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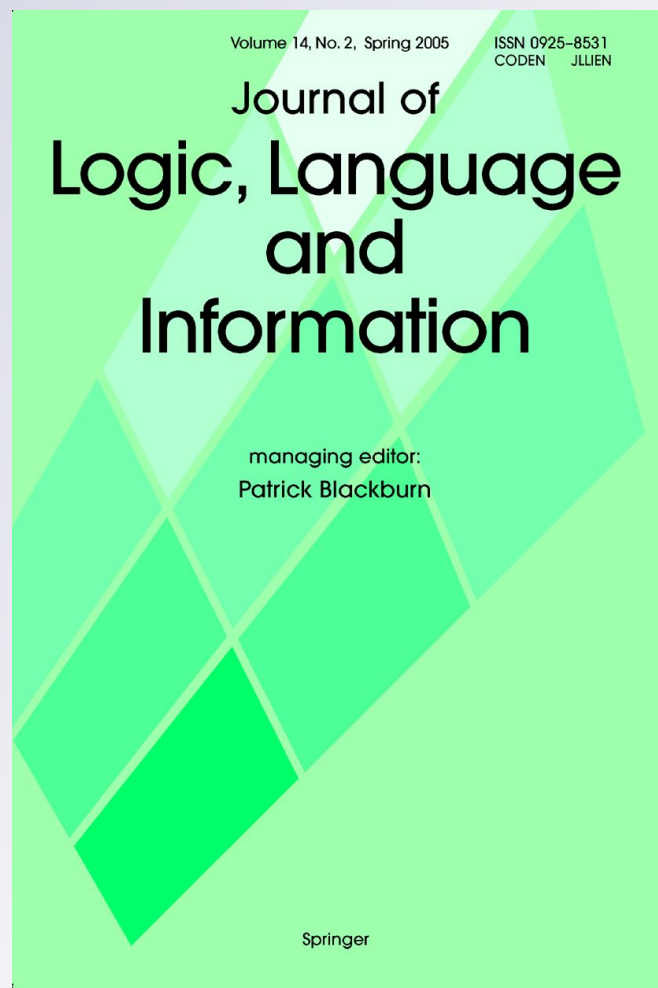
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Imperfective and Perfective Habituals in Polish: A Bi-Directional OT Account of Variation and Ambiguity

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Abstract This study accounts for the observed patterns of variation and ambiguity in the expression and interpretation of aspect in bare habitual statements in Polish in the framework of Bouma's (2008) recent version of stratified bi-directional Optimality Theory (OT).

Keywords Ambiguity · Aspect · Bi-directional Optimality Theory · Habituality · Modality · Variation

1 Introduction

1.1 Aspectual Manifestations of Habituality in Polish: An Introduction

In Polish, there are two aspectual manifestations of habituality: imperfective and perfective habituals exemplified in (1) and (2), respectively:

- (1) a. Xiu pije mleko sojowe na śniadanie.
Xiu drink-imp-pres-3sg milk soy for breakfast.
'Xiu drinks soy milk for breakfast.'
- b. Marysia piecze najlepsze ciasta.
Mary bakes-imp-pres-3sg best cakes.
'Mary bakes the best cakes.'
- (2) a. Janek pomoże w potrzebie.
Janek help-prfv-pres-3sg in need.
'John will help you in need.'

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1.2 Semantic Differences Between Descriptive and Dispositional Habituals

It appears to be the case that only imperfective habituals of the type presented in (1) can be used to express Carlsonian inductive generalisations. For example, an imperfective habitual statement in (1a) can be used in Scenario 1.

Scenario 1 This summer I spent two months at my friend's house in the Sichuan province in China. My friend's name is Xiu. There were so many cultural differences between my eating habits and the eating habits of Xiu. For instance:

- (a) *Xiu pije mleko sojowe na śniadanie* 'Xiu drinks-imp soy milk for breakfast.'
- (b) *#Xiu wypije mleko sojowe na śniadanie* 'Xiu drink-prfv soy milk for breakfast.'

In this scenario, the speaker observes several actual instances of eventualities of Xiu's drinking soy milk for breakfast and this allows her to conclude that there is some pattern, or more specifically that the generalisation is not limited to the actual instances of eventualities only (see [Greenberg 2003](#)). By contrast, the habitual reading of perfective habituals in (2) can only be obtained in scenarios in which a speaker has in mind and a listener accommodates some law-like characteristics of the subject in virtue of which the generalisations they express are true. The generalisation in (2a) can be used in a scenario in which a speaker means that John will help you whenever you are in need in virtue of his inherent disposition of being helpful. The generalisation in (2b) can be used in a scenario in which a speaker means that whenever Julia is offered cheap wine, she will not drink it, because it does not suit her courtly manners. The generalisation in (2c) can be used in a scenario in which a speaker means that whenever John is in a tear-inducing situation, he will not cry, because he is a tough man. Since habitual contexts presented in (2) are true in virtue of an internal disposition of the subject, they will be referred to as dispositional habituals. The main difference between perfective habituals in (1) and imperfective habituals in (2) is in the type of evidence on which the generalisations they express are based. More formally, it is argued that habitual contexts in (1) and those in (2) are morphological manifestations of two different kinds of modality (see [Greenberg 2003](#); [Hacquard 2006](#)). Their truth is evaluated relative to different sets of possible worlds. More specifically, habitual contexts of the type presented in (1) express a *descriptive situation-oriented modality* (they are headed by a modal operator $\text{Hab}_{\text{descr}}$) whereas habitual contexts presented in (2) express a *dispositional habituality* which is *speaker-oriented* (they are headed by a modal operator Hab_{disp}).

1.3 Variation in the Distribution and Interpretation of Aspect in Habitual Contexts

There is a variation in the use and interpretation of Polish perfective and imperfective aspect in the two discussed kinds of habitual contexts. Dispositional habituals can be expressed by means of both perfective and imperfective aspect as shown in (3) and (4), respectively.

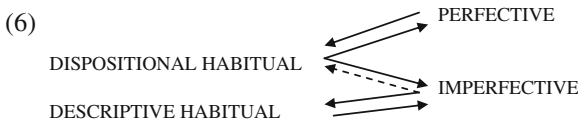
- (3) a. Jane nie zaakceptuje poglądów innych ludzi.
 Jane not accept-prfv-pres-3sg views other people.
 'Jane will not accept other people's views.'

- b. Jane pomoże w potrzebie
Jane help-prfv-pres-3sg in need.
'Jane will help you in need.'
- (4) a. Jane nie akceptuje poglądów innych ludzi.
Jane not accept-imp-pres-3sg views other people.
'Jane will not accept other people's views.'
- b. Jane pomaga w potrzebie.
Jane help-imp-pres-3sg in need.
'Jane helps in need.'

By contrast, descriptive habitual contexts can be expressed by means of imperfective aspect only, as shown in (5):

- (5) a. Maria pali papierosy.
Mary smoke-imp-pres-3sg cigarettes.
'Mary smokes.'
- b. Anna wstaje o 8:00.
Ann get up-imp-pres-3sg at 8 a.m.
'Ann gets up at 8 a.m.'

Thus, dispositional habitual meanings can be expressed by means of perfective or imperfective aspect whereas descriptive habitual meanings can be expressed by means of imperfective aspect only. On the other hand, perfective aspect used in habitual contexts (see example 3) can only obtain a dispositional reading. Imperfective aspect used in habitual contexts is sometimes ambiguous between a descriptive and a dispositional habitual meaning (see example 4) and sometimes it can only get a descriptive habitual reading, as in (5). The discussed facts are schematically summarised in (6):



How does one prove that the generalizations in (3) and (4) are indeed dispositional? As mentioned in the first section, [Carlson \(1995\)](#) claims that apart from inductive generalisations which are based on some observed set of instances, like for example *The Sun rises in the East*, there are generics which do not depend for their truth or falsity upon whether or not there is a set of episodic instances in the world but rather on the **causal forces** behind those instances e.g. *Bishops move diagonally*. In dispositional habitual contexts like those in (3) and (4), the causal force behind the generalisation is a disposition of the subject which a speaker has in mind and a hearer has to accommodate. We can prove that a generalisation is dispositional if we first prove that its truth does not require that there have been 'enough' real instances observed, and secondly if we show that the causal force behind the generalisation is a disposition of the subject, where a disposition is understood as an inherent property of the subject. We can do this by constructing a proper scenario. Consider Scenario 2:

Scenario 2 I met Jane two weeks ago for the first time in my life and we had a short conversation about religion. We had very opposing views but Jane turned out to be a bigot. She was convinced that only her point of view on religion was right. I think

that Jane is the kind of person who **will not/does not accept other people's views no matter what**.

In this scenario, the speaker did not base his generalisation on some observed set of instances of Jane not accepting other people's views, but he found out that she was a bigot and in virtue of this trait of character, she was not willing to accept that people with opposing views could be right. Both perfective and imperfective habitual forms presented in (3a and 4a) can be used in this scenario in Polish. Additionally, the imperfective generalisation in (4a) can have a descriptive reading because it can be based on a set of actual eventualities in which Jane was not willing to accept other people's views. Hence, (4a) gives rise to an ambiguity between a dispositional and a descriptive habitual meaning. How does one prove that the habitual context in (4) cannot be descriptive and dispositional at the same time? Contexts like those in (4) are truly ambiguous, i.e. they either have a descriptive or a dispositional meaning because they can give rise to conflicting interpretations. Consider Scenario 3:

Scenario 3 A: I do not even start discussing controversial issues with Jane. I am sure she **does not accept other people's views**.

B: How do you know that? Did you witness situations in which she strongly criticised someone's opinions?

A: Not really. I just heard from a friend of mine that Jane is very intolerant.

In this scenario, the hearer thought that the speaker based his generalisation on descriptive evidence while in reality the speaker's generalisation that Jane does not accept other people's views was meant to be true in virtue of Jane's being very intolerant. The fact that the conflict in interpretation arises indicates that the statement cannot be based on descriptive and dispositional evidence simultaneously. How does one prove that unlike imperfective generalisations in (4), those in (5) do not have dispositional readings? When we modify imperfective statements (4) and (5) slightly, as shown in (7) and (8), respectively, it turns out that only in statements presented in (7) it is possible to come up with dispositions in virtue of which these generalizations are true.

- (7) a. Jane jest taka, że nie akceptuje poglądów innych ludzi.
Jane is sothat not accept-imp-pres-3sg other people's views
'Jane is so that she does not accept other people's views.'
- b. Jane jest taka, że pomaga w potrzebie.
Jane is sothat help-imp-pres-3sg in need
'Jane is so that he helps other people in need.'
- (8) a. Jane jest taka, że pali papierosy.
Jane is sothat smoke-imp-pres-3sg cigarettes
'Jane is so that she smokes.'
- b. Jane jest taka, że wstaje o 8:00.
Jane is sothat get up-imp-pres-3sg at 8 o'clock
'Jane is so that she gets up at 8 o'clock.'

According to Polish native speakers, it follows from the contexts in (7) that Jane is so intolerant that she does not accept other people's views and that Jane is so kind that she helps other people in need. In imperfective habitual contexts in (8), native speakers of

Polish could not come up with any dispositions in virtue of which these generalisations are true. How does a hearer know which disposition to accommodate? For a habitual statement to count as dispositional, the accommodated disposition has to fulfill an important condition. There must be a stereotype causally connecting the accommodated disposition of the subject and the eventuality expressed in a verb phrase. For example in the case of the contexts in (7a), there is a stereotype according to which if one is intolerant, he or she does not accept otherness. By contrast in (8b), one could argue that we can say that John is so hard-working that he gets up at 8 o'clock, but there is no stereotype according to which it is true that when someone is hard-working he or she gets up at 8 o'clock. The discussed patterns of variation and ambiguity in the expression and interpretation of aspect in bare habitual contexts will be accounted for in the framework of a modified version of a bi-directional Optimality Theory (OT) as developed by Bouma (2008).

2 Descriptive and Dispositional Habitual Contexts: Formal Semantic Commonalities and Differences

In the previous section intuitive differences between descriptive and dispositional habituals were introduced. This section is devoted to a more formal discussion of semantic similarities and differences between descriptive and dispositional habituals. The first thing which descriptive and dispositional contexts have in common is that they both express atemporal, law-like, nonaccidental generalisations over eventualities as they are not limited to the actual eventualities, but rather allow us to predict 'further unexamined cases' (Goodman 1947: 26). In other words, both imperfective and perfective statements express laws, habits, and dispositions which are true of the subject not at a particular point in time but generally. Additionally, it is traditionally assumed in the literature that logical forms of habitual contexts contain a modal Hab operator (cf. Krifka et al. 1995; Filip and Carlson 1997; Lenci and Bertinetto 2000; Ferreira 2005; Boneh and Doron 2008, 2009). We assume that the underlying representation of both imperfective (e.g. *Jan robi pyszne pierogi* 'John makes delicious dumplings') and perfective (e.g. *Jan pomoże w potrzebie* 'John will help in need') habitual statements contains a Hab operator which is represented formally as a universal quantifier $\forall$ relating sets of eventualities in all appropriately accessible possible worlds, as shown in the respective formulae in (9) and (10).

$$(9) \forall w' [w' \text{ is appropriately accessible relative to an event of evaluation} \wedge C(w')] \\ \rightarrow \forall [e[\text{make dumplings}(j,e,w') \rightarrow \text{make delicious dumplings}(j,e,w')]]$$

Paraphrase: In all appropriately accessible worlds determined by context, all eventualities of John's making dumplings are eventualities of John's making delicious dumplings.

$$(10) \forall w' [w' \text{ is appropriately accessible relative to an event of evaluation} \wedge C(w')] \\ \rightarrow \forall [e[\text{do something when you are in need}(j,e,w') \rightarrow \text{help you when you are in need}(j,e,w')]]$$

Paraphrase: In all appropriately accessible worlds determined by context, all eventualities of John's doing something when you are in need are eventualities of John's helping you when you are in need.

As mentioned earlier in Sect. 1.2, imperfective and perfective habitual contexts are morphological manifestations of two different kinds of modality, which means that their truth is evaluated relative to different sets of possible worlds. This difference will be represented formally in the underlined part of the formulae in (9) and (10). As it will be shown in Sects. 2.1 and 2.2, Hab is restricted by a descriptive and a dispositional accessibility relation in the formulae of the type presented in (9) and (10), respectively. This will allow us to make a distinction between $\text{Hab}_{\text{descr}}$ and Hab_{disp} .

2.1 The Formal Semantics of Descriptive Habituals

As mentioned in the first section, descriptive generalisations are made on the basis of a number of actual instances of individuals or eventualities which allow us to conclude that there is some pattern (cf. Carlson 1995; Greenberg 2003). Greenberg (2003) additionally argues that an important aspect of the meaning of descriptive statements is the presupposition of the existence of a sufficient number of relevant instances of individuals or eventualities in the actual world. For instance, the habitual generalization *Janek płaci podatek dochodowy na czas* 'John pays income tax on time' cannot be uttered if the described eventuality happened in the actual world only once. What is the semantics of the Hab operator in generalisations based on a descriptive evidential mechanism (henceforth referred to as $\text{Hab}_{\text{descr}}$)? It is assumed in this study that the semantics of $\text{Hab}_{\text{descr}}$ comprises event iteration and descriptive modality (cf. Boneh and Doron 2008, 2009). The notion of iteration is understood as in Kratzer (2005) as a lexical property of a verb. In their semantics of habituality, Boneh and Doron (2008, 2009) replace the notion of weak lexical plurality (cf. Krifka 1992; Landman 1997; Kratzer 2005) with a stronger notion of iterativity, which excludes singularity. An event argument is lexically iterated when it satisfies a property Q described by a verb and additionally consists of **proper** subevents which also satisfy Q. The second component of the meaning of $\text{Hab}_{\text{descr}}$ is modality. It is claimed here that $\text{Hab}_{\text{descr}}$ is a modal operator which is restricted by a descriptive accessibility relation. What is the nature of the descriptive accessibility relation? We resort to Hacquard's (2006) novel account of modals which differs slightly from Kratzer's traditional theory (1981, 1991) in that it assumes that an accessibility relation of a modal operator is relative to an event of evaluation and not relative to a world of evaluation. In the spirit of Hacquard (2006), it is assumed that an accessibility relation of $\text{Hab}_{\text{descr}}$ is relative to circumstances of an iterated event lexically introduced by a verb, where circumstances of the iterated event are the properties of the event's participants at the event's location and time in the real world. We adopt Hacquard's function $\text{CIRC}(e)$, which is meant to provide semantic content for $\text{Hab}_{\text{descr}}$. $\text{CIRC}(e)$ maps actual circumstances of an iterated event to all the possible worlds restricting $\text{Hab}_{\text{descr}}$. In what follows, the complete semantics of the descriptive habitual statement *John makes delicious dumplings* is given in (11):

- (11) $\forall w_1 \in \text{CIRC}(e) \wedge C(w') \rightarrow \forall [e [\text{make dumplings } (j,e,w') \rightarrow \text{make delicious dumplings } (j,e,w')]]$

Paraphrase: In all possible worlds to which the function $\text{CIRC}(e)$ maps contextually determined circumstances of an iterated event in the actual world, it is the case that all eventualities of John's making dumplings are eventualities of John's making delicious dumplings.

2.2 The Semantics of Dispositional Habituals

Inspired by [Greenberg's \(2003\)](#) analysis of the semantics of indefinite singular generics, we suggest that the habitual reading of perfective statements of the type presented in (2) can only be obtained if a speaker has in mind, and a listener can accommodate, some relatively specific disposition of the subject in virtue of which a generalisation over eventualities is true. Dispositional habituals differ from descriptive habituals in that they do not require that there exist any verifying instances of the described eventualities in the actual world. Another difference between descriptive and dispositional habituals is that the accessibility relation of the former is relative to the circumstances of the iterated event in the actual world, while the accessibility relation of the latter is relative to the event of speaking (cf. [Hacquard 2006](#)). In that sense dispositional habituals resemble epistemic modals e.g. *Jan musi być śpiący po nocnej zmianie* 'John must be sleepy after the night shift'. In fact, there are a number of similarities between dispositional habituals and epistemic modals. Firstly, both epistemic modals and perfective habituals are speaker-oriented in that they describe the speaker's subjective attitude toward the factuality of the proposition. Secondly, when we embed epistemic modals and perfective habitual statements, the subjective conviction is oriented towards the attitude holder in the main clause, as shown in (12):

- (12) a. Marysia uważa, że Jan musi być śpiący po nocnej zmianie.
Mary believes that John must be sleepy after night shift.
'Mary believes that John must be sleepy after the night shift.'
b. Jan uważa, że Xiu nie wypije taniego wina.
Jan believes that Xiu not drink-prfv-pres cheap wine
'Jan believes that Xiu will not drink cheap wine.'

Furthermore, [Anand and Hacquard \(2009\)](#) observe that epistemic modals can appear only in the scope of certain attitude verbs:

- (13) a. John {believes, argues, assumed} that the Earth might be flat.
b. *John {hopes, wishes, commanded} that the Earth might be flat.

Interestingly, the modal meaning of perfective habituals can be maintained only when they occur in the scope of the same attitude verbs which license epistemic modals.

- (14) a. Marcin uważa, że Jan pomoże w potrzebie. (≈felicitous as habitual)
Martin thinks that John help-prfv-pres in need.
'Martin thinks that John will help in need.'
b. Marcin ma nadzieję, że Jan pomoże w potrzebie. (≈infelicitous as habitual)

Martin hopes that John help-prfv-pres in need.
'Martin hopes that John will help in need.'

In [Hacquard's \(2006\)](#) theory, modals are relative to an event of evaluation. [Anand and Hacquard \(2009\)](#) argue that an epistemic accessibility relation of modals can only be licensed by an event with an associated propositional content, which only speech events and certain attitude events have (those in 13a). Content is defined by [Anand and Hacquard \(2009\)](#) as a function $\text{CONTENT}(e)$ which picks out the set of propositions associated with the event e of speaking or an attitude event, which is formalised for epistemic modals as in (15):

$$(15) f_{\text{epistemic}}(e) = \lambda w'. w' \text{ is compatible with } \text{CONTENT}(e)$$

This function is only defined when bound by an event which has a propositional content (speaking event or attitude event). In the spirit of [Hacquard \(2006\)](#) and [Anand and Hacquard \(2009\)](#), we assume that Hab in contexts based on a disposition (henceforth referred to as Hab_{disp}) is speaker-oriented or attitude holder oriented. The accessibility relation of Hab_{disp} is defined by a function $\text{CONTENT}_{\text{disp}}(e)$ which picks out the set of propositions expressing dispositions of the subject which the speaker or the attitude holder have in mind. The dispositional accessibility relation of Hab_{disp} is formalised in (16):

$$(16) f_{\text{dispositional}}(e) = \lambda w'. w' \text{ is compatible with } \text{CONTENT}_{\text{disp}}(e)$$

The complete semantics of the perfective habitual statement *Jan pomoże w potrzebie* 'John will help in need' is formally represented in (17):

$$(17) \forall w \in f_{\text{dispositional}}(e) \wedge C(w') \rightarrow \forall e [\text{do something when you are in need } (j, e, w') \rightarrow \text{help you when you are in need } (j, e, w')]$$

Paraphrase: In all possible worlds in which a relevant disposition which the speaker or the attitude holder has in mind is true (here it is John's being kind), all eventualities of John's doing something when someone in need, are the eventualities of his helping someone.

As mentioned earlier, Hab_{disp} does not presuppose the existence of an eventuality described by a verb in the actual world. This follows from the nature of the dispositional accessibility relation, which is evaluated relative to an event of speaking or an event of holding an attitude and not relative to the actual world event. There are dispositional habitual contexts in which the existence of verifying events described by a verb in the actual world is impossible. Consider contexts in (18):

- (18) a. Salomon nawet kamień ugotuje
Salomon even stone cook-prfv-pres-3sg
'Salomon will boil even a stone.'
- b. Jan z piasku bicz ukręci
John from sand whip make-prfv-pres-3sg
'John will make a whip even out of sand.'

The truth of these sentences should not be relativised to the actual world. The accessibility relation of dispositional habitual sentences is speaker or attitude holder oriented.

This means that we have to assume that the truth conditions of dispositional habitual sentences are evaluated relative to speaker's or attitude holder's beliefs even if they are exaggerated and implausible. Sentences of the type presented in (18) are not fixed expressions. We can generate similar sentences productively e.g. *Jan podniesie Mont Everest* 'John will lift Mount Everest'. The impression of idiomaticity of these contexts arises because the speaker intends vividly to exemplify the disposition of the subject. Having discussed the formal semantics of descriptive and dispositional habitual contexts, we are ready to pass on to the discussion of the formal semantics of perfective and imperfective aspectual forms in Polish. This will help us understand the nature of variation in the distribution and interpretation of aspect in habitual contexts.

3 The Semantics of Polish Perfective and Imperfective Aspect

In Polish, verbs are obligatorily marked for either perfective or imperfective grammatical aspect in all kinds of contexts. The formation of perfective and imperfective verbs in Slavic languages is derivational. Perfective aspect is expressed in the majority of cases by the attachment of a perfectivising prefix to a lexical root e.g. *zbudował* 'built-prfv-ptc-3sg'. In turn, imperfective aspect is expressed by an unprefixd verbal form e.g. *budował* 'built-imp-ptc-3sg' or an imperfectivising suffix *-ywa-* e.g. *dobudowywał* 'built-imp-ptc-3sg (an additional) part of sth'. While the meaning of the perfective operator is fairly specific and it invariably denotes an atomic event e.g. *Jan przeniósł klucz* 'John moved a key (once)', imperfective aspect may give rise to many interpretations. Unlike progressive aspect in English, imperfective aspect in Slavic can be used to denote both unbounded episodic and quantified/frequentative/iterative/habitual eventualities e.g. *Jan kosi trawnik* 'John is mowing/mows the lawn'. In both uses the eventualities in the denotation of imperfective aspect are unbounded. In order to account for the interaction of aspect with Hab_{disp} and $\text{Hab}_{\text{descr}}$ we adopt Kratzer's (1998) semantics of perfective and imperfective aspect with some modifications postulated by Hacquard (2006). Their assumption is that aspect existentially quantifies over an event variable and maps a predicate of events onto a predicate of times by locating the temporal trace of the event $\tau(e)$ with respect to the evaluation time given by tense. Perfective aspect locates the time of the event within the reference time, while imperfective aspect locates the reference time within the temporal trace of an event.

- (19) PERFECTIVE $\sim > \lambda w. \lambda t. \lambda P_{\langle et \rangle}. \exists e[e \text{ is in } w \ \& \ \tau(e) \subseteq t \ \& \ P(e)]$
 IMPERFECTIVE $\sim > \lambda w. \lambda t. \lambda P_{\langle et \rangle}. \exists e[e \text{ is in } w \ \& \ t \subseteq \tau(e) \ \& \ P(e)]$

The semantic entries in (19) include a modification which Hacquard (2006) introduced in the original semantics of aspect proposed by Kratzer (1998). In her study of the interaction between aspect and modality, Hacquard assumed that aspect takes a world argument in its restriction as well as in its scope, and this world argument has to be bound by the closest modal binder. In the absence of such a modal binder, the world argument is by default bound by the actual world. It is argued here that Hab binds the world argument of aspect. There is still one element of the semantics of perfective aspect in Polish which needs to be modified in order to capture an important contrast between perfective aspect in French and in Polish. Boneh and Doron (2009, 4) claim

that in French habituals such as *Paul est allé-prfv à la messe le dimanche pendant trente ans* ‘Paul went to church on Sundays for 30 years’, perfective aspect expresses a habit which is limited within the boundaries of a given time span. By contrast, perfective aspect in Polish cannot express habits included within the boundaries of a given time span as in **Paweł poszedł-prfv do kościoła w niedzielę przez 30 lat* ‘Paul went to church on Sundays for 30 years’, even though this should be possible according to the definition of perfective given in (19). This indicates that perfective aspect in Polish imposes an additional restriction on an event argument, namely that it is atomic (non-iterated). To sum up, perfective aspect in Polish, apart from locating a temporal trace of an event within a reference time, requires that an event e which satisfies a predicate P does not consist of the sum of proper subevents which also satisfy P . This modification is included in the semantic entries of Polish perfective and imperfective aspect in (20) and (21), respectively:

(20) PERFECTIVE $\sim > \lambda w. \lambda t. \lambda P_{<et>}. \exists e[e \text{ is in } w \ \& \ \tau(e) \subseteq t \ \& \ P(e) \ \& \ e \neq \sigma e' [P(e') \ \& \ e' \subset e]]$

(21) IMPERFECTIVE $\sim > \lambda w. \lambda t. \lambda P_{<et>}. \exists e[e \text{ is in } w \ \& \ t \subseteq \tau(e) \ \& \ P(e)]$

Why are these two aspectual forms used and interpreted differently in descriptive and dispositional habitual contexts? This question will be handled in the framework of Bouma’s bi-directional OT model of variation and ambiguity.

4 Bouma’s Bi-Directional OT Model of Variation and Ambiguity

In Optimality Theory, a mechanism of form/meaning optimisation is regulated by constraints which are universal for all speakers of the same language. OT constraints are reflections of linguistic regularities which are potentially conflicting. Conflicts among constraints are resolved because the constraints can be ordered in a constraint hierarchy according to strength. A constraint may be violated, but only in order to satisfy a stronger constraint. A grammar is thus assumed to consist of a ranked set of violable constraints. In OT syntax, the optimal form is chosen for a given input meaning and in OT semantics, the optimal meaning is chosen for a given input form. Sometimes, however, combining OT syntax with OT semantics does not create a consistent relation between forms and meanings, as it will turn out to be the case in our analysis. One way to avoid this mismatch between form and meaning is by adopting a bi-directional approach to optimisation. Following Blutner (2000), we show that hearer perspective and speaker perspective cannot be taken in isolation from each other. When we use a bi-directional OT model, both the speaker and the hearer consider production and interpretation constraints and the most harmonic form-meaning pair is chosen by the speaker and the hearer. Under this view, a grammar consists of a Generator (Gen) which generates a set of candidate form/meaning pairs and a set of universal constraints which form a strict dominance hierarchy or ranking relative to which the candidate form/meaning pairs are evaluated. In Blutner’s (2000) version of a bi-directional OT, a form-meaning pair $\langle f, m \rangle$ is called super-optimal if and only if there is no other super-optimal pair $\langle f', m \rangle$ such that $\langle f', m \rangle \gg \langle f, m \rangle$ ($\gg$ can be read as ‘being more harmonic’), and there is no other super-optimal pair $\langle f, m' \rangle$ such

that $\langle f, m' \rangle \gg \langle f, m \rangle$. [Blutner \(2000, 199–200\)](#) defines grammaticality under strong bi-directional OT as follows:

- (22) A form-meaning pair $\langle f, m \rangle$ is grammatical, iff:
- $\langle f, m \rangle \in \text{Gen}$
 - and there is no $\langle f', m \rangle \in \text{Gen}$ such that $\langle f', m \rangle \gg \langle f, m \rangle$ (production)
 - and there is no $\langle f, m' \rangle \in \text{Gen}$ such that $\langle f, m' \rangle \gg \langle f, m \rangle$ (comprehension)

This grammar imposes a total order on the constraints: $A \gg B \gg C$ which means that there is always one winning candidate for exactly one winning constraint profile. Consequently, there is no way for variation and ambiguity to enter this picture. [Anttila \(1997, 11\)](#) states that ‘since grammar-induced variation is a fact of life there must be some way of modelling variation in OT’. [Bouma \(2008\)](#) solves this problem in bi-directional OT by adopting [Anttila’s \(1997\)](#) way of capturing variation in production. Anttila uses partial rankings of constraints in so-called strata. A language particular grammar is a distribution of the universal constraints over a number of strata. Constraints in different strata are ranked with respect to each other while constraints within strata are unranked with respect to each other. When two constraints in one stratum are unranked, there are two possible constraint rankings which permit two winning candidates. This approach predicts variation. With these modifications in mind, [Bouma \(2008\)](#) develops a new definition of strong bi-directional optimality to include the new ranking scheme, as presented in (23):

- (23) A form-meaning pair $\langle f, m \rangle$ is grammatical in a stratified grammar S (a set of compatible full rankings), iff:
- $\langle f, m \rangle \in \text{Gen}$
 - and there is an $s \in S$ such that
- there is no $\langle f', m \rangle \in \text{Gen}$ such that $\langle f', m \rangle \gg_s \langle f, m \rangle$ (production)
 there is no $\langle f, m' \rangle \in \text{Gen}$ such that $\langle f, m' \rangle \gg_s \langle f, m \rangle$ (comprehension)

The new definition of a bi-directional OT will be used to model variation and ambiguity in the expression and interpretation of Polish bare habituals. In the next section, constraints which are responsible for the discussed aspects of variation and ambiguity are motivated and defined.

5 Constraints Accounting for Variation in the Expression of Aspect in Bare Habitual Contexts in Polish

The main goal of this section is to motivate a set of constraints which regulate the process of optimisation in the expression of aspect in descriptive and dispositional habituals in Polish. The central question is why dispositional habituals can be expressed by means of both perfective and imperfective aspect and why descriptive habituals can be expressed by means of imperfective aspect only. One of the crucial aspects of the semantics of both dispositional and descriptive habituals is the presupposition of the existence of a plural set of events in the domain over which $\text{Hab} (\forall)$ quantifies in all appropriately accessible possible worlds. All verbs in Polish are obligatorily marked for either perfective or imperfective aspect in all kinds of contexts. As it follows from

the semantics of perfective aspect presented in (20), it locates the time of the event within the reference time and it requires that an event argument in its restriction is atomic (non-iterated). In other words, it requires that an event *e* which satisfies a predicate *P* does not consist of the sum of proper subevents which also satisfy *P*. In what follows, perfective aspect is generally allergic to contexts which feature non-atomic event reference. On the other hand, imperfective aspect locates the time of reference within the time of an event; hence the event time can extend without limits. Consequently, imperfective aspect is more suitable in contexts in which reference is made to an underspecified number of eventualities. Under the assumption that members of the perfective/imperfective dichotomy always compete with each other in the process of meaning/form optimisation, it is sufficient to show that there is a linguistic constraint which blocks one aspectual form and by doing so makes the competing form preferable. I argue that this is exactly what happens when a speaker wants optimally to express plural event reference involved in dispositional and descriptive habitual contexts. It is argued in this study that a speaker has in his grammar a violable constraint **Perf/[non-atomic event reference]*, formulated in (24), which blocks the use of perfective aspect in contexts which have non-atomic event reference.

- (24) ****Perf/[non-atomic]***: avoid perfective aspect in contexts which have non-atomic event reference.

Given that in both descriptive and dispositional contexts the *Hab* operator gives rise to the presupposition of the existence of a plural set of events in its domain of quantification, the constraint in (24) predicts that it should be possible to express them both by means of imperfective aspect. This prediction is correct. It is still an open question why only dispositional habituals can be expressed by means of both perfective and imperfective aspect. An essential difference between descriptive and dispositional habituals is that only the former give rise to the presupposition of the existence of a sufficient number of eventualities in the actual world. No such presupposition is present in dispositional habitual contexts. For example, when dispositional contexts in (25) are expressed by means of imperfective aspect, they become implausible, because they presuppose the existence of actual instances of eventualities of Salomon boiling a stone in the actual world, which is common-sensically impossible.

- (25) a. #Salomon nawet kamień gotuje
 Salomon even stone cook-imp-pres-3sg
 ‘Salomon boils even a stone.’
 b. #Jan z piasku bicz kręci
 John from sand whip make-imp-pres-3sg
 ‘John makes a whip even out of sand.’

It appears to be the case that imperfective aspect facilitates an interpretation in which actual instances of eventualities are presupposed to exist in the real world. This motivates the second relevant constraint which says that imperfective aspect should be avoided in contexts in which no reference is made to eventualities in the actual world, as phrased in (26):

- (26) ****Imp/[-actual]***: avoid imperfective aspect in statements in which no reference is made to events in the actual world.

These two aspect-related constraints are sufficient to account for variation in the expression of aspect in descriptive and dispositional habitual contexts in a unidirectional OT framework. In Bouma's (2008) version of Optimality Theory, constraints which are in different strata are ranked with respect to each other, while those constraints which are within one stratum are unranked with respect to each other. Variation and ambiguity arise in the latter case. When two constraints are unranked with respect to each other within one stratum, there are two possible constraint rankings which in turn result in two optimal forms, meanings or form/meaning pairs. It is argued in this analysis that the variation in the expression of dispositional habitual contexts arises since ***Perf/[non-atomic]** and ***Imp/[-actual]** are within one stratum, and hence are unranked with respect to each other. Two possible rankings of these constraints are shown in (27):

- (27) a. ***Perf/[non-atomic]** » ***Imp/[-actual]**
 b. ***Imp/[-actual]** » ***Perf/[non-atomic]**

When the input meaning involves Hab_{disp} , the production optimisation proceeds under the two constraint rankings given in (27) as shown in Tableaux 1 and 2, respectively.

In Tableaux 1 and 2, there are two competing aspectual forms for the expression of a dispositional habitual input meaning. Under the constraint ranking ***Perf/[non-atomic]** » ***Imp/[-actual]** in Tableau 1, perfective aspect violates the higher constraint which says that perfective aspect should be avoided in contexts which involve non-atomic event reference. Therefore, imperfective aspect, which commits a less serious violation of the lower constraint, wins over perfective aspect in the production optimisation. On the other hand, when the ranking is ***Imp/[-actual]** » ***Perf/[non-atomic]**, as in Tableau 2, imperfective aspect violates the highest constraint which says that imperfective aspect should be avoided in contexts in which there is no reference to eventualities in the actual world. Perfective aspect violates the lower constraint, hence it makes a better candidate for the expression of the input meaning. When the input

Tableau 1 Production

DISPOSITIONAL HABITUAL MEANING	*Perf/[non-atomic]	*Imp/[-actual]
Janek pocieszy w potrzebie	*	
John PERF-comfort in need		
 Janek pociesza w potrzebie		*
John comfort-IMP in need		

Tableau 2 Production

DISPOSITIONAL HABITUAL MEANING	*Imp/[-actual]	*Perf/[non-atomic]
 Janek pocieszy w potrzebie		*
John PERF-comfort in need		
Janek pociesza w potrzebie	*	
John comfort-IMP in need		

Tableau 3 Production

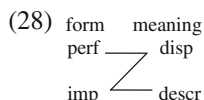
DISPOSITIONAL HABITUAL MEANING	*Perf/[non-atomic]	*Imp/[-actual]
☞ Xiu pije mleko sojowe		
Xiu drinks-IMP soya milk		
Xiu wypije mleko sojowe	*	
Xiu PERF-drink soya milk		

Tableau 4 Production

DESCRIPTIVE HABITUAL MEANING	*Imp/[-actual]	*Perf/[non-atomic]
☞ Xiu pije mleko sojowe		
Xiu drinks-IMP soya milk		
Xiu wypije mleko sojowe		
Xiu PERF-drink soya milk		*

meaning involves $\text{Hab}_{\text{descr}}$, the production optimisation proceeds under the two constraint rankings given in (27) as shown in Tableaux 3 and 4, respectively.

As Tableaux 3 and 4 suggest, imperfective aspect does not lead to any violation of constraints under any of the two rankings. On the other hand, perfective aspect violates the constraint *Perf/non-atomic event reference under both rankings. This explains why all descriptive contexts are always expressed by means of imperfective aspect. These two constraints give us a z-shaped mapping in a simple production optimisation, as shown in (28):



These two aspect-related constraints capture the fact that such imperfective habitual contexts as *Xiu pije mleko sojowe* ‘Xiu drinks-imp soy milk’ are purely descriptive but they are insufficient to account for the fact that imperfective habitual contexts of the type *Jan pomaga w potrzebie* ‘John help-imp in need’ are ambiguous between a descriptive and a dispositional reading. For the imperfective input form e.g. *Xiu pije mleko sojowe* ‘Xiu drinks-imp soy milk’ only the constraint *Imp/[-actual] is relevant in the interpretation optimisation and this constraint is violated by the dispositional reading under both possible rankings, as shown in Tableaux 5 and 6:

Tableau 5 Interpretation

Xiu pije mleko sojowe	*Imp/[-actual]	*Perf/[non-atomic]
Xiu drinks-IMP soy milk		
☞ DESCRIPTIVE HABITUAL MEANING		
DISPOSITIONAL HABITUAL MEANING	*	

Tableau 6 Interpretation

Xiu pije mleko sojowe	*Perf/[non-atomic]	*Imp/[-actual]
Xiu drinks-IMP soy milk		
 DESCRIPTIVE HABITUAL MEANING		
DISPOSITIONAL HABITUAL MEANING		*

The prediction is then that imperfective habitual statements should always obtain a descriptive interpretation which is not the case, because as mentioned in Sect. 1.3, there are imperfective habitual statements which are ambiguous between descriptive and dispositional readings e.g. *Jan pomaga w potrzebie* ‘John help-imp in need.’ What remains to be accounted for is why imperfective habitual statements of the type *Jan pomaga w potrzebie* ‘John help-imp in need’ can have a dispositional reading. The above mentioned problems suggest that we need to motivate additional interpretation constraints. This will be discussed in Sect. 6.

6 OT constraints Accounting for the Interpretation of Perfective and Imperfective Habituals in Polish

As mentioned in Section 1.4, in Polish there are habitual statements which are unambiguously interpreted as descriptive generalisations, those which are unambiguously interpreted as dispositional generalisations and those which are ambiguous between the dispositional and the descriptive reading. In the previous section it was demonstrated that two aspect-related constraints cannot account for all these interpretation facts in a simple OT semantics model. It is necessary to motivate an interpretation constraint which will help us account for these facts formally. As mentioned in Sects. 2.1 and 2.2, what is essential in arriving at the correct readings of perfective and imperfective habitual statements are two presuppositions: the presupposition of the existence of a set of actual instances of eventualities in the real world (= Hab is restricted by CIRC and a descriptive reading arises) and the presupposition of the existence of a disposition of the subject in virtue of which an eventuality described in a verb phrase is true (= Hab is restricted by CONTENT and a dispositional reading arises). As we saw at the end of Sect. 5, in our OT semantics account, the constraint *Imp/[-actual] favours the descriptive reading of ambiguous imperfective habituals. What is missing in our system is a constraint which would account for the fact that in proper contexts ambiguous imperfective habitual statements are preferably interpreted as dispositional. Our hypothesis is that the problem of ambiguity of imperfective habitual statements of the type *Jan pomaga w potrzebie* ‘John helps in need’ can be solved if we use an additional pragmatic constraint FIT, phrased in (29) :

- (29) **FIT** – Interpretations should not conflict with a linguistic context (due to Zwarts 2004: 356). When two or more underlying meanings compete, choose the one which does not conflict with the linguistic context.

It is argued in this study that we should take the resolution of the ambiguity of habitual contexts out of the grammar and locate it in the embedding of the interpretation in the

context by appealing to the constraint FIT. How does linguistic context resolve ambiguity? In order to answer this question, we resort to a processing account proposed by Dwivedi et al. (2010). Dwivedi et al. (2010) looked at the scope ambiguity of the contexts presented in (30):

- (30) a. Every kid climbed a tree. The tree was full of apples. ($\forall > \exists$)
 b. Every kid climbed a tree. The trees were full of apples. ($\exists > \forall$)

The context in (30a) favours the surface scope reading ($\forall > \exists$), whereas the context in (30b) favours the inverse scope reading ($\exists > \forall$). Dwivedi et al. used Event Related Potentials (ERPs) to test how the scope ambiguity of the contexts in (30) is processed. They made two initial predictions: (i) There can be a preference for the surface scope reading. If yes, there should be a preference for a plural definite NP continuation. (ii) There can be a preference for the inverse scope reading. If yes, there should be a preference for a singular definite NP continuation. In both cases, the expectation is that once the nonpreferred NP is encountered in a continuation, the processor should revise the initially preferred interpretation. There is an ERP component which arises when initial choices in the processing are revised. This component is called P600. In their experiment, Dwivedi et al. (2010) observed no P600 once the def plural/singular NP was encountered in the continuation, which suggests that there is no immediately preferred reading and scope is left underspecified until context resolves it. This prediction can be supported by the fact that another ERP waveform occurred once the def plural/singular NP was encountered, namely a slow negative shift. A slow negative shift has been taken to indicate an extensive use of working memory resources, which suggests that our parser does not immediately assign a logical meaning to scope ambiguous sentences. At very early stages of comprehension, the parser treats scope ambiguous sentences as underspecified representations. How can this approach help us understand the process of resolving ambiguity in the interpretation of imperfective habitual statements? In fact, imperfective habitual sentences such as *Jan nie płacze z byle powodu* ‘John does not cry without reason’ are preferably interpreted as descriptive, but in a proper context, the dispositional reading is also available. When we interpret our discussed imperfective habitual sentences, the ambiguity remains unresolved until we encounter something in a context which favours one interpretation over another. When we process the sentence *Jan nie płacze z byle powodu* ‘John does not cry without reason’ we leave the choice of an accessibility relation restricting the Hab modal operator underspecified and when nothing in the surrounding linguistic context resolves this ambiguity in favour of the dispositional reading, our parser exploits contextual clues available in the sentence itself and it chooses a descriptive reading because of the constraint *Imp/[-actual], as shown in the interpretation Tableau 7.

Tableau 7 Interpretation

Jan nie płacze-IMP z byle powodu ‘John does not cry without reason’	FIT	*Perf/[non-atomic]	*Imp/[- actual]
☞ DESCRIPTIVE HABITUAL MEANING			
DISPOSITIONAL HABITUAL MEANING			*

Tableau 8 Interpretation

Jan nie płacze-IMP z byle powodu, bo jest twardzielem 'John does not cry without reason because he is tough'	FIT	*Perf/[non-atomic]	*Imp/[- actual]
DESCRIPTIVE HABITUAL MEANING	*		
 DISPOSITIONAL HABITUAL MEANING	*		

We assume that FIT is ranked higher than *Imp/[-actual] because the descriptive reading of ambiguous imperfective habitual statements can be overridden by contextual information as in *Jan nie płacze z byle powodu, ponieważ jest twardzielem* 'John does not cry without reason because he is a tough guy'. In this scenario, our parser again leaves the conflict between a descriptive and a dispositional reading unresolved, but because the continuation states explicitly that this generalisation is true in virtue of John's disposition, our parser chooses a dispositional reading because the choice of a descriptive reading leads to a violation of FIT, as presented in Tableau 8.

Why is a dispositional reading missing in such imperfective habitual contexts as "Mary smokes.imp"? In contexts of this type only the *presupposition of the existence of a set of actual instances of eventualities in the real world* is available, hence no ambiguity arises.

7 A Bi-Directional OT Account of Variation and Ambiguity in the Expression and Interpretation of Aspect in Habitual Contexts in Polish

Summarising the above discussion, our system contains three constraints i.e. *Perf/[non-atomic], *Imp/[-actual] and FIT. Because *Perf/[non-atomic] and *Imp/[-actual] are unranked, our system contains two possible constraint rankings, presented in (31):

- (31) a. FIT » *Imp/[-actual] » *Perf/[non-atomic]
- b. FIT » *Perf/[non-atomic] » *Imp/[-actual]

We have shown that variation in the expression of aspect can be accounted for in a simple OT syntax model in which the speaker's perspective is taken into account. Additionally, all the facts related to the interpretation of perfective and imperfective habitual statements can be accounted for in a simple OT semantics model, in which only the hearer's perspective is taken into account. However, when OT syntax and OT semantics are combined it is not always the case that a consistent relation between forms and meanings is assigned. In other words, when we start out with a meaning and apply OT syntactic constraints to arrive at a certain form, and then apply OT semantic constraints, we may not get back to the original meaning. In a simple OT model, a speaker may intend to express a dispositional reading and under the ranking FIT » *Perf/[non-atomic] » *Imp/[actual] he or she will choose an imperfective form *Jan nie płacze z byle powodu* 'John does not cry without reason' because in a pure production model the interpretation constraint FIT will not be relevant (which means that the speaker will not take the hearer's perspective into account). In an interpretation model this sentence will in turn be interpreted as descriptive (see Tableau 7). As a result the

Tableau 9 Bi-directional optimisation for the context ‘John does not cry without reason’ under the ranking FIT » *Imp/[*-actual*] » *Perf/[*non-atomic*]

Imp descr ☞	←	Imp disp
↑		↓
Perf descr		Perf disp ☞

input meaning in a production model will be different from the output meaning in an interpretation model. When we use a bi-directional OT model, both the speaker and the hearer consider production and interpretation constraints simultaneously and the most harmonic form-meaning pair is chosen. Our main intention in this section is to show how syntax and semantics come together in a bi-directional setting. Let us consider how a bi-directional optimisation proceeds under both constraint rankings: FIT » *Imp/[*-actual*] » *Perf/[*non-atomic*] and FIT » *Perf/[*non-atomic*] » *Imp/[*-actual*]. Tableau 9 shows how a bi-directional optimisation proceeds for the context ‘John does not cry without reason’ under the ranking FIT » *Imp/[*-actual*] » *Perf/[*non-atomic*].

In Tableau 9, there are four competing form-meaning pairs out of which two end up being bi-directionally super-optimal (as indicated by means of the symbol ☞) i.e. <imp, descr> and <perf, disp>. Arrows point to form-meaning pairs which are more harmonic under a given constraint ranking. The pair <imp, descr> is superoptimal because imperfective aspect is more harmonic than the competing perfective aspect for the expression of the plural (non-atomic) event reference involved in descriptive habitual contexts, as determined by *Perf/[*non-atomic*]. Moreover, out of the two competing pairs <imp, descr> and <imp, disp> the former is more harmonic due to the fact that for the discussed context ‘John does not cry without reason’ the descriptive reading of the imperfective habitual statement is favored by the constraint *Imp/[*-actual*]. This is because the hearer reasons that imperfective aspect indicates that the habitual context is true of some actual world instances of relevant eventualities. This excludes the dispositional reading of the imperfective habitual statement. The constraint FIT which is ranked higher than *Imp/[*-actual*] is not violated because nothing in the linguistic context states that the generalisation is true in virtue of a disposition of the subject. Why is not imperfective aspect more optimal than perfective aspect for the expression of dispositional habitual contexts which also involve plural (non-atomic) event reference? It happens so because there is a constraint *Imp/[*-actual*], which is ranked higher than *Perf/[*non-atomic*]. This constraint blocks the use of imperfective aspect in dispositional habitual contexts, in which no reference is made to eventualities in the actual world. How does a bi-directional optimisation proceed under the ranking FIT » *Imp/[*-actual*] » *Perf/[*non-atomic*] for a richer linguistic context ‘John does not cry without reason because he is tough’. This is demonstrated in Tableau 10.

The optimisation procedure in Tableau 10 differs only in one respect from the optimisation procedure in Tableau 9. Namely out of two competing form-meaning pairs: <imp, descr> and <imp, disp> the latter is more harmonic. The dispositional reading of the imperfective form in a habitual context *Jan nie płacze bez powodu*,

Tableau 10 Bi-directional optimisation for the context ‘John does not cry without reason because he is tough’ under the ranking FIT » *Imp/[-actual] » *Perf/[non-atomic]

Imp descr	→	Imp disp
↑		↓
Perf descr		Perf disp ✗

Tableau 11 Bi-directional optimisation for the context ‘John does not cry without reason’ under the ranking FIT » *Perf/[non-atomic] » *Imp/[-actual]

Imp descr ✗	←	Imp disp
↑		↑
Perf descr		Perf disp

ponieważ jest twardzielem ‘John does not cry without reason because he is tough’ is favoured by the highest-ranked constraint FIT because the linguistic context states explicitly that this statement is true in virtue of John’s disposition of being tough. The choice of the descriptive reading for the imperfective habitual form would conflict with the discussed context and thus lead to a violation of FIT. Under the second ranking FIT » *Perf/[non-atomic] » *Imp/[-actual], there are also two possible optimizations depending on the type of the linguistic context. Tableau 11 shows a bi-directional optimization procedure in the context ‘John does not cry without reason’.

In Tableau 11, there are also four competing form-meaning pairs: <imp, descr>, <imp, disp>, <perf, descr> and <perf, disp>, out of which only <imp, descr> ends up being super-optimal (as indicated by ✗). Because *Perf/[non-atomic] is ranked higher than *Imp/[-actual], the imperfective aspectual form is more harmonic for the expression of the plural event reference of both descriptive and dispositional habitual meanings. Hence, the form-meaning pairs <imp, descr> and <imp, disp> are more harmonic than the pairs <perf, descr> and <perf, disp>, as indicated by vertical arrows. Out of these two form-meaning pairs, the pair <imp, descr> is super-optimal, because the constraint *Imp/[-actual] favours a descriptive reading, which involves reference to actual world eventualities, unlike a dispositional reading. Moreover, in the context *Jan nie płacze bez powodu* ‘John does not cry without reason’ it is not stated explicitly that the generalisation is true in virtue of John’s disposition, hence the choice of the descriptive reading of this imperfective habitual statement does not lead to a violation of FIT. On the other hand, Tableau 12 shows a bi-directional optimization procedure for the constraint ranking FIT » *Perf/[non-atomic] » *Imp/[-actual] for the context ‘John does not cry without reason because he is a tough guy’.

The difference between the optimisation procedure in Tableaux 11 and 12 resides in the fact that in the latter, out of two competing form-meaning pairs: <imp, descr> and <imp, disp> the latter is more harmonic and it ends up being super-optimal. Since, the

Tableau 12 Bi-directional optimisation for the context ‘John does not cry without reason because he is tough’ under the ranking FIT » *Perf/[non-atomic] » *Imp/[-actual]

Imp descr	→	Imp disp
↑		↑
Perf descr		Perf disp

linguistic context states explicitly that the imperfective generalisation *Jan nie płacze bez powodu, ponieważ jest twardzielem* ‘John does not cry without reason because he is tough’ is true in virtue of John’s disposition of being tough, the dispositional reading of this form is favoured by the highest-ranked constraint FIT. The choice of the descriptive reading for the imperfective habitual form would contradict the discussed context and thus lead to a violation of FIT.

8 Conclusions

There are two types of habitual contexts in Polish: those exemplifying a *descriptive situation-oriented modality* and those exemplifying a *dispositional habituality* which is *speaker-oriented*. Descriptive habitual contexts are invariably expressed by means of imperfective aspect while dispositional habitual contexts are subject to variation and can be expressed by means of both perfective and imperfective aspect. In the case of interpretation, ambiguity arises in the case of some imperfective habitual contexts in which both the descriptive and the dispositional habitual reading is available. In this paper it is argued that there are two constraints which determine variation. These are *Perf/non-atomic event reference and *Imp/-actual world event reference. These two constraints are argued to be in the same stratum and as such they give rise to two constraint rankings and consequently the grammar can generate two winning candidates. On the other hand, when we look at the ambiguities with imperfective habituals, we can similarly say that the descriptive meaning is favoured by the constraint Imp/[-actual], but it can be overruled in the right context by the higher ranked constraint FIT. This means that we endorse a more cross-modular approach in which grammatical and pragmatic constraints work together to lead to a particular meaning. Additionally, it has been demonstrated that the discussed patterns of variation in the expression and interpretation of aspect in descriptive and dispositional habitual contexts can be best accounted for in the framework of bi-directional OT in which a speaker takes a hearer’s perspective into account and vice versa.

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