoing debate about the adequate definition of the agent and other semantic roles (see Levin & Rappaport-Hovav 2005). There is a growing body of evidence suggesting that a feature-based definition of the agent and other roles can capture a number of empirical findings more accurately than, for instance, atomic or monolithic role definitions (Rissman & Majid 2019; Kretzschmar et al. 2019; Kretzschmar & Brilmayer 2020). Intriguingly, the evidence in favour of feature-based role definitions has accrued for Dowty’s (1991) prototype model, which, while being largely consistent with other feature-based models (e.g. Rozwadowska 1988) in the way it treats the experiencer vs. agent role, has a key property distinguishing it from other feature-based role definitions, as we will describe next.

Dowty (1991) postulates two generalized proto-roles, Proto-Agent and Proto-Patient, which result from bundles of verb-semantic entailments or role features. He lists five features each for the Proto-Agent and the Proto-Patient role, which may occur in isolation or in combination. For the Proto-Agent role, Dowty (1991: 572) assumes the following agentive features: volition, sentience, causation, movement, and independent existence. Of these, only volition, sentience and movement are relevant in our experiments. According to Dowty (1991: 552, 607), a volitional agent is sentient and acts volitionally and intentionally. A moving agent moves autonomously, whereas non-autonomous/caused movement is a Proto-Patient feature (ibid. 574). Dowty assumes a broad definition of movement so that volitional perception verbs entail mental activity (e.g. *look at*; ibid. 554). Sentience includes perception (e.g. *see*), cognition (e.g. *know*), and emotion (e.g. *fear*) predicates (ibid. 573), so a sentient agent is capable of perception, mental representation or emotional evaluation of a situation.

Dowty's prototype model shares some assumptions with other feature-based accounts of semantic roles with respect to the status of the sentience feature. First, sentience is an agentive feature that is not only used to indicate argument selection restrictions pertaining to animacy, but its presence particularly defines the experiencer role (Rozwadowska 1988; Reinhart 2002). Second, subject experiencers lack the agentive feature of causation (e.g. Rozwadowska 1988; Schlesinger 1992; Reinhart 2002), which, in contrast to sentience, is not restricted to animate referents. Similarly to other accounts, Dowty assumes that causation is a critical feature in determining argument selection for subjecthood or objecthood. For instance, an argument assigned causation will always be encoded as a syntactic subject – and hence be interpreted as more agentive – vis-à-vis an argument with only the movement feature, which will be selected as direct object (Dowty 1991: 574). Sentience, by contrast, does not take priority over other features in distinguishing agentive from non-agentive roles, neither in Dowty's prototype model nor in other feature-based accounts.

However, there is one major difference that sets Dowty's model apart from other feature-based accounts without a specified mechanism for feature interaction (e.g. Cruse 1973; Rozwadowska 1988; 1989; Schlesinger 1992; Reinhart 2002): feature accumulation as the key mechanism to determine role prototypicality. Dowty specifically assumes that feature accumulation distinguishes subtypes of agentive or patientive roles as it helps to rank them according to their proximity to the role prototype. In the case of the Proto-Agent role, this means that the "agent prototype accumulates the highest number of agentive features, and an argument with a higher number of agentive features will be closer to the prototype (i.e. more agentive) and preferably selected as the subject of the verb (Dowty 1991: 576)" (Kretzschmar & Brilmayer 2020: 3). As a consequence, the role assigned to the subject of sentience verbs qualifies as an agentive role, albeit a less typical one, because sentience is the only agentive feature. Action verbs assigning volition, sentience and movement to their subject therefore entail a prototypical agent role (Primus 2012).

A critical consequence of Dowty's feature accumulation mechanism is that it introduces a bias towards the role prototype regardless of the argument selection procedure (e.g. subject selection, agent demotion).<sup>1</sup> For agent demotion, for instance, this bias means that the most agentive role will always be more worthy of demotion, whatever construction it appears in. This is because feature accumulation is exclusively tied to verb semantics. For example, a verb entailing none of Dowty's (1991) agentivity features for its subject (e.g. *glitter* or *stink*) already encodes in its

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<sup>1</sup> The same holds for Ackerman & Moore (2001), who extend Dowty's framework to include semantically induced argument alternations that do not affect an argument's selection as subject vs. object but the realization of either function (e.g. direct vs. indirect object). Ackerman & Moore's extension also exemplifies successfully that Dowty's framework is not limited to argument selection but can be used to describe variation in semantic role typicality, i.e. the extent to which an argument's properties fit the assigned proto-role.

verb semantics that there is no salient agent in the situation, so that there is no need to use a grammatical transformation like passivization or impersonalization to express this. Consequently, feature accumulation and the resultant prototype bias are invariant across constructions. In line with this, findings from several languages show that prototypical but not peripheral agents are the preferred target of agent-demoting constructions: Impersonal passives in German, Dutch, and Icelandic (Primus 2011a), Polish and Serbo-Croatian reflexive impersonals (Bunčić 2018), and the *-no/-to* construction in Polish (Bunčić 2018; 2019) are better with highly agentive verbs than with less agentive or non-agentive ones.

In sum, there is converging evidence for the empirical adequacy of Dowty's (1991) role features (Rissman & Majid 2019) and the existence of subtypes of the agent role, signalling varying degrees of agentivity (Kretzschmar & Brilmayer 2020). However, feature accumulation as a mechanism for feature interaction has only rarely been studied directly (Kretzschmar et al. 2019; Kretzschmar & Brilmayer 2020). This is an important research gap – which the current study aims to address – as there is evidence that an alternative mechanism, feature weighting, may also yield agentivity effects in sentence interpretation. For instance, it has been claimed that causation is the most important feature for subject selection in the English active voice (Koenig & Davis 2001), whereas in German volition is sufficient for selecting nominative-marked subjects in the active voice (Primus 2012). Thus, it is not the number of features (as by feature accumulation), but rather the kind of feature(s) (as by feature weighting) that counts for subject selection in these two languages. Feature weighting is a viable alternative to feature accumulation but inevitably poses conceptual problems for explaining the source of the weighting and its range of applicability. For example, if feature weighting for active voice differs from that of passive voice, what is the functional motivation of this variation? Also, at what level can such variation manifest itself, i.e. is it tied to voice alternations, syntactic constructions or referential relations in discourse? Following the previous proposal of Kretzschmar et al. (2019), we assume that the concept of linguistic prominence as defined by Himmelmann & Primus (2015) may establish a systematic framework to address these issues.

## 2.2 Role prominence

Linguistic prominence contributes to the form-to-meaning mapping in language and, accordingly, its correlates have been reported for linguistic domains such as phonetics/phonology, morphosyntax and discourse semantics. Despite the ubiquity of the cross-linguistically attested prominence effects, many attempts to account for them limit their descriptive or explanatory scope in one or another way: (i) they work with minimal, i.e. one-dimensional, definitions such as that a prominent unit “stands out from its [immediate] environment” (Cangemi & Baumann 2020: 1; similarly Matthews 1997), (ii) they focus on individual linguistic domains (e.g. Aissen 1999; 2003 and Lockwood & Macaulay 2012 for the syntax-semantics interface, Vogel 2015 for

morphosyntax, von Stechow & Schumacher 2019 and Haude 2019 for discourse semantics and its interfaces, Kaiser 2020 and Latrouite 2014 for event structure), or (iii) they concentrate on specific subdisciplines (e.g. Aissen 1999; 2003 for linguistic theory, Bornkessel-Schlesewsky & Schlewsky 2009 for psycho- and neurolinguistics, Cangemi & Baumann 2020 for experimental phonology).

The prominence account by Himmelmann & Primus (2015) is, to the best of our knowledge, the only one that proposes a multi-dimensional definition of prominence *and* strives toward an integrative framework of prominence across linguistic domains, thus establishing prominence as an organizing linguistic principle alongside other principles such as markedness or head-dependent asymmetry. Himmelmann & Primus (2015) set up three criteria to define prominence relations among linguistic units ranging from phonology to the discourse domain. First, units of the same type are structured such that some units ‘stand out’ (are prominent) in relation to others (ibid. 41). Hence, prominence is a relational property among competitors of equal type. Second, a prominent unit serves as a “structural attractor” (ibid. 44), i.e. it licenses, or serves as an anchor for, more operations (e.g. phonological, morphosyntactic) than other units. Third, the unit that stands out may shift as discourse unfolds, so that what is prominent at time  $t_1$  in the discourse may not be prominent at time  $t_2$ . Himmelmann & Primus (2015) discuss semantic-role prominence as one example of these criteria. Semantic roles or role features constitute a set of equals, of which one is selected as the most prominent one. By default, the (proto-)agent is the most prominent role (ibid. 48) and anchors the semantic and syntactic interpretation of sentences (e.g. volitional agents license action events, agents preferentially precede other arguments in linear word order; ibid. 50–52). Contextual constraints may require a shift so that another role becomes prominent, for which passivization is a typical means (ibid. 49). It is well established that passives serve to adapt sentence structure to the ongoing discourse (e.g. Bresnan et al. 2001, see also Gehrke & Grillo 2009 and Section 3 below), thereby structuring the prominence of referents or events in discourse.

Himmelmann & Primus (2015: 50) assume that, at least for semantic roles, prominence is independent of prototypicality, but the most prominent role in a sentence can in principle coincide with the role prototype as defined by Dowty (1991). Since Dowty assumes that role prototypicality hinges on the number of proto-role entailments or features, the prototypical role will always win over a peripheral role wherever semantic roles compete. Hence, it is the third prominence criterion that sets prominence apart from prototypicality. It predicts that role-related effects in sentence interpretation vary both as a function of syntactic construction – because different constructions serve different discourse functions – and, as recently suggested in an elaboration of the prominence criteria (Kretzschmar et al. 2019: 104), of the language under study, because languages differ in their form-to-meaning mappings.

To sum up, from the perspective of the prominence model and its mechanism of feature weighting, role features are flexibly selected as being prominent depending on the construction and language under study. As with Dowty's feature accumulation, this mechanism may apply to any kind of linguistic operation, such as subject selection or role demotion/promotion. Worthiness of an agent role for demotion, for instance, results from the interplay of role features (provided by the verb) and discourse requirements (provided by the construction in which the verb occurs). Importantly, this contrasts with role prototypicality and its mechanism of feature accumulation in that feature weighting can select both prototypical and peripheral agentive roles for role-dependent operations. The mechanism is therefore more flexible than feature accumulation, which necessarily selects the most prototypical role.

### 2.3 Cross-linguistic comparison

Kretzschmar et al. (2019) have conducted a test for or against role prominence (vs. prototypicality) by comparing the same verb classes in constructions with different discourse functions. They report initial evidence from German that role-related acceptability clines for the same set of verb classes differ as a function of syntactic construction. They compared verbs from five verb classes (see (1) below) in the personal passive, *do*-clefts (*what Bill did was roll the ball*, a subtype of *wh*-clefts), and active voice, by asking German native speakers to judge sentences for acceptability.

- (1) Overview of verb classes in Kretzschmar et al. (2019) and role features of the subject argument according to Dowty (1991)
- |   |            |             |            |
|---|------------|-------------|------------|
| 1. WATCH class (volitional perception verbs):   | [volition] | [sentience] | [movement] |
| 2. SEE class (non-volitional perception verbs): |            | [sentience] |            |
| 3. HATE class (emotion verbs):                  |            | [sentience] |            |
| 4. KNOW class (cognition verbs):                |            | [sentience] |            |
| 5. EXHIBIT class (ascription verbs):            |            |             | ∅          |

As can be seen in (1), the five verb classes assign different agentive features to their subject argument. The volitional perception verbs (WATCH) assign a prototypical agent role to their subjects (Primus 2012), whereas non-volitional perception, emotion, and cognition verbs (SEE, HATE, KNOW) only assign sentience as a role feature and therefore classify as subject-experiencer verbs. Ascription verbs (EXHIBIT) do not assign any of the three relevant role features. Intriguingly, Kretzschmar et al. (2019) found clines unique for each of the three tested constructions. For the personal passive, they report that agentivity features do not seem to be relevant in this construction at all, whereas affectedness as a patient feature plays an important role in acceptability clines for personal passives in German (WATCH = SEE = HATE > KNOW > EXHIBIT, *ibid.* 115). This may indicate that there is competition between agentivity effects and patientivity effects in personal passives, given that their main function is the promotion

of the patient (Keenan & Dryer 2007: 325). This clearly contrasts with impersonal passives of intransitive verbs, which lack a patient-promoting function and only serve to demote the agent. As described above, impersonal passives in German and other languages (e.g. Primus 2011a) provide evidence for feature accumulation and, hence, role prototypicality. This shows that individual role features that have an effect in one construction may not have any effect in another construction. Consequently, a prototype model with feature accumulation appears insufficient to explain these effects, whereas the prominence account can capture construction-dependent variation by dynamically tying construction use to discourse function.

It is important to note that the existing evidence for or against role prototypicality and role prominence stems from different languages and different study designs, and so may limit the validity of conclusions regarding the adequacy of the prototype and prominence accounts. What is missing currently is a systematic investigation using the same study design within or across languages in order to investigate the applicability of the prototypicality vs. prominence accounts to role-related effects in sentence interpretation.

This research gap was the motivation to adopt the general study design by Kretzschmar et al. (2019) but apply it to Polish, testing three constructions: the personal passive (without an agent phrase, e.g. *zachód słońca był oglądany* ‘the sunset was watched’), the impersonal *-no/-to* construction (e.g. *oglądano zachód słońca* ‘people/they/one watched the sunset’), and personal active sentences (e.g. *niektórzy oglądali zachód słońca* ‘some (people) watched the sunset’). Choosing Polish as the language under investigation is motivated by the fact that it allows for both a within-language comparison of role-related effects across syntactic constructions with similar discourse functions and for a between-language comparison of prominence effects in passives in Polish and German (i.e., a partial replication). Regarding the within-language comparison, previous results on prominence effects in German are based on two fairly different constructions (personal passives and *do*-clefts), which supposedly induce larger effects as they target different referent types (events and argument roles). However, since personal passive and impersonal *-no/-to* construction in Polish have similar, though not identical, discourse functions (see Section 3), the current study may be able to reveal whether role-related prominence effects can also be detected if the (discourse-functional) difference between constructions is more subtle.

### 3 Polish passive and impersonal

For our experiments we selected personal passives as in the study on German (Kretzschmar et al. 2019) to keep partial comparison, but we compare them with an impersonal construction with a partly overlapping discourse function. The common function of passives<sup>2</sup> and impersonals

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<sup>2</sup> By distinguishing passives from impersonals we use the term *passive* in the narrower sense (as, e.g., Malchukov & Ogawa 2011), not in the wider sense (as, e.g., Siewierska 1988), which would include impersonals.



is the demotion of the agent, i.e. making the agent less accessible or less prominent. Both passives without an agent phrase (“basic passives” in Keenan & Dryer’s (2007) terminology) and impersonals exhibit reduced reference to the agent. What distinguishes passives from impersonals is the fact that passives *also* promote the patient (or some other non-agent, Siewierska 1988: 243), which is why by using an agent phrase a passive can be turned into a patient-promoting construction without the reduction of agent reference. In this case the agent is demoted only syntactically, by being turned from a subject into an oblique phrase, but not semantically. In impersonals, an agent phrase makes no sense and is therefore usually ungrammatical (Keenan & Dryer 2007: 348, Malchukov & Ogawa 2011: 37), because it would counteract the only discourse function impersonals have.<sup>3</sup> Thus, the comparison of prominence effects induced by passives and impersonals relies on highly similar discourse functions involving the same kind of referents (verbal arguments), with only the number and kind of semantic role (agent or patient) of the referent differing.

In contrast to most other Slavic languages (Siewierska 1988: 247), the Polish passive is formed using a passive participle in both the perfective and the imperfective aspect. In fact, there are three different forms of the personal direct passive in Polish: a perfective actional passive formed with the auxiliary *zostać* ‘become’ as in (2) a perfective stative passive formed with the auxiliary *być* ‘be’ as in (3), and an imperfective actional passive, also formed with the auxiliary *być* ‘be’ but from the imperfective verb stem, as in (4).

(2) *Podłoga została zabrudzona (przez dzieci).*  
 floor became soil.PFV.PASS.PTCP by children  
 ‘The floor got soiled (by the children).’ (Laskowski 1999: 196)

(3) *Podłoga była zabrudzona (\*przez dzieci).*  
 floor was soil.PFV.PASS.PTCP by children  
 ‘The floor was dirty (\*by the children).’ (ibid.)

(4) *Podłoga była brudzona (przez dzieci).*  
 floor was soil.IPFV.PASS.PTCP by children  
 ‘The floor was (repeatedly) soiled / was being soiled (by the children).’ (ibid.)

The same constructions can also be formed with the iterative forms of the auxiliaries (*bywać* ‘be repeatedly’ and *zostawać* ‘become repeatedly’; Laskowski 1999: 195). Furthermore, there is a reflexive passive as in (5), an impersonal passive (i.e. a passive without an overt subject, although this is lexically restricted) as in (6), and a recipient passive (indirect passive, experiencer passive) formed with the auxiliary *mieć* ‘have’ as in (7) (although this is marked as colloquial).

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<sup>3</sup> The so-called impersonal passives, though formally resembling a passive, are thus functionally closer to impersonals than to personal passives because they do not promote a patient.

- (5) *Szkoła buduje się.*  
 school.NOM.SG build.IPFV.PRS.3SG REFL  
 ‘The school is being built.’ (Laskowski 1999: 195)
- (6) *W pokoju było ładnie posprzątane (przez Piotra).*  
 in room be.PST.3SG nicely tidy\_up.PFV.PASS.PTCP.NOM.SG.N by Piotr  
 ‘It was nicely tidied up (by Piotr) in the room.’ (Kibort 2011: 358)
- (7) *Od lat mam obiecywaną podwyżkę.*  
 for years have.1SG promise.IPFV.PASS.PTCP.ACC.SG.F pay\_raise.ACC.SG.F  
 ‘For years I have been promised a pay raise.’ (Bunčić 2015: 420)

Apart from that, Polish has three impersonal constructions that can be classified as *arbs* (“constructions with arbitrary interpretations”, Malamud 2013: 1) and that belong to the active voice in the sense that the patient can be realized in the accusative case: a reflexive impersonal (similar to the *se/si* constructions in the Romance languages) as in (8), a third person plural impersonal (similar to English *they say*), which is marked as colloquial, as in (9), and the so-called *-no/-to* construction as in (10), which is formed by attaching *-no* or *-to* to the verb stem.

- (8) *Buduje się tutaj szkołę.*  
 build.3SG REFL here school.ACC  
 ‘They are building a school here.’ (Krzek 2011: 68)
- (9) *Znowu podnieśli cenę paliwa.*  
 again raise.PST.3PL price.ACC fuel.GEN  
 ‘They raised the fuel price again.’ (Kibort 2004: 294)
- (10) *Kupowano tutaj dużo chleba.*  
 buy.PST.IMPRS here much.ACC bread.GEN  
 ‘One/They/People bought a lot of bread here.’ (Krzek 2017: 310)

The *-no/-to* form is etymologically derived from the nominative/accusative singular neuter form of the passive participle, but synchronically it is not homonymous with any form of this participle (since the nominative/accusative singular neuter of the participle nowadays ends in *-n-e/-t-e*). Formed without any auxiliary, so that the former participle synchronically has to be regarded as a full-fledged finite verb form, this construction is always preterite, i.e. it cannot express present or future tense; however, the conditional can be formed by adding the conditional particle *by*, as in (11).

- (11) *Nie używano by dzisiaj papieru, gdyby nie był lepszy od pergaminu.*  
 not use.IMPRS COND today paper if.COND not was better than parchment  
 ‘One would not use paper today if it were not better than parchment.’ (Ruda 2014: 211)

The present paper will examine the imperfective passive as in (4) and the *-no/-to* construction as in (10), assuming that the former serves to promote the patient and demote the agent, while the latter only serves to demote the agent in discourse. Bunčić (2019) has shown that with intransitive verbs the *-no/-to* construction shows an effect of agentivity such that verbs with a prototypical agent are more acceptable in this construction than verbs with an atypical agent. Hence, worthiness of the agent role appears to be a constraint on the occurrence of intransitive verbs in the *-no/-to* construction.

## 4 Predictions

In this section, we will derive specific predictions from the preceding sections. Recall that the goal of the present paper is twofold: (i) examining agentive features in different syntactic constructions in Polish (personal passive, personal active and impersonal *-no/-to* construction) and comparing them to data from German; and (ii) elucidating the status of experiencer subjects in relation to more or less agentive subjects, including different types of experiencer verbs that may favour human vs. animate referents to different degrees. Therefore, we adopted an experimental design originally used for a similar investigation in German (Kretzschmar et al. 2019) and tested sentences including verbs from the five verb classes given in (1) above: volitional perception verbs (class 1: WATCH), non-volitional sentence verbs of three different types (class 2–4: SEE, HATE, KNOW) and ascription verbs (class 5: EXHIBIT).

### 4.1 Experiencer verbs and sentience

As briefly outlined above, we use several verb classes assigning the sentience feature to their subject in order to vary agentivity. This allows us to further explore Dowty's sentience feature, investigating especially whether sentience as an agentivity feature has to be decomposed into several features, e.g. cognition, perception, and emotion. It is well established that there are different subgroups of sentience verbs, but the question whether they show variable behaviour in experimental studies has been addressed less often. There are at least two further reasons why a closer look at sentience verbs seems worthwhile. First, sentience is not a typical agentive feature. Feature-based accounts other than Dowty's (1991) do not typically consider it as a role feature (Cruse 1973; Schlesinger 1992). Even Dowty (1991: 573) himself is unsure whether sentience should be classified together with perception or not, pointing to possible differences between subgroups of sentience verbs. Second, sentience verbs can be assumed to exhibit different (cross-linguistic) preferences as regards animacy properties of the referent being assigned sentience. For instance, perception predicates (e.g. *see, hear, feel*) are equally compatible with animate and human referents, whereas cognition predicates (e.g. *know, believe, suspect*) prefer human referents over non-human animate ones. Whether such variability needs to be accounted for in a particular language is not yet well studied experimentally.

Traditional approaches have tried to describe the fact that some constructions are not equally acceptable with all verbs on the basis of a dichotomous distinction between grammatical and ungrammatical sentences. For instance, Cetnarowska (2000: 38) claims that perfective unaccusative verbs “are infelicitous (or marginally possible) in *-no/-to* sentences”.<sup>4</sup> Rozwadowska (1989: 124; 1992: 77) states that “[o]nly [+sentient] arguments can be impersonalized”. For the five verb classes in (1) this would predict that classes 1–4 (WATCH, SEE, HATE, KNOW) are all equally acceptable, whereas class 5 (EXHIBIT) is completely unacceptable. This prediction can be represented as in (12) (with ‘>’ indicating significantly higher acceptability ratings for the verb class(es) to the left compared to the class(es) to the right and ‘=’ indicating statistically non-significant differences).

(12) Grammaticality prediction for impersonal constructions

WATCH = SEE = HATE = KNOW > EXHIBIT

Moreover, our choice of verb classes serves to provide further experimental data on different types of sentience verbs (perception, emotion and cognition verbs) within and across languages. For instance, Bunčić (2018; 2019) reports for Polish sentience verbs that they behaved differently in his experiments and corpus studies: The verbs of the type ‘fear’, ‘doubt’, ‘suffer’, etc., with no agentivity features except sentience, turned out to be at least as acceptable or even more acceptable than verbs like ‘sneeze’, ‘shiver’, ‘cough’, etc., which are supposed to entail both sentience and movement. This might be due to the special role cognition and emotions play for *homo sapiens*. However, Kretzschmar et al. (2019: 114–117) found that in the German personal passive emotion and perception verbs were equally acceptable (see also (14) below), while cognition verbs were rated worse. Hence, perception and emotion seemed to be ‘better’ variants of sentience than cognition for German passives. With the current study, we additionally test whether this difference is due to the different constructions being tested in prior studies or whether it is a true cross-linguistic difference between Polish and German.

## 4.2 Prototypicality vs. construction-specific prominence effects

According to Dowty’s (1991) feature accumulation, the five verb classes in (1) can be grouped depending on the degree of agentivity associated with their respective subject referent: Class 1 (WATCH), assigning three agentivity features, should always be associated with a more prototypical agent than the other four classes. The sentience verbs of classes 2–4 (SEE, HATE, KNOW), assigning one feature, should be more agentive than class 5 (EXHIBIT) with none of the

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<sup>4</sup> While the “marginally possible” cases seem to point towards a cline as described in 2.2 rather than to a matter of grammaticality vs. ungrammaticality, we will not discuss Cetnarowska’s hypothesis here in more detail because the tests we conducted were restricted to the imperfective aspect (see 3.1.2), for which the unergative/unaccusative distinction does not seem to have an effect on the *-no/-to* construction.

tested agentivity features. Assuming that acceptability is proportional to the number of role features present in the situation denoted by the verb, Dowty's mechanism of feature accumulation predicts the following acceptability cline:

(13) Prototype prediction

WATCH > SEE = HATE = KNOW > EXHIBIT

Only the number of features is crucial; the different features are all rated equally. Importantly, the cline should be independent of the construction, i.e. in any construction we should find either this cline or no cline at all. If a construction is influenced by agent prototypicality, sentence verbs should be rated worse than verbs selecting prototypical agents, but they should still be rated better than verbs that assign none of Dowty's features to their subject. This implies that the experiencer role would empirically qualify as agentive.

By contrast, a prominence account in the spirit of Himmelmann & Primus (2015) predicts that the constructions we examine are subject to flexible role prominence, not to fixed prototypicality. We assume that the reasons underlying the tested alternations in argument structure are rooted in discourse semantics, not (or only secondarily) in verb semantics. That is, role features are assigned by the verb lexeme independently of the construction, but the construction modulates the discourse prominence status of referents. For example, the personal passive is used to invert the discourse prominence relation agent > patient, which is the default in an active construction, to patient > agent, i.e. to promote the patient and/or demote the agent. Thus, while the type of features assigned to the agent or patient remains the same in each voice alternation, their importance (or feature weighting) for discourse needs varies.

If patient promotion is the primary function of the personal passive of transitive verbs (see Section 3 above), we should rather expect effects of the patient than of the agent; and the effects to be expected are those that agree with the increased discourse prominence of the patient. The personal passive in Polish should show an effect of affectedness if it behaves like the personal passive in German beyond similar verb restrictions for passivization (Bondaruk & Rozwadowska 2018). Following the patient effect recently reported for German personal passives (Kretzschmar et al. 2019), this predicts the construction-specific acceptability cline in (14):

(14) Prominence prediction for the personal passive

WATCH = SEE = HATE > KNOW > EXHIBIT

As argued in Kretzschmar et al. (2019), volition as an agentive feature is irrelevant for determining the acceptability of personal passives, whereas a verb's liability to adopt an inchoative reading – and, hence, patient affectedness – is critical for acceptability. By looking at personal passives in Polish, we can additionally test (i) whether Polish shows an effect of agentivity (contrary

to German), since the secondary function of the passive is the demotion of the agent, and (ii) whether lexical aspect modulates feature weighting cross-linguistically.

The impersonal *-no/-to* construction, which demotes the agent but does not promote the patient, should only show an agentivity effect that should be driven by the number of agentive features, as has been found for intransitive verbs (Bunčić 2019). This predicts the following acceptability cline:

- (15) Prominence prediction for the *-no/-to* construction  
 WATCH > SEE = HATE = KNOW > EXHIBIT

Although in this case we test the construction with transitive verbs and overt direct objects, we do not expect any effect of affectedness because the construction does not change the expression of the patient.

Finally, the personal active sentences should not show any effect of agentivity or patientivity, as they are the unmarked default structure in discourse. The Polish personal active, which is termed “the unmarked (or neutral) diathesis” (“diateza nienacechowana (lub neutralna)”) by Laskowski (1999: 189) as the construction representing the “natural hierarchization of predicate arguments” (“naturalna hierarchizacja argumentów predykatu”, *ibid.*), is not constrained by any specific discourse factors (for corresponding evidence from German see Lenerz 1977 and Höhle 1982). This predicts the following acceptability cline:

- (16) Prominence prediction for the unmarked active voice  
 WATCH = SEE = HATE = KNOW = EXHIBIT

To sum up, role prototypicality as determined by feature accumulation predicts the same cline in all constructions or none at all, whereas construction-specific role prominence predicts a specific cline for each construction. The pattern of results therefore has implications for the embedding of prototypicality and prominence in a theoretical framework covering organizing linguistic principles.

## 5 Experiment 1: The Polish passive

In the first experiment, we tested to what extent role prominence differs for personal passives and active clauses in Polish.

### 5.1 Methods

#### 5.1.1 Participants

Ninety-two participants with Polish as their native language who responded to our online questionnaire (see Section 5.1.3) were included in the final dataset (68 female, 24 male; mean

age: 31 years, range: 19–67 years; 53 with university education, 30 university students, 9 others). We excluded 10 additional participants whose native language was not Polish. All participants gave written informed consent prior to participating and were free to end the survey at any time.

### 5.1.2 Material

In order to eliminate the limitation in the existing evidence for construction-specific clines, namely the lack of comparability due to different test designs, one rationale in designing the experimental stimuli was to keep the materials as close to the German original as possible in order to facilitate a comparison with the German findings reported in Kretzschmar et al. (2019). Therefore, we chose to first translate the German stimuli into Polish and then make only the changes necessary for keeping the items grammatical in Polish.

Because the verb class factor is crucial to the present investigation, we took special care in verb selection. Polish verbs had to meet three requirements in order to be included: (i) they select an accusative object; (ii) they allow for the imperfective aspect form; and (iii) they are lexically different verbs in Polish. Transitive verbs were restricted to those selecting accusative case marking of the direct object, because this correlates with a prototypical object role.

The imperfective aspect (rather than the perfective aspect) was chosen because it could be formed from all selected verbs, whereas some of the verbs do not have a perfective aspect. This is because, in Polish, some verbs have a semantic restriction such that they only occur with one aspect, either imperfective (*imperfectiva tantum*) or perfective (*perfectiva tantum*). Verbs that can only be used with the imperfective aspect have a static, indefinite meaning, and this actional meaning is incompatible with the function of the perfective aspect of expressing a state of affairs holistically. Hence, such verbs lack an aspectual partner for systematic semantic reasons, and form a monoaspectual (aspectually defective) verb lexeme (Breu 2009: 213).

Three out of four verbs (*kochać* ‘love’, *lubić* ‘like’ and *bać się* ‘fear’) in the HATE class show this semantic limitation and thus are classified as *imperfectiva tantum*.<sup>5</sup> Their specific semantic behaviour led us to use the imperfective aspect throughout all test items. As a consequence of

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<sup>5</sup> For *kochać* and *lubić*, there are verbs that look like aspectual partners, *pokochać* and *polubić*. However, these verbs represent the inchoative *aktionsart*, meaning ‘start to love’ and ‘start to like’, respectively. Consequently, their lexical meaning is synonymous neither with the verbs used in the German study (which makes them unsuitable for our purpose) nor with *kochać* and *lubić*. The important point is that the imperfective verbs cannot be used to replace perfective *pokochać* or *polubić* in contexts where the perfective aspect is impossible (e.g. when a narration is described in a plot summary in the present tense), so that according to Maslov’s ([1948] 1984) criterium they are no aspectual partners for them, and *kochać* and *lubić* have to be classified as *imperfectiva tantum*. Note that this is different for verbs like *usłyszeć* ‘(start to) hear’ or *zobaczyć* ‘see, catch sight of’, which do function as aspectual partners for *słyszeć* ‘hear’ and *widzieć* ‘see’, respectively, because these verbs can replace each other and thus pass Maslov’s test for aspectual pairs.

this verb-lexeme restriction, we had to use the imperfective actional passive as in (4) above (see also **Table 2** below). We will return to this point and its consequence for possible patientivity effects in Section 8. Keeping aspect constant reduces the complexity of our experimental design (see Section 5.1.2 below) but still allows for follow-up studies to systematically compare our results with those for other passive and impersonal constructions (e.g. the ones in (2)–(3) and (5)–(9)) as well as with the perfective aspect).

Finally, to meet the third requirement above, we had to reduce the number of verbs per verb class from six in Kretzschmar et al.’s (2019) test materials to four in the current experiment. The verbs chosen correspond to the verbs in the German study, with one exception: As there were too few lexically different verbs in the EXHIBIT class, we additionally included *posiadać* ‘possess’ as a new class member.<sup>6</sup> **Table 1** lists the verb lexemes per verb class as used in this and the second experiment (reported in Section 6).

<b>WATCH</b> [volition, sentience, movement]	<b>SEE</b> [sentience]	<b>HATE</b> [sentience]	<b>KNOW</b> [sentience]	<b>EXHIBIT</b> [∅]
<i>oglądać</i> ‘watch’	<i>słyszeć</i> ‘hear’	<i>bać się</i> ‘fear’	<i>przewidywać</i> ‘predict’	<i>sprawować</i> ‘hold’
<i>obserwować</i> ‘observe’	<i>wąchać</i> ‘smell’	<i>nienawidzić</i> ‘hate’	<i>wierzyć</i> ‘believe’	<i>zajmować</i> ‘occupy’
<i>obwąchiwać</i> ‘sniff at’	<i>widzieć</i> ‘see’	<i>kochać</i> ‘love’	<i>znać</i> ‘know’	<i>posiadać</i> ‘possess’
<i>dotykać</i> ‘touch’	<i>zauważać</i> ‘notice’	<i>lubić</i> ‘like’	<i>przypuszczać</i> ‘suppose’	<i>mieć</i> ‘have’

**Table 1:** Verb lexemes used per verb class.

Furthermore, in order to ensure that the effects seen in our data are not merely an artefact of the lexical frequencies of the verbs, we established the frequency of each verb lexeme in the balanced 300-million-token subcorpus of the Polish National Corpus (*Narodowy korpus języka polskiego* (NKJP), <http://nkjp.pl/>):

1. **WATCH class:** *oglądać* ‘watch’ 32,323; *obserwować* ‘observe’ 20,192;  
*dotykać* ‘touch’ 7,577; *obwąchiwać* ‘sniff at’ 234 ∅ 15,082
2. **SEE class:** *widzieć* ‘see’ 136,051; *słyszeć* ‘hear’ 41,563;  
*zauważać* ‘notice’ 8,365; *wąchać* ‘smell’ 839 ∅ 46,705

<sup>6</sup> Three out of the six EXHIBIT verbs that were used in the German experiment (*dabeihaben* ‘have sth. with one’, *aufweisen* ‘exhibit’ and *dahaben* ‘have sth. here/there’) all translate into *mieć* ‘have’.



- |   |           |
|---|-----------|
| 3. <b>HATE class:</b> <i>lubić</i> ‘like’ 42,895; <i>kochać</i> ‘love’ 35,965;<br><i>bać się</i> ‘fear’ 17,786; <i>nienawidzić</i> ‘hate’ 4,258                 | ∅ 25,226  |
| 4. <b>KNOW class:</b> <i>znać</i> ‘know’ 129,263; <i>wierzyć</i> ‘believe’ 39,243;<br><i>przewidywać</i> ‘predict’ 26,907; <i>przypuszczać</i> ‘suppose’ 10,305 | ∅ 51,430  |
| 5. <b>EXHIBIT class:</b> <i>mieć</i> ‘have’ 1,079,874; <i>zajmować</i> ‘occupy’ 63,213;<br><i>posiadać</i> ‘own’ 58,892; <i>sprawować</i> ‘hold’ 11,461         | ∅ 303,360 |

As can be seen, there is a substantial amount of variation within the verb classes. The raw frequency values per verb lexeme were entered as a co-variate in the statistical models for both experiments.

The critical sentences were constructed following a  $2 \times 5$  factorial design with construction (active vs. passive) and verb class (WATCH vs. SEE vs. HATE vs. KNOW vs. EXHIBIT) as factors. For each individual verb lexeme 10 different sentences were constructed, with the critical verb embedded in a clause depending on a main clause with one out of 10 further experiencer verbs (not identical to the critical subordinate verbs), which were the same 10 verbs for each verb and each construction. This resulted in 40 lexically different items per verb class condition. Altogether this yielded 200 ( $= 5 \times 40$ ) critical sentences in active voice and 200 corresponding passives. Agentive phrases in the active clauses were strong indefinite pronouns such as *kilku* ‘some’, and patient arguments were singular definite inanimate noun phrases (NPs). This served to minimize intervening patient effects due to referential properties of the NPs serving as the patient argument. Passives were formed as basic passives, i.e. without agentive *by*-phrases, and the inanimate definite description served as the passive subject. In addition, twelve ungrammatical sentences were constructed which served as a control condition (‘negative control’) for the judgement of ungrammaticality. That is, their primary function was to calibrate the rating scale, i.e. to provide clear examples of fully ungrammatical items. In those sentences we used dative experiencer verbs in passive voice. **Table 2** presents example stimuli per condition and an example of the negative control items.

The construction and word order of the stimuli is rather marked in Polish, but we decided to keep it for the sake of comparability with the German data from Kretzschmar et al. (2019: 113), assuming that a possible reduction of the ratings throughout all the verb classes can be tolerated.<sup>7</sup> Note that some items necessarily involve an aspectual mismatch between the verbal aspect encoded in the main verb and in the embedded verb. To address this confounding factor, we included aspectual match vs. mismatch between main and embedded verb as a co-variate in our statistical models.

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<sup>7</sup> Note that we had to change the sentence structure such that the main clause (e.g. *Zaskoczyło Kasię* ‘it surprised Kasia’) preceded the embedded clause, because the reverse order used in the German materials would have been ungrammatical in Polish.

Verb class	Voice	Example stimulus and English translation
WATCH	active	<i>Zaskoczyło Kasię, że niektórzy oglądali zachód słońca.</i> 'It surprised Kasia that some observed the sunset.'
	passive	<i>Zaskoczyło Kasię, że był oglądany zachód słońca.</i> 'It surprised Kasia that the sunset was observed.'
SEE	active	<i>Zaskoczyło Piotra, że niektórzy widzieli latarnię morską.</i> 'It surprised Piotr that some saw the lighthouse.'
	passive	<i>Zaskoczyło Piotra, że była widziana latarnia morska.</i> 'It surprised Piotr that the lighthouse was seen.'
HATE	active	<i>Przeszkadzało Jarkowi, że niektórzy nienawidzili zimowego chłodu.</i> 'It bothered Jarek that some hated the winter cold.'
	passive	<i>Przeszkadzało Jarkowi, że był nienawidzony chłód zimowy.</i> 'It bothered Jarek that the winter cold was hated.'
KNOW	active	<i>Zaskoczyło Jarka, że wielu znało ryzyko plagiatu.</i> 'It surprised Jarek that many knew the risk of plagiarism.'
	passive	<i>Zaskoczyło Jarka, że było znane ryzyko plagiatu.</i> 'It surprised Jarek that the risk of plagiarism was known.'
EXHIBIT	active	<i>Zachwyciło Anię, że wielu miało koszulkę uniwersytetu.</i> 'It amazed Anna that many had a T-shirt from the University.'
	passive	<i>Zachwyciło Anię, że była miana koszulka uniwersytetu.</i> 'It amazed Anna that the T-shirt from the University was had.'
negative control	passive	<i>Przeszkadzało Jarkowi, że muzyka rockowa była podrobana.</i> 'It bothered Jarek that the rock music was pleased.'

**Table 2:** Example stimuli for Experiment 1.

The 400 critical sentences were distributed over 10 lists following a Latin Square design. In each list, there was one sentence per verb lexeme, four lexically different sentences per verb class, and no item occurred more than once. Active and passive versions of the same items occurred in different lists. The occurrence of verb lexemes in specific lexicalizations was not predictable for participants. In total, each list contained 40 critical sentences (4 per condition, 20 per voice construction and 8 per verb class) and 12 negative control items (identical across lists), and was presented in two pseudorandomized orders (with the second order being the reverse of the first). Pseudorandomization ensured that verbs from the same verb class did not occur in adjacent items, that items with the same construction did not cluster, and that negative control items did not occur immediately before or after a passive form of the EXHIBIT class).

### 5.1.3 Procedure

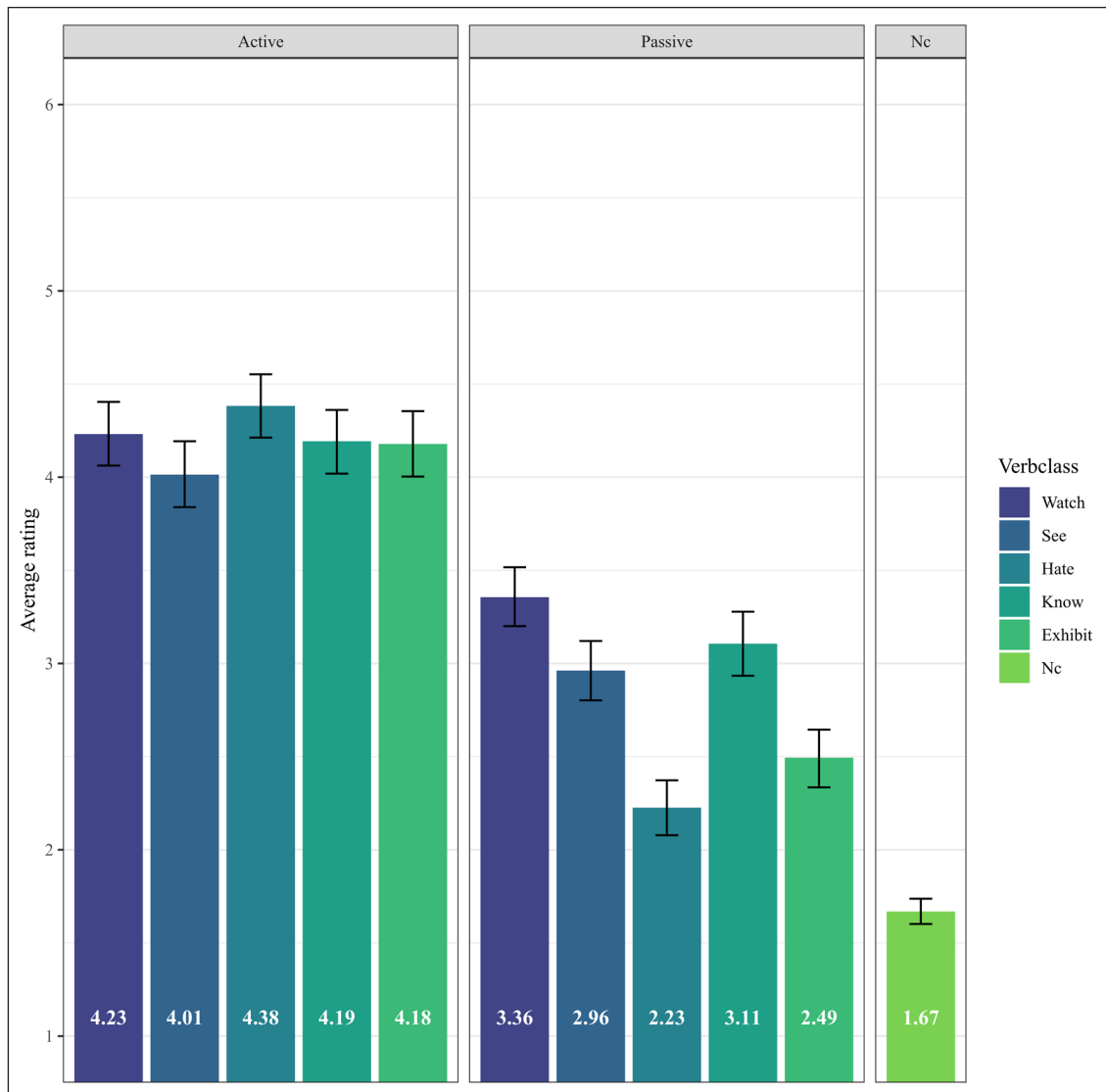
The pseudorandomized lists were uploaded to the survey platform [socsisurvey.de](https://www.socsisurvey.de), and links were distributed via personal contacts and social media. The questionnaire was online for a total duration of four weeks. Each participant only saw one list.

Participants were asked to rate the naturalness and acceptability of each item on a 6-point Likert scale ranging from “— — —” (completely unacceptable) to “+ + +” (completely acceptable). In addition to this, a bar helped to determine the degree of (un)acceptability. The active sentences and the negative fillers should in principle allow participants to use the end points of the scale. We decided to use a rating scale with an even number of rating categories to force participants to at least indicate a tendency in their rating and to avoid indifferent ‘I don’t know’ answers by choosing the middle category. It was also possible to give a free-text comment on every test item.

## 5.2 Analysis and results

Prior to analysis, we excluded missing responses and recoded the response categories to a numerical scale (6 = completely acceptable and 1 = completely unacceptable). We used multi-level cumulative logit regression (Agresti 2002, Bürkner & Vuorre 2018) to account for the ordinal scale of our response variable and to avoid inflated Type I and Type II errors and distorted estimates of effect size (Liddell & Kruschke 2018). The analysis was performed in R (version 4.1.0, R Development Core Team 2017) with the package *ordinal* (v2020.8-22, Christensen 2015). We fitted a model with verb class and voice as fixed effects and participants and items as crossed random intercepts. Aspectual mismatch and (scaled) raw frequency for each verb lexeme (see Section 5.1.2) were modelled as additive co-variates in the fixed-effects structure to account for confounding effects unrelated to the experimental factors (Sassenhagen & Alday 2016). Verb class and voice were modelled as additive random slopes by participants and voice was modelled as a by-items random slope. We did not model the interaction of these factors as a random slope as this resulted in model overfit. All variables in the fixed-effects structure of the resulting model were analysed with sum contrast coding. Significance of the main effects of construction and verb class as well as their interaction was assessed using the package *RVAideMemoire* (v0.9-79, Hervé 2019). Because neither the significance test nor the actual mixed model directly tested all the relevant pairwise comparisons, we used the package *emmeans* (v1.6.1, Lenth et al. 2018) to analyse the pairwise contrasts for the verb class within each level of the construction factor. We did this in a hierarchical manner, i.e. only when the superordinate interaction between verb class and voice was significant. Pairwise comparisons involving the five critical verb classes were performed once for active voice and once for passive voice. The *emmeans* package applies the Tukey correction method to control for inflated Type-1 error rates due to multiple comparisons. Finally, note that negative control items were not statistically analysed, because our predictions only concerned the relative difference between the four critical verb classes.

**Figure 1** illustrates the mean acceptability ratings per condition, including negative control items for completeness.



**Figure 1:** Mean acceptability ratings per condition (1 = very unacceptable, 6 = very acceptable). Error bars represent 95% confidence intervals (bootstrapped) of the mean.<sup>8</sup>

**Table 3** presents the statistical results, with main results of significance testing in the upper panel and results of the pairwise comparisons in the lower panel.

<sup>8</sup> In Figures 1 and 2, verb classes are ordered per construction from left to right as follows: WATCH, SEE, HATE, KNOW, EXHIBIT. The rightmost bar represents the mean acceptability ratings for the negative control items. Numbers within each bar show the mean per condition.

Overview of Anova-Style Type-II test				
	$\chi$	Df	<i>p</i> -value	
Verb class	12.896	4	< .02	
Construction	122.637	1	< .001	
Aspectual mismatch	0.334	1	.563	
Verb frequency	1.175	1	.278	
Interaction verb class $\times$ construction	48.920	4	< .001	
Pairwise comparisons				
	Estimate	Standard Error	z ratio	<i>p</i> -value
<i>Active</i>				
WATCH vs. SEE	0.218	0.202	1.082	.815
WATCH vs. HATE	-0.208	0.198	-1.052	.830
WATCH vs. KNOW	0.000	0.197	0.004	1.000
WATCH vs. EXHIBIT	-0.055	0.212	-0.264	.998
SEE vs. HATE	-0.427	0.198	-2.157	.196
SEE vs. KNOW	-0.217	0.203	-1.075	.819
SEE vs. EXHIBIT	-0.274	0.212	-1.298	.692
HATE vs. KNOW	0.209	0.199	1.053	.830
HATE vs. EXHIBIT	0.152	0.207	0.739	.947
KNOW vs. EXHIBIT	-0.056	0.208	-0.272	.998
<i>Personal passive</i>				
WATCH vs. SEE	0.423	0.209	2.030	.251
<b>WATCH vs. HATE</b>	1.304	0.193	6.770	<b>&lt; .0001</b>
WATCH vs. KNOW	0.272	0.208	1.308	.686
<b>WATCH vs. EXHIBIT</b>	0.916	0.212	4.323	<b>.0001</b>
<b>SEE vs. HATE</b>	0.881	0.186	4.739	<b>&lt; .0001</b>
SEE vs. KNOW	-0.151	0.207	-0.731	.949
SEE vs. EXHIBIT	0.492	0.205	2.404	.114
<b>HATE vs. KNOW</b>	-1.032	0.191	-5.411	<b>&lt; .0001</b>
HATE vs. EXHIBIT	-0.388	0.184	-2.106	.217
<b>KNOW vs. EXHIBIT</b>	0.644	0.207	3.120	<b>&lt; .02</b>

**Table 3:** Statistical results of Experiment 1.

**Figure 1** shows that all verb classes in both constructions are rated better than the negative control items. Mean ratings for the passive were lower than for the active voice. As can be seen in the upper panel of **Table 3**, there were significant main effects of verb class and voice and a significant interaction between the two factors. Both the lexical frequency of the critical verb lexemes and the presence/absence of an aspectual mismatch did not yield significant effects. Given the significant interaction, we tested for verb-class differences in each of the two constructions. The lower panel of **Table 3** shows that there were no significant differences between any of the verb classes in the active voice. By contrast, in the passive voice we found that the HATE and the EXHIBIT verb class each received significantly lower acceptability ratings than the WATCH and KNOW verb classes, which did not differ significantly from each other in receiving highest ratings. HATE and EXHIBIT, showing the lowest mean ratings, did not differ significantly from each other either. The SEE class fell in between these two groups in that it was rated better than HATE, while being statistically indistinguishable from the other verb classes.

### 5.3 Interim discussion

The first experiment tested whether sentence acceptability varies as a function of agentivity features entailed by the verb and whether this influence was modulated by the type of voice the verb occurs in. We hypothesized that if the number of agentivity features is the only factor influencing sentence acceptability, acceptability should be higher with a higher number of role features that a verb entails (see prediction (13) above). This would be compatible with feature accumulation and the prototype account proposed by Dowty (1991). By contrast, according to the prominence account proposed by Himmelmann & Primus (2015), the passive as a discourse-pragmatically marked construction should be associated with a particular weighting of features, whereas the unmarked active voice should show no particular feature weighting. In addition, we explored whether the passive cline in Polish would mirror the one found previously for German or whether cross-linguistic differences in the aspectual system would have a modulating influence.

The clines in the passive and active are different from one another, as revealed by a significant interaction between the factors voice and verb class. We found no significant differences between verb classes in the default active voice as summarized in (18):

- (18) Acceptability cline in the active (Experiment 1)  
 WATCH = SEE = HATE = KNOW = EXHIBIT

This is compatible with the assumption that active voice as the unmarked default construction in Polish is not constrained by any specific discourse factors and hence is not sensitive to role-related effects with the experimental task employed here. For the personal passive, by contrast, the data revealed the acceptability clines in (19):

- (19) Acceptability clines in the personal passive
- a. WATCH = KNOW > HATE = EXHIBIT
  - b. SEE > HATE<sup>9</sup>

Volitional perception verbs (WATCH), non-volitional perception verbs (SEE) and non-volitional cognition verbs (KNOW) were all rated alike. WATCH and KNOW verbs were significantly better than non-volitional emotion verbs (HATE) and ascription verbs (EXHIBIT), which did not differ significantly from each other. SEE verbs only reliably differed from HATE. This pattern partly replicates (via cross-experimental observations) what Kretzschmar et al. (2019) reported for personal passives in German in that volition seems to be irrelevant for the acceptability of passive sentences in Polish as well. This is not compatible with Dowty’s Proto-Agent features and prediction (13), according to which the WATCH class should be rated better than non-volitional verbs. The dynamic feature weighting of the prominence account allows for features like volition to be relevant or irrelevant depending on the discourse function of a specific construction.

Polish and German deviate from one another in how non-volitional sentence verbs are treated. Emotion verbs fare worse than cognition verbs in Polish, while the opposite is true in German. We will return to this in Section 8.

## 6 Experiment 2: The Polish *-no/-to* construction

In the second acceptability experiment, we tested whether or not the impersonal *-no/-to* construction, which only demotes the agent but does not promote the patient, yields an acceptability cline similar to the one we obtained for the personal passive.

### 6.1 Methods

#### 6.1.1 Participants

Seventy-six participants with Polish as their native language (61 female, 13 male, 2 non-binary; mean age: 26.7 years, range: 18–60 years; 26 with university education, 43 university students, 7 others) who responded to our online questionnaire (see Section 6.1.3) were included in the final dataset. We excluded 5 additional participants because their first language was not Polish or because they did not provide information about their first language. All participants gave written informed consent prior to participating and were free to end the survey at any time. None of them took part in Experiment 1.

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<sup>9</sup> Note that the SEE verbs did not significantly contrast with any verb class other than HATE. Strictly speaking, we could include SEE to the left of the first significance threshold (>) in (19a), but we refrain from doing so to avoid misrepresenting the null effect between SEE and EXHIBIT verbs.

### 6.1.2 Material

Stimuli were identical to Experiment 1 with the exception that passive clauses were changed to the *-no/-to* construction. **Table 4** presents example stimuli per condition and an example of the negative control items.

Verb class	Voice	Example stimulus and English translation
WATCH	active	<i>Zaskoczyło Kasię, że niektórzy oglądali zachód słońca.</i> 'It surprised Kasia that some observed the sunset.'
	<i>-no/-to</i> arb	<i>Zaskoczyło Kasię, że oglądano zachód słońca.</i> 'It surprised Kasia that one observed the sunset.'
SEE	active	<i>Zaskoczyło Piotra, że niektórzy widzieli latarnię morską.</i> 'It surprised Piotr that some saw the lighthouse.'
	<i>-no/-to</i> arb	<i>Zaskoczyło Piotra, że widziano latarnię morską.</i> 'It surprised Piotr that one saw the lighthouse.'
HATE	active	<i>Przeszkadzało Jarkowi, że niektórzy nienawidzili zimowego chłodu.</i> 'It bothered Jarek that some hated the winter cold.'
	<i>-no/-to</i> arb	<i>Przeszkadzało Jarkowi, że nienawidzono zimowego chłodu.</i> 'It bothered Jarek that one hated the winter cold.'
KNOW	active	<i>Zaskoczyło Jarka, że wielu znało ryzyko plagiatu.</i> 'It surprised Jarek that many knew the risk of plagiarism.'
	<i>-no/-to</i> arb	<i>Zaskoczyło Jarka, że znano ryzyko plagiatu.</i> 'It surprised Jarek that one knew the risk of plagiarism.'
EXHIBIT	active	<i>Zachwycalo Anię, że wielu miało koszulkę uniwersytetu.</i> 'It amazed Anna that many had a T-shirt from the University.'
	<i>-no/-to</i> arb	<i>Zachwycalo Anię, że miano koszulkę uniwersytetu.</i> 'It amazed Anna that one had a T-shirt from the University.'
negative control	passive	<i>Przeszkadzało Jarkowi, że muzyka rockowa była podobana.</i> 'It bothered Jarek that the rock music was appealed.'

**Table 4:** Example stimuli for Experiment 2.

### 6.1.3 Procedure

The distribution of items over experimental lists and the administration of the online survey were identical to Experiment 1.

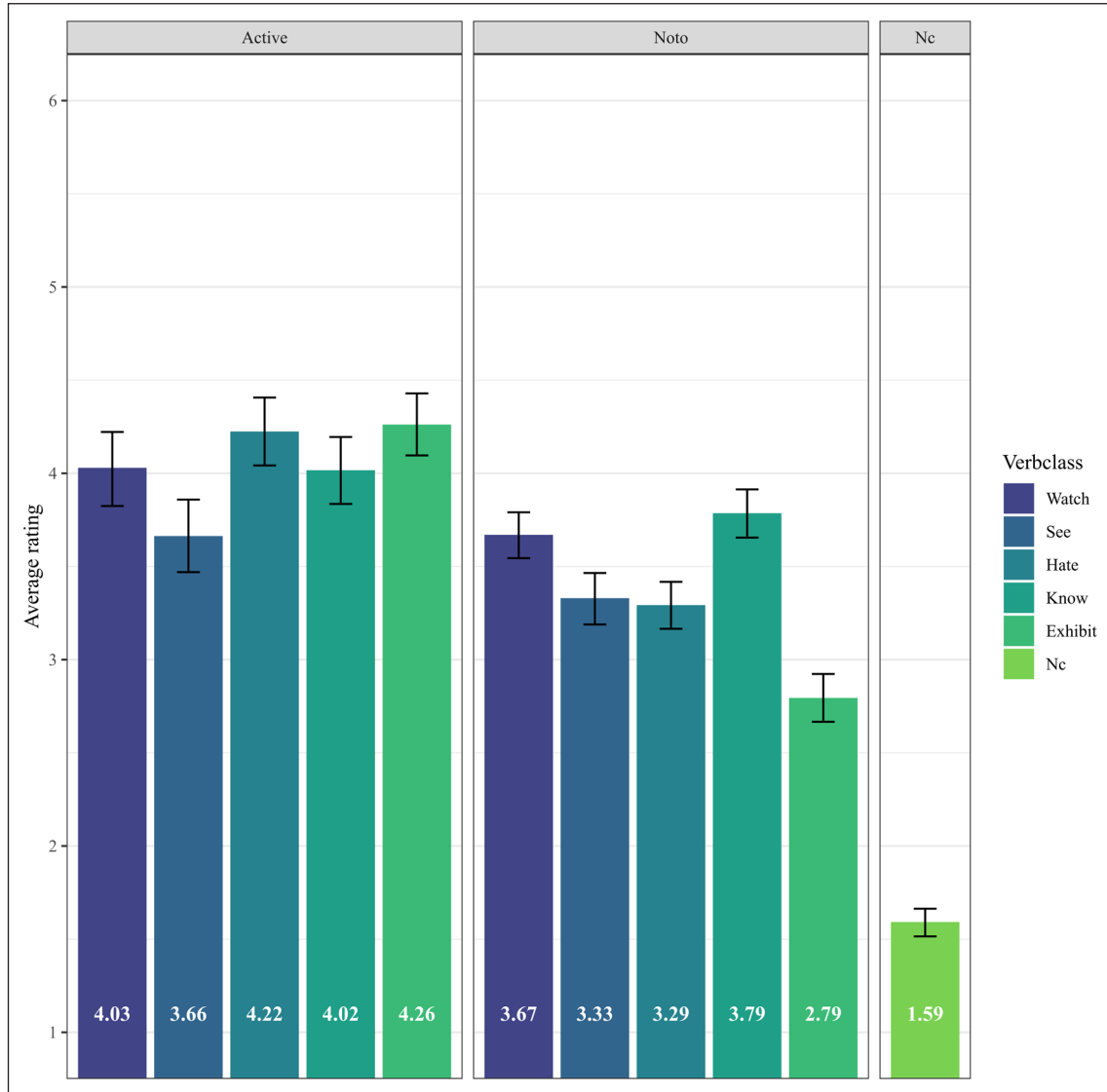
## 6.2 Analysis and results

Prior to analysis, we excluded missing responses and recoded the response categories to a numeric scale (6 = completely acceptable to 1 = completely unacceptable). We used the same



model specifications as described for Experiment 1 with the exception that there was no by-item random slope for voice as this resulted in convergence failure.

**Figure 2** illustrates the mean acceptability ratings per condition, including negative control items for completeness.



**Figure 2:** Mean acceptability ratings per condition (1 = very unacceptable, 6 = very acceptable). Error bars represent 95% confidence intervals (bootstrapped) of the mean.

**Table 5** presents the statistical results, with the main results of significance testing in the upper panel and the results of the pairwise comparisons in the lower panel.

<b>Overview of Anova-Style Type-II test</b>				
	$\chi$	Df	<i>p</i> -value	
Verb class	12.891	4	< .02	
Construction	53.800	1	< .001	
Aspectual mismatch	0.030	1	.862	
Verb frequency	9.854	1	< .002	
Interaction verb class $\times$ construction	121.645	4	< .001	
<b>Pairwise comparisons</b>				
	Estimate	Standard Error	<i>z</i> ratio	<i>p</i> -value
<i>Active</i>				
WATCH vs. SEE	0.445	0.189	2.355	.127
WATCH vs. HATE	-0.150	0.171	-0.880	.904
WATCH vs. KNOW	0.043	0.171	0.254	.999
WATCH vs. EXHIBIT	-0.356	0.180	-1.980	.275
<b>SEE vs. HATE</b>	-0.595	0.190	-3.140	<b>&lt; .02</b>
SEE vs. KNOW	-0.401	0.198	-2.024	.254
<b>SEE vs. EXHIBIT</b>	-0.801	0.208	-3.855	<b>&lt; .002</b>
HATE vs. KNOW	0.193	0.186	1.039	.837
HATE vs. EXHIBIT	-0.206	0.187	-1.103	.804
KNOW vs. EXHIBIT	-0.399	0.191	-2.098	.220
<i>-no/-to arb</i>				
WATCH vs. SEE	0.353	0.175	2.020	.256
WATCH vs. HATE	0.331	0.161	2.066	.234
WATCH vs. KNOW	-0.202	0.158	-1.285	.700
<b>WATCH vs. EXHIBIT</b>	0.770	0.174	4.430	<b>.0001</b>
SEE vs. HATE	-0.021	0.177	-0.123	.999
<b>SEE vs. KNOW</b>	-0.556	0.185	-3.002	<b>&lt; .03</b>
SEE vs. EXHIBIT	0.416	0.201	2.070	.232
<b>HATE vs. KNOW</b>	-0.534	0.178	-3.008	<b>&lt; .03</b>
HATE vs. EXHIBIT	0.438	0.185	2.370	.123
<b>KNOW vs. EXHIBIT</b>	0.972	0.185	5.271	<b>&lt; .0001</b>

**Table 5:** Statistical results of Experiment 2.

Visual inspection of **Figure 2** suggests that all verb classes in both constructions are rated much better than the ungrammatical items. Mean ratings for the *-no/-to* construction were lower than for the active voice but still somewhat higher than for the personal passive in Experiment 1. As can be seen in the upper panel of **Table 5**, there were again significant main effects of verb class and voice and a significant interaction between the two factors. As for the two co-variates, lexical frequency of the verb lexemes was a significant predictor, while aspectual mismatch was not. Given the significant interaction, we tested for verb-class differences in each of the two constructions. The lower panel of **Table 5** shows that in the active voice SEE was rated significantly worse than both HATE and EXHIBIT, while no other contrasts approached significance. In the *-no/-to* construction we found that the EXHIBIT verb class received significantly lower acceptability ratings than the WATCH and KNOW verb classes. In addition, the KNOW verb class was rated significantly better than SEE and HATE. No further contrasts were reliable.

### 6.3 Interim discussion

In our second acceptability-rating experiment we tested whether the *-no/-to* construction differed from active voice and (via cross-experimental observation) personal passive in revealing a unique acceptability cline. A difference in acceptability ratings is expected from the perspective of the prominence account because passive and *-no/-to* construction both serve partly different discourse functions, while the active voice is the unmarked default construction. More specifically, we assumed that the *-no/-to* construction with transitive verbs may show a cline similar to the one previously found for intransitive verbs (see prediction (15) above) so that the number of agentive features is decisive for sentence acceptability.

The findings of Experiment 2 only partly confirm our predictions. First, non-volitional perception verbs were rated significantly worse than non-volitional emotion and ascription verbs in the active voice, as summarized in (20). This finding is not predicted by our hypothesis (16) for the active voice, and contrasts with the null effect in Experiment 1 and data from the comparable German experiment in Kretzschmar et al. (2019).

(20) Acceptability cline in the active (Experiment 2)

HATE = EXHIBIT > SEE

Regarding the acceptability cline for the *-no/-to* construction, the pattern in (21) comprises two clines which are partially in line with the grammaticality prediction (12) and the construction-specific prominence prediction (15).

(21) Acceptability clines in the *-no/-to* construction

- a. KNOW > SEE = HATE = EXHIBIT
- b. WATCH > EXHIBIT<sup>10</sup>

Volitional perception (WATCH) and non-volitional cognition (KNOW) verbs are more acceptable than ascription (EXHIBIT) verbs without any of the tested features (21a, b), but volitional perception verbs are not preferred over any of the non-volitional sentence verb classes. This rules out an explanation on the basis of prototype theory as in (13) or of prior findings with intransitive verbs as in (15). The grammaticality prediction in (12) is partly confirmed as regards the disadvantage of ascription verbs in the construction, but it fails to account for the significant advantage of cognition verbs over non-volitional perception and emotion verbs as well as for the null effect between non-volitional perception, emotion and ascription verbs (21a). Hence, agentive roles with sentence as an agentive feature are more acceptable in the *-no/-to* construction only if sentence is entailed by cognition or volitional perception verbs. The lack of a preference for volitional perception verbs is similar to what we found for the personal passive in Experiment 1, yet both constructions differ regarding the HATE and the KNOW verb classes. The HATE verb class now received better ratings and is on a par with SEE and WATCH predicates. Additionally, KNOW predicates are rated significantly better than the other non-volitional verb classes (SEE, HATE, EXHIBIT) but are still statistically indistinguishable from volitional verbs (WATCH). Thus, a cross-experimental observation suggests that the different types of sentence verbs react differently to the *-no/-to* construction and the personal passive, with HATE and KNOW showing larger variability amongst constructions than SEE. We will discuss the implications of these results in Section 8.

## 7 Additional support by corpus data

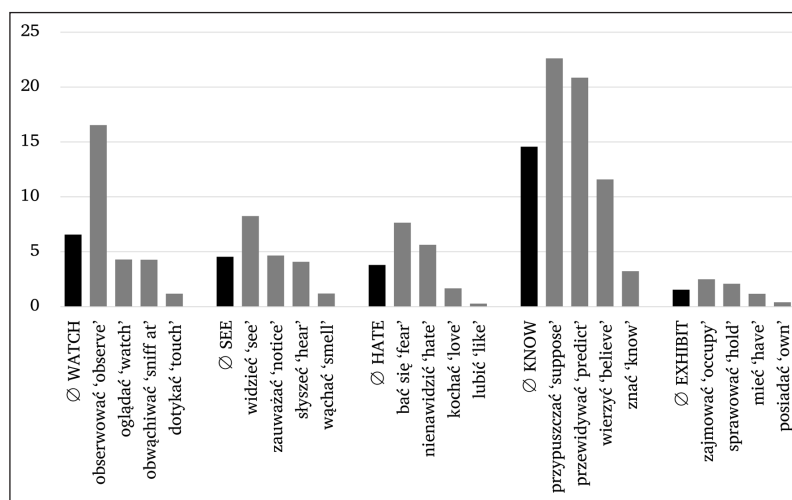
Before interpreting the experimental results for the *-no/-to* construction together with the results for the passive, we decided to test whether they are supported by a corpus analysis. We assume that the more acceptable a construction is, the more frequently a given verb should be used in this construction. That is, acceptability correlates with the ratio of the frequency of the verb in this construction to the overall frequency of the verb lexeme in all its forms. Hence, our prediction for the corpus study on the *-no/-to* construction is that it shows the same clines described in (21) that we found in Experiment 2.<sup>11</sup>

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<sup>10</sup> Note that the WATCH verbs did not significantly contrast with any verb class other than EXHIBIT. Strictly speaking, we could include WATCH to the left and the right of the significance threshold ('>') in (20a), but we refrain from doing so to avoid confusion in the notation.

<sup>11</sup> For this additional support we decided to concentrate on the *-no/-to* construction and to not include the personal passive because corpus searches for the passive participle return a high number of false positives (mainly participles used in attributive function). This number can be reduced by including the auxiliary in directly adjacent position, but this produces false negatives. A reliable estimation of the frequency of personal passives in the corpus would therefore be much more complex and time-consuming.

We used the Polish National Corpus (*NKJP*) and chose the balanced subcorpus with 300 million tokens<sup>12</sup> because this seems to give the most representative image of Polish language use.<sup>13</sup> We followed Bunčić's (2018) method of analysis and looked first for the concrete *-no/-to* form of each verb (*oglądano* 'one watched', *widziano* 'one saw', *nienawidzono* 'one hated', etc.) and then for the whole lexeme with all its forms (i.e. the *lemma* in the terms of corpus linguistics). Not in all cases, however, could the numbers be used as they were given by the PELCRA corpus search engine because there were homonymies with *mieć* 'have'<sup>14</sup>, *bać się* 'fear'<sup>15</sup>, and *lubić* 'like'<sup>16</sup> (other possible homonymies<sup>17</sup> were found not to play a role), which had to be subtracted.



**Figure 3:** Frequency of the *-no/-to* form per 1000 forms of the verb lexeme (in the balanced Polish National Corpus, 300 million tokens, <http://nkjp.pl/>).

<sup>12</sup> The corpus includes a variety of different genres and text types from both written and spoken Polish (e.g. press texts, fiction, internet texts, transcripts of conversations). The subcorpus is balanced so that it includes all text types and genres in a proportion that mirrors their respective proportion in the Polish language (cf. Górski & Łaziński 2012).

<sup>13</sup> We also conducted the analysis in the full corpus of 1.8 billion tokens, which in general yielded the same results but showed the corpus's bias towards press texts in an overrepresentation of typical press phrases, especially *obserwowano* 'it was observed (that)', which in that corpus has a frequency of 25.0 per 1000 forms of the lexeme *obserwować* 'observe'.

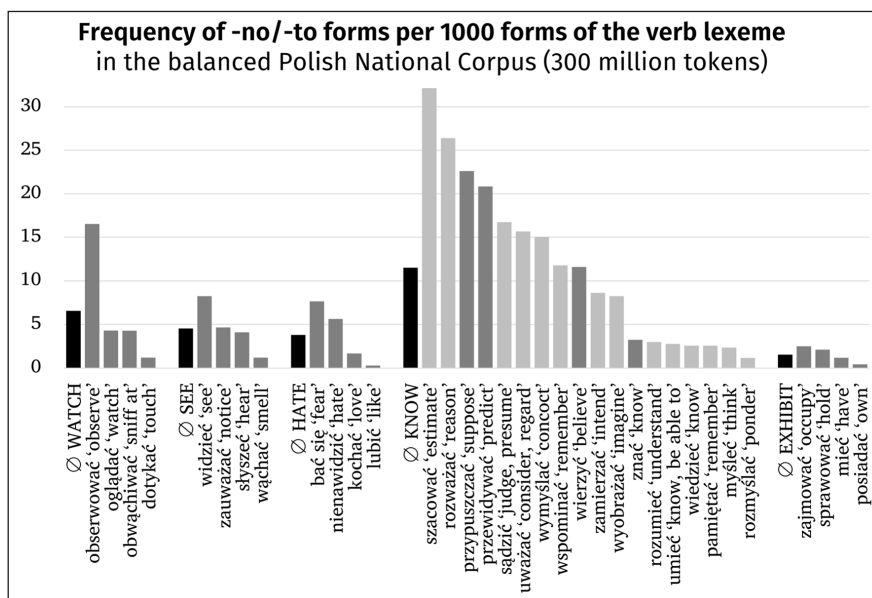
<sup>14</sup> The impersonal form of *mieć* 'have', *miano*, happens to be homonymous with *miano* 'name'. Since among the first 100 of the 2,698 hits for *miano* the context suggested the noun 'name' in 53 cases, 1,430 (= 53% of 2,698) was subtracted both from the number of *-no/-to* forms and from the overall frequency of the verb.

<sup>15</sup> In the case of the reflexive verb *bać się* 'fear', the reflexive pronoun *się* can be placed anywhere in the sentence, but since *bać* cannot occur without it, we could simply search for *bano* and *bać*. Of the 142 hits for *bano* (*się*) 'it was feared', 6 actually referred to the Italian musician Al Bano, so that these 6 were subtracted from the frequencies for *bano* (*się*) and *bać się* 'fear'.

<sup>16</sup> The (very rare) imperative singular *lub* 'like!' is homonymous with the (much more frequent) conjunction *lub* 'or'. In this case a separate search for *lub* was conducted, which reported 229,474 hits. This number was subtracted from the 272,369 hits the search engine gave for the lexeme *lubić* 'like', thus possibly disregarding a handful of uses of the singular imperative that the corpus might include.

<sup>17</sup> For example, *kocha* as the 3sg present form of *kochać* 'love' is homonymous with *Kocha* as the genitive/accusative of the German surname *Koch*.

**Figure 3** shows how often the *-no/-to* form of each of the verbs was used per 1000 forms of the lexeme ( $\frac{-no/-to \text{ occurrences}}{\text{lexeme occurrences}} \times 1000$ ). The differences between the verb classes are indeed comparable to those in the acceptability judgement test, and seem even more pronounced in the corpus than they are in the experiment. However, the data also reveal considerable item-based variation. For instance, the advantage of the WATCH class over the other verb classes (except for the KNOW class) is mainly due to the form *obserwowano* ‘it was observed (that)’, which is rather frequent in press texts. In fact, the impersonal form of *oglądać* ‘watch’ itself is considerably less frequent than the one of the verb *widzieć* ‘see’. Similarly, the KNOW class owes its high frequencies least of all to the verb *znać* ‘know’. The other three tested verbs all denote a cognition with less than 100% certainty and thus seem to lend themselves especially well to expressions with an arbitrary subject like *przewidywano* ‘it was predicted’, *wierzono* ‘it was believed’, and *przypuszczano* ‘it was supposed’, which are, again, typical of press reports. Consequently, to make sure that the high frequency value of the KNOW class is not an artefact of the choice of verbs, we selected 14 additional frequent cognition verbs (with a lexeme frequency of at least 10 per million in the corpus) and extended the corpus analysis to these verbs as well. As can be seen in **Figure 4**, this only yielded a small difference: The average frequency of *-no/-to* forms per 1000 cognition verb forms is reduced from 14.6 for the four verbs of the acceptability judgement test to 11.5 for the 18 verbs of the larger sample, which is still far above average of the WATCH class (6.6). Consequently, the high frequency must be regarded as an effect of this verb class as a whole, not of a skewed choice of verbs for the test.



**Figure 4:** Frequency of the *-no/-to* form (like Figure 3) with additional cognition verbs (light grey).

A closer look at the cognition verbs in **Figure 4**, however, shows that among the ones most frequently used in the impersonal form are those that are often used metaphorically as *verba dicendi* (e.g. *szacować* ‘estimate’ can be used in the sense of ‘to express an estimate’, *rozważać* ‘reflect’ can be used in the sense of ‘discuss’, *przewidywać* ‘predict’ can be used in the sense of ‘to make a prediction’, etc.). Many of the cognition verbs appearing less frequently in the *-no/-to* form seem to denote a more purely internal sort of cognition. The numbers for the quasi-synonyms *wspominać* and *pamiętać* ‘remember’ are symptomatic: The former, more frequent one, is often used in the sense of ‘mention’ (e.g. *Czasem tylko zasepiał się, gdy wspomiano przy nim wybitnego łódzkiego kardiochirurga profesora Jana Molla* ‘Only sometimes he got sad when professor Jan Moll, the eminent heart surgeon from Łódź, was remembered/mentioned in his presence’, NKJP), whereas the latter seems to be the more typical choice when referring to actual internal cognition (e.g. *Może Łabęckiego nie chciano, bo pamiętano jego przemówienia sprzed stanu wojennego* ‘Maybe people did not want Łabęcki because they remembered his speeches before the martial law’, NKJP). If a cognition verb has the reading of expressing an opinion, it is of course more agentive than in the reading of pure cognition, since speaking entails volition and also a certain amount of movement.

However, while the *verbum dicendi* readings might explain the frequency of the impersonal cognition verbs in the corpus, this does not seem to be a sufficient explanation for the results of the acceptability judgement test because the test items did not contain contexts implying this reading (e.g. *Zachwyciło Anię, że przewidywano wynik wyborów* ‘Ania was surprised that people had foreseen the outcome of the elections’, *Interesowało Tomka, że przypuszczano przyczynę wypadku* ‘It interested Tomek that people supposed the reason for the accident’, or *Wywarło na Marysi wrażenie, że wierzono w legendę świętego* ‘Marysia was impressed that people believed in the legend about the saint’).

In order to assess the significance of the visual impressions, we ran a generalized linear regression model on the two data sets underlying **Figures 3** and **4**. The analyses were carried out in R (version 3.5.1, R Development Core Team 2017) with the package *lme4* (v1.1-21, Bates et al. 2015) to implement the regression model, and the package *car* (v3.0-0) for significance testing. Pairwise comparisons involving the verb classes were computed with the package *emmeans* (v1.6.1, Lenth et al. 2018). In both models, the 5-level factor verb class was the only fixed effect (with sum-contrast coding), verb lexemes were modelled as random intercept. The regression models tested the data assuming a binomial family, so the dependent or response variable was modelled as a two-column integer matrix: The first column gives the number of successes (i.e. the number of *-no/-to* forms for each verb lexeme) and the second the number of failures (i.e. the total number of hits for each verb lexeme minus the number of *-no/-to* forms). This is equivalent to the relative frequency counts depicted in **Figures 3** and **4** above. **Tables 6** and **7** give the results of the statistical analyses for both datasets.

Overview of Anova Type-II test				
	$\chi$	Df	<i>p</i> -value	
Verb class	14.104	4	< .007	
Pairwise comparisons				
	Estimate	Standard Error	<i>z</i> ratio	<i>p</i> -value
WATCH vs. SEE	0.049	0.674	0.073	1
WATCH vs. HATE	0.715	0.663	1.079	.817
WATCH vs. KNOW	-0.972	0.657	-1.480	.575
WATCH vs. EXHIBIT	1.258	0.661	1.905	.314
SEE vs. HATE	0.666	0.652	1.022	.845
SEE vs. KNOW	-1.021	0.647	-1.579	.510
SEE vs. EXHIBIT	1.209	0.650	1.860	.339
HATE vs. KNOW	-1.687	0.634	-2.663	< .06
HATE vs. EXHIBIT	0.543	0.637	0.852	.914
<b>KNOW vs. EXHIBIT</b>	<b>2.231</b>	<b>0.631</b>	<b>3.534</b>	<b>&lt; .004</b>

**Table 6:** Statistical results of the corpus analysis including the verb lexemes from Experiment 2.

**Table 6** clearly shows that the differences between verb classes in the corpus match the experimental findings only for the “extreme” cases: The best rated verb class KNOW is also the most frequent one, which is significantly different from EXHIBIT, being the least frequent and least acceptable verb class. A similar picture emerges when a more varied sample of verbs is used for the KNOW verb class, as revealed by **Table 7**. Again, only the contrast between the KNOW and EXHIBIT verb classes is significant.

In summary, the corpus analysis revealed that the frequency counts per verb class are partly consistent with the results of the acceptability judgement test in Experiment 2. The cognition verb class (KNOW) and the ascription verb class (EXHIBIT) yield significantly different acceptability ratings (with cognition verbs outperforming ascription verbs) and this difference is also manifest in the frequency counts. Indeed, it appears even more pronounced in the corpus data than in the experimental data (by comparison of the respective estimates). However, there is also considerable variation between verb lexemes, so differences between verb classes falling in between the most frequent verb class (cognition verbs) and the least frequent verb class (ascription verbs) turn out not to be significant in the corpus data.



Overview of Anova Type-II test				
	$\chi$	Df	<i>p</i> -value	
Verb class	15.49	4	< .004	
Pairwise comparisons				
	Estimate	Standard Error	<i>z</i> ratio	<i>p</i> -value
WATCH vs. SEE	0.052	0.716	0.073	1
WATCH vs. HATE	0.709	0.704	1.007	.852
WATCH vs. KNOW	-0.583	0.561	-1.040	.836
WATCH vs. EXHIBIT	1.249	0.702	1.779	.385
SEE vs. HATE	0.656	0.694	0.946	.878
SEE vs. KNOW	-0.635	0.548	-1.160	.774
SEE vs. EXHIBIT	1.197	0.692	1.730	.415
HATE vs. KNOW	-1.292	0.532	-2.430	.107
HATE vs. EXHIBIT	0.540	0.679	0.795	.932
KNOW vs. EXHIBIT	1.832	0.529	3.464	< .005

**Table 7:** Statistical results of the corpus analysis including additional cognition verb lexemes in the KNOW class.

This finding lines up with some previous research findings on the relationship between corpus frequencies and experimental data such as acceptability judgements (e.g. Featherston 2005; Bresnan 2006; Arppe & Järvikivi 2007; Divjak 2008). There is evidence that the relation between corpus frequencies and judgement data is not bidirectional, i.e. both data types do not unequivocally predict each other, but a few unidirectional relations seem robust. For instance, unacceptable structures tend to be infrequent in corpora, while acceptable structures may be frequent or infrequent. Frequent structures, however, tend to be acceptable (Arppe & Järvikivi 2007; Divjak 2008).

## 8 General discussion

With two acceptability-rating experiments and a corpus study in Polish, the present paper investigated to what extent role properties, especially those of the agent role, interact with the type of syntactic construction (personal passive, impersonal *-no/-to* construction and personal active) to determine Polish native speakers' judgements about sentence acceptability. Specifically, we asked whether role-related acceptability clines can be better captured by the notion of role prototypicality (and feature accumulation) as proposed by Dowty (1991) or by the notion of role

prominence (and feature weighting) as proposed by Himmelmann & Primus (2015). We defined the agent role based on Dowty's (1991) feature-based proto-role approach and additionally asked whether the agentive feature of sentience may have to be decomposed into several features, e.g. cognition, perception, and emotion, given the well-known cross-linguistic variability in the argument structure of sentience verbs.

In (22)–(24) below we repeat the clines for each construction for ease of comprehension (see (18)–(21) above).

- (22) Acceptability cline in the active voice
- a. Experiment 1: WATCH = SEE = HATE = KNOW = EXHIBIT
  - b. Experiment 2: HATE = EXHIBIT > SEE
- (23) Acceptability clines in the personal passive (Experiment 1)
- a. WATCH = KNOW > HATE = EXHIBIT
  - b. SEE > HATE
- (24) Clines in the impersonal *-no/-to* construction (Experiment 2 and corpus data)
- a. Acceptability: KNOW > SEE = HATE = EXHIBIT
  - b. Acceptability: WATCH > EXHIBIT
  - c. Corpus frequency: KNOW > EXHIBIT

Altogether, the data reveal at least three noteworthy patterns (based on cross-experimental observation). First, each construction yields clines partly different from the other constructions, and the main difference between personal passive and impersonal *-no/-to* construction seems to be the enhanced acceptability of two sentience verb classes – non-volitional cognition and emotion – in the latter construction. This speaks against the prototype view which allows for only one agentivity cline, as feature accumulation applies wherever agentivity is relevant. Second, the cline found for the Polish personal passive only partially reflects the cline previously found for German (as observed via cross-experimental comparison), which suggests some cross-linguistic variation due to further properties of the language's grammar (e.g. aspect) that interact with semantic role-related interpretation. Third, some effects pertaining to sentience verbs suggest that they qualify for agentive roles in Polish and in German but that they also intersect differently with the animacy properties of the subject referent. In particular, cognition verbs (the KNOW class) show the best ratings, numerically followed by volitional perception verbs (the WATCH class). Cognition verbs, and to some extent volitional perception verbs, are particularly sensitive to human referents, whereas the other sentience verbs can also combine with non-human animate referents. Thus, it seems again that it is not only the presence/absence of particular role features that accounts for the pattern but the interaction between role features and further types of information, such as animacy as a referential property that strongly points to agents. We will elaborate on the second and third patterns in more detail in the following paragraphs.

In German, personal passives showed the cline WATCH = SEE = HATE > KNOW > EXHIBIT (Kretzschmar et al. 2019). First, there is a striking similarity of Polish and German as regards the status of volition. The WATCH class did not fare better than the SEE class in the Polish passive (despite a numerical trend), which would have been expected if the number of agentive features was crucial or if volition was the only relevant feature defining a prototypical role, since WATCH verbs entail volition, sentience and movement and thus two agentivity features more than the SEE verbs, which only entail sentience. This is in line with the pattern of results for the German personal passive as reported by Kretzschmar et al. (2019), who argued that in the German passive the effect of agentivity seems to have been blocked by the effects of the patient feature of affectedness. However, the transitivity effects related to the inferred affectedness or change of state of the patient/theme (“O” in Hopper & Thompson 1980) that Kretzschmar et al. (2019) see as the cause for the behaviour of the German passive are likely more difficult to obtain in Polish. The most probable reason for this is the aspect of the tested verbs. As explained in Section 5.1.2, we used only the imperfective aspect because the central verbs of the HATE and KNOW classes are *imperfectiva tantum*. However, in an aspect language the change-of-state reading is connected to the perfective aspect (e.g. Rozwadowska 2020: 61). Consequently, in the Polish test items the object may not have been construed as affected, thereby diminishing the patientivity effect, so that the discourse function of patient demotion may not have ‘overshadowed’ the agent demotion function, which should produce an effect of agentivity in the Polish imperfective passive. From this perspective, we predict that in the Polish perfective passive there should be a reliable affectedness effect, just like in the German passive. In summary, we conclude that volition is not privileged over other agentive features in the Polish personal passive, but that the reason for this pattern may be different from the one proposed for German passives and that this can be directly tested with a replication using the perfective aspect.

A major difference from the results for the German passive reported by Kretzschmar et al. (2019) is that the KNOW class, which was rated worse than WATCH, SEE and HATE in the German passive, turned out either as acceptable as perception classes (SEE, WATCH) or more acceptable than emotion verbs (HATE) in Polish. This can be explained based on the different use of affectedness and animacy information in both languages: In the German passive it was relevant that the KNOW verbs imply little affectedness for the object, whereas in Polish it is the semantic role of the subject that is decisive. Both volitional and non-volitional perception verbs are characteristic of animals as well as humans, but cognition as denoted by verbs like *znać* ‘know’, *przewidywać* ‘predict’, *wierzyć* ‘believe’, or *przypuszczać* ‘suppose’ is a rather specific feature of humans. Consequently, the cognition verbs entail higher animacy than the other sentience verbs, and in the Polish passive we see this effect of animacy in addition to agentivity. This in turn suggests that a more fine-grained differentiation of sentience into several semantic subclasses (or even features) may be more adequate for Polish.

Another difference between the German and the Polish data is the rating for the HATE class. In the German passive it was on the same level as WATCH and SEE, since the object is similarly unaffected by being loved or hated as by being watched or seen. In the Polish passive, however, the HATE class turned out much worse, almost on a level with the EXHIBIT verbs. This can be explained by the fact that these verbs are more stative than the WATCH and SEE verbs because perception always brings about a change in the mental state of the perceiver, who has to process and assimilate the new information (even if perception is an ongoing process, as indicated by the imperfective aspect used in our test items). Given that dynamicity positively correlates with agentivity (e.g. Smith 1999), one might even hypothesize that this processing activity is a feature that moves the experiencer of perception verbs a bit closer to the prototype of the Proto-Agent role than an experiencer of the more stative verbs of the HATE class.

The results for the *-no/-to* construction are similar to the results of the passive, inasmuch as the status of volition is concerned: As in the passive, we again see no advantage of volitional perception (WATCH) over non-volitional perception (SEE), cognition (KNOW) and emotion (HATE) verbs. Thus, we found no privilege for the prototypical agent role in these constructions, contrary to what has been reported for the *-no/-to* construction with intransitive verbs in Polish (Bunčić 2018; 2019). The other tested agentivity feature, sentience, by contrast, shows a clear effect, because the non-agentive, non-sentient EXHIBIT verbs were rated significantly worse than all the other classes, which is in line with Rozwadowska's (1989: 124) prediction that [–sentient] verbs should be ungrammatical in impersonal constructions.

As in the passive, cognition verbs (KNOW) are rated on the same level as the volitional perception verbs (WATCH), even though they do not entail volition. Yet, their acceptability is somewhat enhanced in the *-no/-to* construction compared with the Polish personal passive as these verbs now contrast with more verb classes (i.e. non-volitional perception and emotion verbs). This enhancement is mirrored by their higher frequency values in the *-no/-to* corpus. This pattern again shows an effect of the higher animacy status entailed by cognition verbs. This finding is similar to recent findings from the German impersonal active construction involving the impersonal pronoun *man* 'one'. In this construction, acceptability ratings are better for verb classes that select an animate or human subject referent compared to verbs that select inanimate subject referents (Kretschmar & Primus 2020). Hence, referential animacy and sentience may converge to increase sentence acceptability in impersonal constructions in German and Polish and in the Polish personal passive.

Another main difference between the clines for the *-no/-to* construction and the personal passive is the fact that in the *-no/-to* construction the HATE class is not worse than the SEE class. Obviously, the stativity of the HATE verbs discussed above, which rendered the passives of these verbs less acceptable, is not an obstacle for the *-no/-to* construction. This is in line with a general openness of this construction for a great variety of verbs that cannot be passivized:

“The *-no/-to* construction differs from the passive construction in two important respects. First, it applies to a wider class of verbs than the passive. In particular, it unproblematically applies to canonical unaccusative verbs, such as ‘remain’, ‘die’, or even ‘be’ [...]” (Kibort 2001: 163)

Consequently, it seems legitimate to attribute the low rating for the HATE class in the passive to the difficulty of passivizing statives, not to agentivity as such.

In the active voice, finally, there is no advantage for verb types with proto-roles closer to the prototype or for verb types of higher transitivity. Since volition and affectedness are crucial parameters in Hopper & Thompson’s (1980) transitivity prototype, we can conclude that the results we found for the active voice fail to provide evidence for effects based on prototypical agentivity or transitivity. We note, however, that our second experiment revealed an unexpected pattern, with the SEE class being rated worse than the HATE and EXHIBIT classes. As this finding did not replicate across both experiments (including the same lexical items in the active) and was not included in our predictions, further research is needed to investigate its robustness.

To sum up, we find similar, yet not fully identical acceptability clines for the personal passive and the impersonal *-no/-to* construction in Polish, and both are clearly distinct from the active voice that does not reveal a consistent pattern across both experiments. Neither cline shows a pattern that is consistent with feature accumulation, a central mechanism to determine role prototypicality in Dowty’s (1991) framework. This result is in line with the hypothesis that role-related effects in sentence comprehension are due to role prominence rather than role prototypicality. Recall that role prominence hinges on the discourse function of a syntactic construction and, hence, shifts depending on which discourse function a construction serves. Thus, the current study provides additional empirical evidence for Himmelmann & Primus’ (2015) position that role prominence and role prototypicality are two distinct principles that apply to different constructions. It may still be that the role prototype is also the most prominent unit in a construction (as previously reported, e.g., for the *-no/-to* construction with intransitive verbs; see Bunčić 2018; 2019), but the reverse does not necessarily hold, i.e. a prominent role does not have to be prototypical. This suggests that the notion of prominence is not a substitute for the prototypicality account. Rather, it seems that different constructions are sensitive to either the prototype with the highest number of role features or some other peripheral role with the relevant feature(s). The prominence account can integrate feature accumulation and feature weighting as mechanisms to determine role prominence and, hence, includes prototypical roles as a subtype of prominent roles (see also Himmelmann & Primus 2015: 50).

The current study also extends the empirically observable range of role-related prominence effects. In contrast to previous studies that investigated fairly different

constructions with distinct discourse functions, the current study compared discourse-semantically marked constructions with more similar, partly overlapping functions, targeting the same set of referents (agent or patient). This revealed role-related prominence effects and also that these may interact with further grammatical properties of a language or with referential properties of the verbal arguments. Personal passives in German and Polish show comparable clines regarding the status of volition as a role feature that is not prominent with passivization and regarding sentience as an agentive feature. They diverge, however, when further characteristics of the respective language system come into play, such as dynamicity or verbal aspect. For impersonals (Polish *-no/-to* and German *man* construction), both languages show sensitivity to sentience but also to animacy. Thus, experimental research on sentience verbs should consider specifically which subtypes of verbs are tested (i.e. emotion, perception or cognition), because each of them is differently sensitive to animacy, which in turn may have stronger or weaker effects on role-related prominence effects.

## 9 Conclusion

We have shown that role prominence can capture role-related effects in sentence interpretation, as visible in acceptability judgements. Importantly, semantic-role prominence hinges on referential prominence in discourse, which can be deduced in turn from the discourse function of a syntactic construction (or argument alternation). A clear effect of agent prominence emerged in the impersonal *-no/-to* construction, which only demotes the agent without promoting the patient. Since the main discourse function of personal passives is the promotion of the patient, they can also depend on patient prominence. In the German personal passive, this effect completely blocked any effects of agent prominence that the demotion of the agent might have had (Kretzschmar et al. 2019). In the Polish imperfective passive tested here, we did find effects of agentivity/animacy, probably because effects of affectedness were in turn blocked by the use of the imperfective aspect.

The data obtained provide additional evidence for agent prominence in marked diatheses. Furthermore, the advantage of cognition verbs over non-volitional perception and emotion verbs has shown that there is an interaction between agentivity and entailed animacy. The subtle differences in discourse function between the constructions examined exert a great influence on the effects of role prominence, which confirms the “dynamic nature of prominence asymmetries” postulated by Himmelmann & Primus (2015: 44).

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## Abbreviations

1 = first person; 3 = third person; ACC = accusative; COND = conditional; F = feminine; GEN = genitive; IMPRS = impersonal; IPFV = imperfective aspect; N = neuter; NOM = nominative; NP = noun phrase; PASS = passive; PFV = perfective aspect; PL = plural; PRS = present; PST = past/preterite; PTCP = participle; REFL = reflexive (pronoun); SG = singular.

## Data availability

Analysis scripts, raw data and experimental items can be found in the supplementary materials: [https://osf.io/q438j/?view\\_only=5e40243a62944feebe48480f9062a878](https://osf.io/q438j/?view_only=5e40243a62944feebe48480f9062a878)

## Ethics and consent

Following national and institutional guidelines, Experiments 1 and 2 were exempt from an ethics vote. As specified by the rules of the German Research Foundation (DFG), psycholinguistic experiments that sample healthy adults and that use behavioural non-invasive methods for data collection do not require a special ethics vote as long as they pose no risk or physical/emotional burden to participants and as long as participants are debriefed after participation ([https://www.dfg.de/foerderung/faq/geistes\\_sozialwissenschaften/](https://www.dfg.de/foerderung/faq/geistes_sozialwissenschaften/)).

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## Competing interests

The authors have no competing interests to declare.

## Author contributions

BP, DB and FK developed the study design. MKP collected the experimental data. FK and MKP analysed them. DB collected the corpus data, and DB and FK analysed them. DB, FK, MKP and BP interpreted the data. FK, DB and MKP wrote the text.

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