

# Generalized incrementality: The veridicality property of clause-embedding reveal-type predicates in Polish<sup>1</sup>

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**Abstract.** It is a common observation that the so-called incremental theme verbs like ‘eat’, ‘drink’ or ‘build’ enforce a gradual affectedness of a direct object by the verbal process (Dowty, 1991; Krifka, 1992 among others). In aspect languages like Polish, perfective incremental theme verbs imply a total affectedness: The object vanishes (in the case of ‘eat’ or ‘drink’), it appears in its totality (in the case of ‘build’) or is fully involved in any other way (for example in the case of ‘read’, where there are no unread pages left in a single reading event). In contrast, imperfective counterparts only imply partial affectedness of their objects (Wierzbicka, 1967; Filip, 1985, 1997, 1999; Krifka, 1989a, 1989b, 1989c, 1992). Crucially, the gradual/total affectedness relation between the verb and its object only holds for incremental theme verbs. For instance, seeing a sandwich, in contrast to eating a sandwich, neither changes anything in the structure of a sandwich nor does it necessarily relate to its parts. This paper shows that propositional objects are also subjected to verbal events in a gradual manner if a clause-embedding verb is an incremental theme verb. In this case, the counterpart to total affectedness is veridicality, i.e. the revelation of a truth-conditional object. Building upon Zuchewicz (2020), we propose an account of generalized incrementality. In this account, incrementality is defined on the level of events and does not enforce the object to be divided into parts (compared to Krifka, 1989a, 1989b, 1989c, 1992 among others). As a result, the analysis holds for all incremental theme verbs, regardless of the type of a complement they combine with. The justification for this line of reasoning comes from a diverse nature of incrementality. Our object of investigation are transitive verbs which, if realized by clause-embedding predicates, take a *that*-clause as a complement. Their incremental character cannot be captured by dividing a proposition expressed by a *that*-clause into parts, but by a gradual creation of a proof for an embedded proposition.

**Keywords:** aspect, Polish, perfectivity, veridicality, truth-entailment, clause-embedding predicates, incrementality.

## 1. Polish aspectual system

Before moving on to the aspect-dependent interpretation of nominal and clausal complements in Polish, we will briefly describe the Polish aspectual system.

In Polish and in other Slavic and some non-Slavic languages, most verbs build aspectual pairs. As a result, almost all events can be seen from two perspectives, depending on the (im)perfective marking on the stem: They can be viewed as temporally delimited if described with a perfective verb, or as temporally unlimited if described with an imperfective counterpart. Only imperfective verbs can be arguments of phasal verbs like ‘begin’ or ‘finish’ (the so-called

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aspectualizers, cf. Verkuyl, 1999), as example (1) illustrates (cf. also Zuchewicz, 2020 or Borik, 2002 for Russian).

- (1) Jan zaczął / skończył budować / #zbudować  
 Jan started.PFV / finished.PFV build.IPFV / build.PFV  
 szalaś / śpiewać / #zaśpiewać hymn.  
 hut / sing.IPFV / sing.PFV national.anthem  
 ‘Jan has started/has finished building a hut/singing the national anthem.’

The aspect of phasal verbs does not influence the above pattern, compare (2).

- (2) Jan zaczynał / kończył budować / #zbudować  
 Jan started.IPFV / finished.IPFV build.IPFV / build.PFV  
 szalaś / śpiewać / #zaśpiewać hymn.  
 hut / sing.IPFV / sing.PFV national.anthem  
 ‘Jan was starting/finishing building a hut/singing the national anthem.’

Temporal delimitation of verbs that are under the scope of the perfective aspect always implies some sort of completeness. Completeness can have different realizations, depending on the way delimitation is expressed. In the next section, we will discuss some of those realizations. We will concentrate on the orientation on the completion of an entire event with a gradual/total affectedness of a direct object, which are restricted to incremental theme verbs.

## 2. Aspect and the interpretation of nominal arguments

### 2.1. Aspect-dependent interpretation of a direct object

As was mentioned before, the interpretation of a direct object argument under (im)perfective aspect depends on the semantic class a verb belongs to (cf. for instance Krifka, 1989a, 1989b, 1989c, 1992; Filip, 2005; Szucsich, 2005). Compare the following Polish examples of motion verbs.

- (3) Jan przytargał worek ziemniaków.  
 Jan lugged.PFV sack potatoes.of  
 ‘Jan has lugged a sack of potatoes.’  
 Implication: A sack of potatoes reached its destination.

- (4) Jan targał worek ziemniaków.  
 Jan lugged.IPFV sack potatoes.of  
 ‘Jan was lugging a sack of potatoes.’  
 Implication: A sack of potatoes did not necessarily reach its/any destination.

The difference between (3) and (4) lies in the success of reaching a location by the object. In (3), where the perfective verb is used, the sack of potatoes reached its destination. The sentence cannot be continued with ‘but he (Jan) did not bring it finally’. In (4), however, Jan and the sack of potatoes were covering some implicit non-finite path (cf. Filip, 2005; Zuchewicz,

2020), but it is left open whether they have reached any goal; moreover, there need not be any goal at all. It can be the case that Jan was carrying the sack of potatoes just for fun. Therefore, the sentence can be continued with ‘but he (Jan) did not bring it finally’. Crucially, there is no gradual relation between the progress of the process of carrying and the affectedness of the object. The structure of potatoes does not change during this process either independently of the aspectual marking.

Another example for the lack of the direct and gradual affectedness of the object by the verbal process is that of perception verbs. Consider a minimal pair (5) and (6).

- (5) Jan      usłyszał      dziecko      /      poczuł      deszcz.  
 Jan      heard.PFV      child      /      felt.PFV      rain.  
 ‘Jan has heard a child / has felt the rain.’

Implication: Jan started hearing a child/feeling the rain. There was a specific event of Jan’s hearing a child/feeling the rain.

- (6) Jan      słyszał      dziecko      /      czuł      deszcz.  
 Jan      heard.IPFV      child      /      felt.IPFV      rain  
 ‘Jan heard a child / felt the rain.’

Implication: Jan heard a child’s voice/felt the rain for some period of time (and maybe he still hears it/feels it at the utterance time).

In (5) and (6), the difference between the perfective and the imperfective lies in the aktionsart-based enrichment of the meaning of the perfective variants. Whereas both imperfective forms are states, their perfective counterparts receive an inchoative interpretation. In the former case, there is no temporal limitation on the duration of the hearing or feeling event. In the latter case, however, the left boundary of these events is marked. Importantly, the child and the rain are not affected by being perceived.

Now we can take a look at incremental theme verbs that are the main topic of this paper. Consider the following examples, based on the initial observation of Wierzbicka (1967).

- (7) Jan      skonsumował gruszkę,      #której      resztki      widzisz  
 Jan      consumed.PFV pear      of.which      rests      see.2SG  
 na      stole /      #ale      część      zostawił.  
 on      table /      but      part      left

‘Jan has consumed a pear the rests of which you see on the table/but he left a part of it.’

Implication: The process of eating is completed; the pear is not there anymore.

- (8) Jan      konsumował      gruszkę,      której      resztki      widzisz  
 Jan      consumed.IPFV      pear      of.which      rests      see.2SG  
 na      stole /      ale      część      zostawił.  
 on      table /      but      part      left

‘Jan was consuming a pear the rests of which you see on the table/but he left a part of it.’

Implication: The process of eating is not necessarily completed. The amount of pear decreases during the process of eating.

Examples (7) and (8) make clear that a direct object of incremental theme verbs is directly influenced by the verbal process. More precisely, it gradually changes its quantity in the course of this process. The perfective implies a total affectedness, which, in the case of the object of ‘consume’, translates to a complete disappearance of the object. In contrast, the imperfective ‘consume’ only implies a partial affectedness of the object, i.e. its partial disappearance.

The fact that partial affectedness of the object is indeed implied by imperfective incremental theme verbs can be confirmed by (9), a phenomenon known as veridicality of the progressive (cf. Giannakidou and Zwarts, 1999; Giannakidou, 2014).

- (9) Jan konsumował gruszkę, #ale jest ona wciąż cała /  
 Jan consumed.IPFV pear but is it still intact /  
 #ale nawet nie zaczął.  
 but even NEG started

‘Jan was consuming a pear that is still intact/but he did not even start.’

Implication: There is a 1:1-relationship between subevents of eating a pear and parts of the pear that underwent these subevents (the so-called homomorphism from (sub)objects to (sub)events and vice versa, cf. Krifka, 1989a, 1989b, 1989c, 1992).

As was mentioned above, the way a direct object is affected by an incremental theme verb depends on the lexical semantics of the latter. ‘An article’ in ‘read an article’ is an incremental theme, although the internal structure of the article does not change during the process of reading. However, the number of pages that were read corresponds to the realized subevents of reading (cf. Zuchewicz, 2020). More precisely, we can assume that there is an ideal of ‘read x’, where x is read till the end. In order to achieve this ideal (the so-called inherent culmination point of accomplishments), a group of temporally ordered subevents: {e1 < e2 < e3 < e4} gradually minimize the amount of pages that are left to be read. If x has 50 pages, we could have the following constellation: e1 → 40 pages left, e2 → 30 pages left, e3 → 15 pages left, e4 → 0 pages left. This shows that the completion of ‘read x’ is being achieved incrementally.

Importantly, an object is never incremental per se, compare (10).

- (10) Jan namalował / #zjadł gruszkę, która leży na talerzu  
 Jan painted.PFV / ate.PFV pear which lies on table  
 w dużym pokoju.  
 in big room

‘Jan has painted/has eaten a pear that is lying on the plate in the living room.’

An interesting observation about (10) is that, despite the lack of the incremental relation between painting a pear that is lying on the table and this pear itself, there is an incremental relation between the painting event and the pear that is being painted. This relation is based on the gradual creation of an abstract object.

In the following, we will discuss Krifka’s formal implementation of the aspect-dependent (partial) completion of incremental theme verbs based on the homomorphism principle. We will further explain the advantage of an alternative analysis that defines partition only on the level of events, without dividing an object into parts.

## 2.2. Theoretical implementation by Krifka

Krifka (1989a: 92) formulated certain relations that define incrementality of a complex verbal predicate. Relations that must hold for all incremental theme verbs are mapping to objects (11) and mapping to events (12).

$$(11) \quad \forall R[\text{MAP-O}(R) \leftrightarrow \forall e \forall e' \forall x [R(e, x) \wedge e' \subseteq_{EE} e \rightarrow \exists x' [x' \subseteq_{OX} x \wedge R(e', x')]]]$$

$$(12) \quad \forall R[\text{MAP-E}(R) \leftrightarrow \forall e \forall x \forall x' [R(e, x) \wedge x' \subseteq_{OX} x \rightarrow \exists e' [e' \subseteq_{EE} e \wedge R(e', x')]]]$$

According to mapping to objects (11), for every subevent, there is a respective subobject. For instance, every partial event of smoking a cigarette can be linked to the part of a cigarette that disappeared during that specific subevent. The reverse case holds for mapping to events (12). Here, parts of objects correspond to parts of events. Referring to the cigarette example, for every part of a cigarette that disappeared during a particular subevent of smoking, there exists such a subevent. Crucially, the presence of partial events requires the presence of partial objects that are mapped to these subevents, and the presence of partial objects implies that there are subevents that relate to these subobjects, and that have caused the affectedness of these subobjects (cf. Krifka, 1989a: 92). Importantly, the lack of partial objects implies the lack of partial events and vice versa.

Incremental theme verbs that combine with gradual effected ('house' in 'build a house') or gradual consumed patients ('cigarette' in 'smoke a cigarette') – the terminology is adapted from Krifka (1989a: 96) – are describable by an additional rule that is called uniqueness of events. Consider (13), cf. Krifka (1989a: 92).

$$(13) \quad \forall R[\text{UNI-E}(R) \leftrightarrow \forall e \forall e' \forall x [R(e, x) \wedge R(e', x) \rightarrow e = e']]$$

(13) applies to cases where an object is related to exactly one event. For instance, there can be only one event of smoking a particular cigarette, building a particular house etc. In contrast, the same book can be read multiple times, which is why uniqueness of events does not apply to incremental theme verbs that take gradual patients.

Clause-embedding incremental theme verbs that will be discussed in the next section belong to the 'read a book'-group, which means that uniqueness of events does not relate to them either. In line with Zuchewicz (2020), we will refer to their arguments as gradual revealed patients.

The question arises as to how we can mark the lack of accessibility of subobjects and subevents in the case of the perfective aspect, where total affectedness of the object is implied. Building upon Krifka (1989b: 187), perfective incremental theme verbs can be represented by the combination of the explicit marking the incremental relation (INC) and the maximization restriction on the object (MAX), cf. (14) for 'Jan built.PFV a chair.' Since 'chair' appears in its totality, we cannot access its parts. As was mentioned above, the accessibility of parts of objects and events only functions as a 1:1 relationship.

(14)  $\lambda e \exists x [\text{build}(e) \wedge x = \text{MAX}(\text{chair}) \wedge \text{INC}(e, x) \wedge \text{AG}(e, J)]$

As was mentioned above, Krifka's account works for cases with a nominal incremental theme, where it is the object itself that has parts. In the next section, we will move on to incremental theme verbs with propositional complements. With the latter, an internal argument is realized by a *that*-clause. Crucially, as observed by Zuchewicz (2020), we cannot divide a proposition described by a *that*-clause into parts the way we divided nominal incremental themes. Therefore, following Zuchewicz (2020), we propose restricting incrementality to the level of events, which enables a unified analysis for different types of incremental relations. This will be done in the next sections.

### 3. Aspect and the interpretation of clausal complements of incremental theme verbs

#### 3.1. An overview

Based on entailment patterns of (im)perfective clause-embedding verbs in Polish discussed in Zuchewicz (2018), Zuchewicz (2020) empirically investigated the relationship between aspect of three groups of such predicates and the truth-related meaning of the respective embedded propositions. The goal of the study was to verify whether and to what extent certain perfective clause-embedding predicates enforce their complements to be true. Furthermore, imperfective forms were used as primers, in order to investigate their relation to a possible lack or even blocking of truthfulness.

For the purpose of this paper, we will only discuss results for the so-called reveal-type predicates ('prove (that)', 'reveal (that)', 'show (that)'),<sup>2</sup> which exhibit an incremental structure and constitute a clausal counterpart to incremental theme verbs that combine with a nominal incremental theme.

In the next subsection, we will describe the truth inference of reveal-type predicates in more detail. Following this, we will present empirical evidence from the acceptability-judgement study (Zuchewicz, 2020).

#### 3.2. Truth-entailment as a counterpart to total affectedness

Our object of investigation are pairs of sentences as presented in (15) and (16), adapted from Zuchewicz (2018, 2020).

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<sup>2</sup> This term was proposed by Zuchewicz (2020).

- (15) Jan udowodnił / dowiódł / wykazał /  
 Jan proved.PFV / proved.PFV / revealed.PFV /  
 pokazał, że Inga nie ma sześciu lat, #ale się  
 showed.PFV that Inga NEG has six years but REFL  
 pomylił / #ale okazało się to nieprawdą.  
 was.wrong / but turned.out REFL it not.truth  
 ‘Jan has proved/revealed/shown that Inga is not six years old, but he was wrong/but it turned out to be wrong.’  
 → Inga is not six years old.

- (16) Jan udowadniał / dowodził / wykazywał /  
 Jan proved.IPFV / proved.IPFV / revealed.IPFV /  
 pokazywał, że Inga nie ma sześciu lat, ale się  
 showed.IPFV that Inga NEG has six years but REFL  
 pomylił / ale okazało się to nieprawdą.  
 was.wrong / but turned.out REFL it not.truth  
 ‘Jan was proving/revealing/showing that Inga is not six years old, but he was wrong/but it turned out to be wrong.’  
 ⇒ Inga is not six years old.

The above examples demonstrate that perfective incremental theme verbs (15), in contrast to their imperfective counterparts (16), imply that the proposition expressed by the *that*-clause is true; only (16) can be followed by ‘but he was wrong’ / ‘but it turned out to be wrong’. However, the inference presented in (15) does not survive under negation, in yes-/no-questions or after the addition of a modal adverbial, cf. (17), adapted from Zuchewicz (2018, 2020).

- (17) Jan nie udowodnił / dowiódł / wykazał /  
 Jan NEG proved.PFV / proved.PFV / revealed.PFV /  
 pokazał, że Inga nie ma sześciu lat.  
 showed.PFV that Inga NEG has six years  
 ‘Jan has not proved/revealed/shown that Inga is not six years old.’  
 ⇒ Inga is not six years old.

The fact that the truth-inference of the perfective is restricted to the affirmative environment, i.e. that it does not project and is therefore not presupposed (cf. Morgan, 1969; Langendoen and Savin, 1971; Chierchia and McConnell-Ginet, 2000 for the projection pattern), confirms that it is an implication (an entailment) and not a presupposition (cf. Kiparsky and Kiparsky, 1970; Karttunen, 1971 among others).

According to Egré (2008: 101), a verb that entails the truth of its complement in a positive declarative form, i.e. that fulfills the condition: ‘ $V_p \rightarrow p$  for all  $p$ , where  $p$  is a *that*-clause’, is veridical (cf. also Giannakidou, 1994, 1998, 1999). We will adopt this terminology and call reveal-type predicates veridical verbs (in line with Zuchewicz, 2020).

The question arises as to how veridicality relates to total affectedness. Following Zuchewicz (2020), a veridical interpretation of perfective reveal-type predicates in Polish results from the presence of a proof for an embedded proposition. A proof consists of sequences of single pieces

of evidence. Thus, it exhibits a complex internal structure. If evidence available suffices to establish a proof, a that-sentence holds, i.e. a matrix verb receives a veridical meaning. Sufficient (maximal) evidence is only implied by the perfective aspect, and veridicality is a natural way of realizing completeness in the case of reveal-type predicates; something that has been proved/revealed/shown is usually taken for granted, unless there is an explicit indication that it should not. In other words, truthfulness is a natural component of the meaning of a proof which itself implies the presence of a sufficient amount of evidence.

The contrast between perfective and imperfective reveal-type predicates lies in implicating different amounts of evidence for the validity of a that-sentence. The imperfective implies that there is some (but not enough) evidence, i.e. that something has been done towards the establishment of the truth-value of an embedded proposition, and it implicates that there is no proof.<sup>3</sup> On the event level, it works similarly to the realization of parts of events in the case of incremental theme verbs with nominal incremental themes (the presence of partial completions of eating bread/drinking water, with bread and water being affected by the corresponding processes), cf. (18), based on Zuchewicz (2020).

- (18) Jan      udowadniał /      dowodził /      wykazywał /  
 Jan      proved.IPFV /      proved.IPFV /      revealed.IPFV /  
 pokazywał,      że      Inga      nie      ma      sześciu      lat,      #ale      nic  
 showed.IPFV      that      Inga      NEG      has      six      years      but      nothing  
 nie      zrobił      w      tym      kierunku.  
 NEG      did      in      this      direction  
 ‘Jan was proving/revealing/showing that Inga is not six years old, but he did nothing to prove it.’  
 → Certain steps have been taken towards answering the question whether Inga is six years old or not.

According to Zuchewicz (2020), composing proof is incremental, and it can be compared to the creation of a new object. For instance, if we are planning to build a playhouse for our child, we can either buy all parts in a shop or do it from scratch by ourselves. Both ways can result in the existence of a playhouse. This shows that there are many possibilities of getting to x. Similarly, there can be different ways of proving p. For example, during an investigation, two commissioners may independently come to the same conclusion.

Zuchewicz (2020) points out that there is a crucial difference between building x and proving p however. While one cannot build the same house from different sets of parts/build the same house again and again, one can prove the same proposition by going multiple paths (by starting with different pieces of evidence, verifying different hypotheses etc.). With respect to this, proving p is more like reading x, where the same object can be affected by the verbal process unlimitedly.

<sup>3</sup> The fact that the lack of proof in the case of the imperfective is an implication can be confirmed by the semantic well-formedness of sentences like: *Jan udowadniał/dowodził/wykazywał/pokazywał, że Inga nie ma sześciu lat i miał rację. Ona ma dwanaście lat.* ‘Jan was proving/revealing/showing that Inga is not six years old, and he was right. She is twelve years old.’ The same observation holds true for incremental theme verbs that take nominal complements: *Jan jadł czekoladę i nie zostawił nam ani kawałka.* ‘Jan was eating chocolate and he did not even leave a piece for us.’, cf. Padučeva (1996); Grønn (2003); Mueller-Reichau (2018) for different instances of the factual imperfective in Russian, and Danielewiczowa (2002); Zuchewicz (2020) for Polish.

To sum it up, we have shown that reveal-type predicates exhibit an incremental structure. The imperfective implies the presence of some pieces of evidence (some hints) for the validity of an embedded proposition, which are not strong enough to be transformed into a proof though. In contrast, the perfective implies the existence of maximal evidence, i.e. of a proof. In line with Zuchewicz (2020), the perfective builds upon the meaning of the imperfective by inserting a crucial piece of evidence to a proof chain. Importantly, composing a proof is incremental in nature: Even if a crucial piece of evidence appears immediately, we still have several steps in a proof chain that have led to its detection. The presence of a proof for the proposition expressed by the *that*-clause explains a veridical meaning of perfective reveal-type predicates.<sup>4</sup>

In the next subsection, we will briefly discuss empirical evidence for veridicality of perfective clause-embedding reveal-type predicates in Polish, and for the lack of (inherent) veridicality in the case of the respective imperfective counterparts (Zuchewicz, 2020). The fact that Polish native speakers interpret perfective reveal-type predicates as veridical speaks for the integration of veridicality into the core lexical meaning of these verbs.

### 3.3. Empirical evidence for the relationship between perfectivity and veridicality in Polish

Zuchewicz (2020) conducted an acceptability judgment study with 51 Polish native speakers. 10 clause-embedding reveal-type predicates – 5 minimal pairs that differed only with respect to the aspect of the matrix verb – were presented jointly in a factive and a non-factive scenario. The experimental design included a Likert scale with joint presentation, cf. Marty et al. (2018).

Figure 1 shows an example of a test item for the aspectual pair *udowodnić* – *udowadniać* ‘prove’. Importantly, the participants were never presented with the members of an aspectual pair in the two scenarios one after another. Furthermore, (im)perfective alternatives of every verb pair were presented in reverse order in the (non-)factive environments (for example, for a verb pair X, first perfective, second imperfective in a factive context, and first imperfective, second perfective in a non-factive one).

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<sup>4</sup> Building upon Zuchewicz (2020), it needs to be pointed out that the proof for a proposition as defined in this paper needs to be distinguished from a mathematical proof (Schroeder-Heister, 1991; Martin-Löf, 1998; Schroeder-Heister, 2006 among others). The truth of a proposition, in contrast to the mathematical truth, holds independently of the process of proving. More precisely, neither does the ‘truth’ depend on the subevents of proving, nor do single pieces of evidence (hints) depend on each other. For example, the answer to the question ‘Who ate two boxes of donuts?’ does not depend on the result of an investigation; there is a particular person who ate two boxes of donuts in the world of evaluation. Furthermore, evidence 1: Anna was playing with a friend outside {so it was not her who ate two boxes of donuts}, and evidence 2: Ela was at school {so it was not her either} are independent pieces of evidence that cause a progress of an investigation but are not necessary in order to find a culprit.

<u>Factive scenario</u>	<u>Non-factive scenario</u>
Consider what follows a fact: Today it became clear that Alicja stole our company computer.	Consider what follows a fact: Today it became clear that Fryderyk stole our company computer.
Commissioner Jankowski and commissioner Nowak independently of each other investigated the case. Only commissioner Nowak irrefutably documented that Alicja was to blame –	During the investigation commissioner Malinowski picked out Józef, and commissioner Stępień Fryderyk. Commissioner Malinowski could hardly accept that he was wrong –
(a) <i>(He) proved.PFV that she was guilty.</i> very good OOOOOO very bad	(a) <i>(He) proved.IPFV that Józef was guilty.</i> very good OOOOOO very bad
(b) <i>(He) proved.IPFV that she was guilty.</i> very good OOOOOO very bad	(b) <i>(He) proved.PFV that Józef was guilty.</i> very good OOOOOO very bad

Figure 1: A factive and a non-factive scenario for the verb pair *udowodnić – udowadniać* ('prove'), adapted from: Zuchewicz (2020: 137–138).

Joint presentation was used in order to ensure that differences in acceptability could only be traced back to aspect (for the importance of deciding on the right task, see Sprouse and Almeida, 2011, 2017 among others).

Participants were asked to mark the acceptability of both alternatives in the given scenarios on a 7-point scale between 'perfect' and 'very bad'. In the factive scenario, it was expected that perfective forms are ranked higher than their imperfective counterparts. In the non-factive scenario, the reverse tendency was expected to occur. Crucially, while the imperfective was not expected to be completely rejected in the factive context, the perfective was expected to be rejected in the non-factive one. The names of the characters were unique for every verb pair in a particular scenario, which means that each name occurred in the experiment only once.

Figure 2 summarizes the results for reveal-type-predicates.

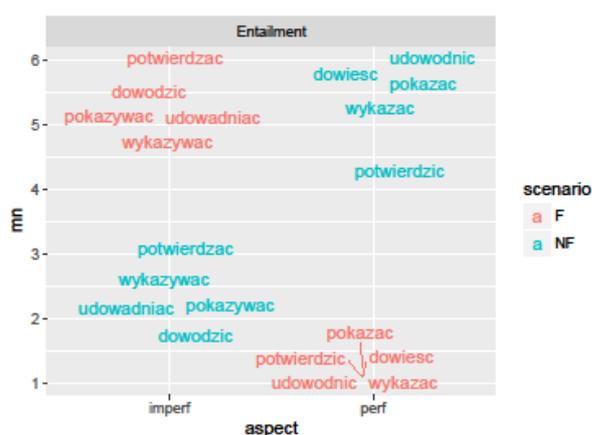


Figure 2: Acceptability of (im)perfective reveal-type predicates in Polish in a factive (F) and a non-factive scenario (NF). '1' stands for the highest acceptance and '6' for the lowest one.

Figure 2 clearly shows that (im)perfective forms of reveal-type predicates are complementary distributed across scenarios, which means that the results were even stronger than expected.

Whereas the perfective is only accepted if it embeds true states of affairs, the imperfective is almost only possible with that-sentences which do not hold true.<sup>5</sup>

Zuchewicz (2020: 145) analyzed the results with the paired-samples t-test (cf. Gries, 2009 among others). It revealed, for the factive scenario, a significant difference between the perfective and the imperfective aspect ratings ( $t = 24.983$ ,  $df = 4$ ,  $p < 0.001$ ), with the imperfective scoring lower (i.e. being worse) than the perfective. In the non-factive scenario, the reverse difference occurred, also significant ( $t = -6.0464$ ,  $df = 4$ ,  $p < 0.01$ ), with the perfective scoring lower than the imperfective.

As was mentioned above, these results confirm that there is a correlation between verbal aspect with incremental theme verbs and the veridical interpretation of these verbs.<sup>6</sup>

#### 4. A unified analysis of incremental theme verbs regardless of their argument type: Formalization with the REAL-operator

In this section, we will present a unified analysis of incremental theme verbs that combine with either nominal or propositional complements, based on Zuchewicz (2020). In line with Zuchewicz (2020), we will follow Neo-Davidsonian event semantics (Castañeda, 1967; Carlson, 1984; Parsons, 1990; Krifka, 1992; Landman, 2000; Champollion, 2016 among others), and introduce variables for events only. The representation of nominal and propositional complements is ensured by establishing an incremental relation between a verbal event and an object (in the following the so-called INC-relation, where INC stands for ‘incrementality’). The advantage of choosing Neo-Davidsonian event semantics lies in the fact that, in this approach, all arguments are represented as relations to events (i.e. the type of object does not matter for its representation; there is no differentiation between arguments and adjuncts), which is why the integration of a clausal complement into the analysis does not make it necessary to significantly modify and additionally justify the formulas.

We will begin with the analysis of incremental theme verbs that take a nominal incremental theme.

<sup>5</sup> Following lexemes were investigated: *udowodnić*.pfv – *udowadniać*.ipfv ‘prove’, *dowieść*.pfv – *dowodzić*.ipfv ‘prove’, *wykazać*.pfv – *wykazywać*.ipfv ‘reveal’, *pokazać*.pfv – *pokazywać*.ipfv ‘show’ and *potwierdzić*.pfv – *potwierdzać*.ipfv ‘confirm’.

Zuchewicz (2020) included ‘confirm’ to the data set for explorative reasons. An interesting result is that, in contrast to other perfective verbs listed above, *potwierdzić* was not completely ruled out in the non-factive scenario; it received a middle acceptance rate, cf. Figure 2. This means that it lacks inherent veridicality. Consider also the following contrast: *Krzysiek #proved/confirmed that Iga was guilty, although she was not guilty, and he knew about that {about the fact that Iga was not guilty}* (adapted from: Zuchewicz, 2020: 155). Furthermore, it can be shown that ‘confirm’ does not exhibit an incremental structure: *Krzysiek just #proved/confirmed that Iga became a new boss, without having dealt with the case at all* (adapted from: Zuchewicz, 2020: 155). These observations provide an extra argument for the relationship between incrementality and veridicality.

In line with Zuchewicz (2020), we do not treat ‘confirm’ as a reveal-type predicate.

<sup>6</sup> The correlation between perfectivity and veridicality (or rather between perfectivity and different types of truth-inferences) is not restricted to Polish. Zuchewicz (2020) provided further evidence from Czech, Russian, Hungarian and two Austronesian languages Daakaka and Mavea. Bhatt (1999) described such a relationship for perfective ability modals and their complements in Greek and Hindi, and Hacquard (2006) followed with similar examples from French. For more details on the cross-linguistic evidence see Zuchewicz (2018, 2020).

#### 4.1. Incremental theme verbs with nominal complements

As was mentioned above, incremental theme verbs that take nominal complements enforce the affectedness of the object by the verbal process and a 1:1 correlation between (sub)objects and (sub)events. However, the affectedness can but does not have to imply changing the internal structure of the object. For instance, an essay that has been read remains the same before, during and after the process of reading; its pages are gradually integrated into every subevent of reading, though. In contrast, a pear disappears completely after it has been eaten. Thus, a crucial criterion for incrementality is an incremental/gradual relation between a verb and its argument.

Following Zuchewicz (2020), we are making use of the REAL-operator that scopes over (partial) events that are realized in the world of evaluation. The realization can be specified as eating, drinking, reading, proving etc., so it is not bound to any particular sort of affectedness. Although REAL explicitly relates to (partial) events, the events themselves contain (partial) objects as their essential components; an incremental event cannot be instantiated without its incremental theme. More precisely, the realization of partial events implies the realization/affectedness of partial objects, and the realization of an entire event implies the affectedness of an entire object (due to the 1:1 relationship between (sub)objects and (sub)events). After the endpoint of an entire event has been reached, the accessibility of parts of an object is blocked.

We can start with the perfective *zbudować szafkę* ‘build.PFV cabinet’, cf. (19). Based on Zuchewicz (2020), the perfective implies that a complete event *e* has been realized in the world of evaluation  $w_0$ , i.e. that a cabinet has been created.

Building upon Zuchewicz (2020: 179), (19) can be read as follows: *e* is an entirely realized building event in  $w_0$  that is in an incremental relation to a cabinet in  $w_0$ . A complete realization of an entire event implies a complete affectedness of an object, since the object is incrementally bound to the entire event.

(19) in  $w_0$ :  
 $\lambda e[\text{build}(w_0)(e) \wedge \text{REAL}(w_0)(e) \wedge \text{INC}(w_0)(e, \text{cabinet})]$

with existential closure:

$\exists e[\text{build}(w_0)(e) \wedge \text{REAL}(w_0)(e) \wedge \text{INC}(w_0)(e, \text{cabinet})]$

Adapted from: Zuchewicz (2020: 180)

(20) illustrates single steps in the derivation that have led to (19). Based on Zuchewicz (2020: 180), we follow standard assumptions on aspectual composition, where the aspect combines with a VP in order to form the aspect phrase. Step 3 introduces the meaning of the perfective; the perfective requires the realization of the entire event *e* in the world of evaluation  $w_0$ .

- (20) **V** 1.=  $\lambda P\lambda e[P(e)](\text{build})$   
**VP** 2.=  $\lambda e[\text{build}(e) \wedge \text{INC}(e, \text{cabinet})]$   
**Asp<sub>pfv</sub>** 3.=  $\lambda P\lambda e[P(w_0)(e) \wedge \text{REAL}(w_0)(e)]$   
4.=  $\lambda P\lambda e[P(w_0)(e) \wedge \text{REAL}(w_0)(e)](\lambda e[\text{build}(e) \wedge \text{INC}(e, \text{cabinet})])$   
**AspP** 5.=  $\lambda e[\text{build}(w_0)(e) \wedge \text{REAL}(w_0)(e) \wedge \text{INC}(w_0)(e, \text{cabinet})]$   
Adapted from: Zuchewicz (2020: 180)

In contrast, the imperfective *budować szafkę* ‘build.IPFV cabinet’ (21) implies the realization of partial events  $e'$  in  $w_0$ . We can read (21) as follows:  $e$  is an ideal of a building event in  $w_0$  (i.e. a building event that reaches its natural endpoint, giving rise to the creation of a new object) that has not been realized in  $w_0$ , and  $e'$  is a part of  $e$  in  $w_0$  that has been realized in  $w_0$ . There is an incremental relation between the ideal (complete) event  $e$  and a cabinet in  $w_0$ . The instantiation of a partial event implies the creation of some parts of a cabinet; since there is an incremental relation between the object and an ideal event, and since parts of this event are realized in  $w_0$ , there exist corresponding parts of the cabinet that are effects of the finished subphases of the building process. Importantly, the whole event  $e$  does not necessarily exist totally in the real world, as **REAL** only applies to the partial event  $e'$  (cf. Zuchewicz 2020: 180).

- (21) in  $w_0$ :  
 $\lambda e'\lambda e[\text{build}(w_0)(e) \wedge e' \sqsubseteq e \wedge \text{REAL}(w_0)(e') \wedge \text{INC}(w_0)(e, \text{cabinet})]$

with existential closure:

$$\exists e'\exists e[\text{build}(w_0)(e) \wedge e' \sqsubseteq e \wedge \text{REAL}(w_0)(e') \wedge \text{INC}(w_0)(e, \text{cabinet})]$$

Adapted from: Zuchewicz (2020: 181)

Compared to the perfective, the only difference in the derivation is the modification of the meaning of an aspectual operator, here **Asp<sub>ipfv</sub>**. As was mentioned above, the imperfective requires the realization of partial event(s)  $e'$  in the world of evaluation  $w_0$ , as step 3 illustrates.

- (22) **V** 1.=  $\lambda P\lambda e[P(e)](\text{build})$   
**VP** 2.=  $\lambda e[\text{build}(e) \wedge \text{INC}(e, \text{cabinet})]$   
**Asp<sub>ipfv</sub>** 3.=  $\lambda P\lambda e'\lambda e[P(e) \wedge e' \sqsubseteq e \wedge \text{REAL}(w_0)(e')]$   
4.=  $\lambda P\lambda e'\lambda e[P(w_0)(e) \wedge e' \sqsubseteq e \wedge \text{REAL}(w_0)(e')](\lambda e[\text{build}(e) \wedge \text{INC}(e, \text{cabinet})])$   
**AspP** 5.=  $\lambda e'\lambda e[\text{build}(w_0)(e) \wedge e' \sqsubseteq e \wedge \text{REAL}(w_0)(e') \wedge \text{INC}(w_0)(e, \text{cabinet})]$   
Adapted from: Zuchewicz (2020: 181)

In the next subsection, we will present semantic representations of (im)perfective incremental theme verbs that combine with propositional complements.

#### 4.2. Incremental theme verbs with propositional complements

According to Zuchewicz (2020), clause-embedding reveal-type predicates like ‘prove’, ‘reveal’ or ‘show’ are incremental, because they imply a gradual creation of proof. Proof has a complex structure that includes single pieces of evidence (hints or steps) that have been taken towards the identification of a crucial piece of evidence. A gradual process of the creation of a proof is similar to the creation of a nominal object. However, the incremental character per se

resembles more that of predicates like ‘read a book’. This is because the validity of a particular proposition can be verified many times, during different events.

We will start with the formal representation of perfective clause-embedding reveal-type predicates, cf. (23) for *pokazać, że* ‘show.PFV that’.

As was said above, perfective reveal-type predicates imply that there is a proof for the proposition expressed by the *that*-clause, which is why this proposition is interpreted as true. Building upon Zuchewicz (2020: 182), (23) receives the following interpretation: *e* is an event of showing (something) that is entirely realized in  $w_0$ , and there is an incremental relation between this event and a propositional object *p* in  $w_0$ . A complete realization of an entire event in the world of evaluation implies the revelation of the truth-conditional object: An embedded proposition holds true, i.e. there is a proof for it.

The only difference between the semantic representation of incremental theme verbs with nominal and propositional complements lies in the specification of the category of a direct object argument.

(23) in  $w_0$ :  
 $\lambda e[\text{show}(w_0)(e) \wedge \text{REAL}(w_0)(e) \wedge \text{INC}(w_0)(e, p^7)]$

with existential closure:

$\exists e[\text{show}(w_0)(e) \wedge \text{REAL}(w_0)(e) \wedge \text{INC}(w_0)(e, p)]^8$

Adapted from: Zuchewicz (2020: 182)

Single steps in the derivation are the same as in the case of incremental theme verbs with nominal arguments.

(24) **V** 1.=  $\lambda P \lambda e[P(e)](\text{show})$   
**VP** 2.=  $\lambda e[\text{show}(e) \wedge \text{INC}(e, p)]$   
**Asp<sub>pfv</sub>** 3.=  $\lambda P \lambda e[P(w_0)(e) \wedge \text{REAL}(w_0)(e)]$   
 4.=  $\lambda P \lambda e[P(w_0)(e) \wedge \text{REAL}(w_0)(e)](\lambda e[\text{show}(e) \wedge \text{INC}(e, p)])$   
**AspP** 5.=  $\lambda e[\text{show}(w_0)(e) \wedge \text{REAL}(w_0)(e) \wedge \text{INC}(w_0)(e, p)]$   
 Adapted from: Zuchewicz (2020: 182)

Now we can move on to the semantic representation of the imperfective counterparts. In line with Zuchewicz (2020), imperfective reveal-type predicates imply the realization of some subevents of entirely non-complete processes of proving/revealing/showing. Since the processes themselves are still ongoing, the evidence available does not suffice to establish a proof for an embedded proposition.

(25) introduces the semantic representation of *pokazywać, że* ‘show.IPFV that’: *e* is an ideal of an event of showing (something) in  $w_0$  that has not been instantiated in  $w_0$ . This ideal represents a situation where something has been proven true (revealed, shown etc.). The ideal *e* has a

<sup>7</sup> *p* represents ‘propositional complement’, cf. Zuchewicz (2020).

<sup>8</sup> The existence of a complete event in a world of evaluation means the revelation of the truth-conditional object, cf. Zuchewicz (2020).

partial event  $e'$  in  $w_0$  that has been realized in  $w_0$ . There is an incremental relation between  $e$  and a propositional object  $p$ . Due to the fact that an incremental relation holds between  $p$  and an ideal/a non-realized event  $e$ , there is no proof for  $p$  yet. The instantiation of (some) subevents of showing  $e'$  implies the presence of single pieces of evidence (hints) that suggest that  $p$ . According to Zuchewicz (2020: 183), imperfective reveal-type predicates can be characterized by the 1:1 mapping between subevents of proving/revealing/showing and single pieces of evidence that occurred during these subevents/that caused a progress in the investigation.

(25) in  $w_0$ :

$$\lambda e' \lambda e [\text{show}(w_0)(e) \wedge e' \sqsubseteq e \wedge \text{REAL}(w_0)(e') \wedge \text{INC}(w_0)(e, p)]$$

with existential closure:

$$\exists e' \exists e [\text{show}(w_0)(e) \wedge e' \sqsubseteq e \wedge \text{REAL}(w_0)(e') \wedge \text{INC}(w_0)(e, p)]$$

Adapted from: Zuchewicz (2020: 183)

As example (26) illustrates, the only difference in the derivation compared to imperfective incremental theme verbs with nominal complements is the presence of a clausal (and not a nominal) patient.

(26) **V** 1. =  $\lambda P \lambda e [P(e)](\text{show})$

**VP** 2. =  $\lambda e [\text{show}(e) \wedge \text{INC}(e, p)]$

**Asp<sub>ipfv</sub>** 3. =  $\lambda P \lambda e' \lambda e [P(e) \wedge e' \sqsubseteq e \wedge \text{REAL}(w_0)(e')]$

4. =  $\lambda P \lambda e' \lambda e [P(w_0)(e) \wedge e' \sqsubseteq e \wedge \text{REAL}(w_0)(e')](\lambda e [\text{show}(e) \wedge \text{INC}(e, p)])$

**AspP** 5. =  $\lambda e' \lambda e [\text{show}(w_0)(e) \wedge e' \sqsubseteq e \wedge \text{REAL}(w_0)(e') \wedge \text{INC}(w_0)(e, p)]$

Adapted from: Zuchewicz (2020: 183)

## 5. Summary

In this article, we proposed an account of generalized incrementality for Polish, building upon Zuchewicz (2020). We have shown that establishing an incremental relation between an event and an object as well as operating on realized/instantiated (parts of) events makes it possible to capture incrementality of predicates regardless of the type of the complement they combine with. We have further shown that incrementality of clause-embedding reveal-type predicates like ‘prove that’, ‘reveal that’ or ‘show that’ is based on composing proof. In line with Zuchewicz (2020), we assume that proof has a complex internal structure; it consists of single pieces of evidence and all other steps that are necessary in order for the investigation to go on. With the perfective, the amount of single pieces of evidence is enough in order to interpret a *that*-clause as true. In this case, evidence turns into a proof. This explains why perfective clause-embedding reveal-type predicates are systematically veridical. In contrast, imperfective reveal-type predicates imply that something has been done towards establishing a truth-value of an embedded proposition, i.e. that there are some pieces of evidence for  $p$ , and they implicate that there is no proof, i.e. that evidence is not sufficient in order to be transformed into a proof. As a result, it is left open whether a *that*-clause holds or not. Following Zuchewicz (2020), we have shown that composing proof does not differ much from building a cabinet or reading an essay. Therefore, we proposed a unified analysis for incremental theme verbs that combine with nouns and clauses.

One of the editors suggested an interesting and important follow-up research on the impact of tense on the veridical interpretation of perfective verbs. Zuchewicz (2018: 482) explains why using the past tense in the (im)perfective matrix verbs in Polish is most suitable for the investigation itself. Since the past tense morphology is available for all stems regardless of their aspectual marking, and since it always results in the reference to the past, it enables the creation of minimal pairs that only differ in the delimitation of events described by matrix verbs. A detailed study on the influence of tense on veridicality will be the subject of future research. We plan to investigate languages with and without a grammatical category of aspect. It cannot be excluded that, depending on the morphological system, some languages allow minimal pairs not only in the past tense/in other tenses. This would be helpful for creating items for empirical studies.

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