

Locating facts in time

Zi Huang (Universitat Pompeu Fabra)
zi.huang@upf.edu

The 9th International Conference on Formal Linguistics
November 7, 2021

1 Introduction

- Vendler (1967) distinguishes two types of nominals: **perfect nominals** (1), which have more nominal properties, and **imperfect nominals** (2), which have more verbal properties.

- (1) Perfect nominals:
 - a. Event nouns: Clay's/his victory
 - b. Nominal gerunds: Clay's/his winning of the game
- (2) Imperfect nominals:
 - a. POSS-*ing*: Clay's/his winning the game
 - b. ACC-*ing*: Clay/him winning the game
 - c. *that* clauses: that Clay won the game

- In this talk I will only focus on gerunds. POSS-*ing* (2a) and ACC-*ing* (2b) are both referred to as **verbal gerunds** because the *-ing* form takes a direct complement. The NP or pronoun preceding the *-ing* form, always interpreted as the subject, appears as the possessor in POSS-*ing* and in the accusative form in ACC-*ing*. **Nominal gerunds** (1b) take an *of*-PP instead of a direct complement.
- Vendler observes the distribution of different nominals in relation to different **containers**. Containers are sentence roots with a noun gap in them suited for a nominal. **Narrow containers** are only compatible with perfect nominals, while **loose containers** are compatible with both perfect and imperfect nominals.

Here are the main types of narrow and loose containers identified by Vendler (1967, 1968):

- (3) Narrow containers:
 - a. Eventive predicates: *occur, take place, begin, end, take up (time)...*
Clay's winning *(of) the game took place at 3 pm.
 - b. Extensional adjectives: *fast, slow, sloppy, gradual, sudden, prolonged...*
Clay's winning *(of) the game was long and painful.
 - c. Temporal prepositions: *before, after, since, until...*
The trouble started after Clay's winning *(of) the game.
 - d. Verbs of perception: *see, watch, hear, observe, feel...*
George watched Clay's winning *(of) the game.
- (4) Loose containers:
 - a. Intensional adjectives: *possible, useful, necessary, (un)likely, probable, certain...*
Clay's winning (of) the game was unlikely, but he managed to outperform his rival.
 - b. Verbs of psychological state: *surprise, astonish, shock...*
Clay's winning (of) the game surprised all his friends.
 - c. Verbs with predicative complements: *mention, deny, remember, admit...*
George remembered Clay's winning (of) the game.

- Vendler proposes that perfect nominals denote **events**, which are perceptible and are located in time. Imperfect nominals denote **facts**, which are not located in either space or time.

The distributional data have motivated many linguists to make an ontological distinction between the denotations of nominal and verbal gerunds. While most agree that nominal gerunds denote events, verbal gerunds have been described as denoting propositional entities (Portner, 1992), facts or possibilities (Asher, 1993), states of affairs (Zucchi, 1993), fluents (Hamm & van Lambalgen, 2002), event kinds (Grimm & McNally, 2015), etc.

- In this talk, I will present corpus data where temporal prepositions select POSS-*ing* and ACC-*ing*, such as:

(5) Anyway, shortly after my joining the board of United Racecourses, it became necessary to find a manager.

My data contradict Vendler’s judgments and challenge the proposal that facts are not located in time. I argue that an ontological distinction between the denotations of nominal and verbal gerunds should be maintained, and that the data shed light on the temporal properties of “facts”, or any other ontological objects denoted by verbal gerunds.

2 Data

2.1 Data collection

- I collected all the POSS-*ing* cases from a dependency parsed version of the British National Corpus (2007). After manually cleaning the data and excluding potentially ambiguous cases (such as when the possessor is *her* or a plural NP ending in *s*), my dataset contains 818 POSS-*ing*.
- Collecting ACC-*ing* is challenging because of the large amount of “NP + *-ing* form + complement” found in the corpus and the fact that most are false positives, such as:

(6) Expect a general rise in fees of some 7-9% for the academic year starting September 1990.

Therefore I used SketchEngine to search for ACC-*ing* in BNC. The searches were limited to ACC-*ing* with personal pronouns combining with specific temporal prepositions. Occasionally, I also used the Corpus of Contemporary American English (Davies, 2008-).

2.2 Classification of temporal prepositions

- What kinds of temporal prepositions select verbal gerunds? A classification of temporal prepositions according to the type of their complement is possible with the help of the Pattern Dictionary of English Prepositions (PDEP) (Litkowski, 2014), based on Quirk, Greenbaum, Leech, and Svartvik (1985).

PDEP Temporal Class (93 senses)

Preposition	Sense	Subclass	Srtype	Supersense	Classed	Count	Pct	NF
\gainst	4(2)	Preceding	EventInFuture		Yes	0	100.0	0.19
\pon	17(8)	SimpleTime	Day	Time	Yes	0	100.0	0.19
\pon	18(8a)	SimpleTime	Occasion	Time	Yes	0	100.0	0.19
about	6(n)	SimpleTime	TimePoint		Yes	2	100.0	89.35
across	1(1)-1	Period	PeriodTraversed	Duration	Yes	4	100.0	21.64
afore	1(1)	Preceding	TimePoint	DeicticTime,RelativeTime	Yes	1	100.0	0.19
after	1(1)	Following	TimePeriod	RelativeTime	Yes	142	100.0	4463.68
after	2(1a)	Period	PeriodRepeated	Frequency	Yes	1	100.0	31.43
after	3(1b)	Following	Hour	ClockTimeCxn	Yes	0	100.0	31.43
after	4(1c)	Period	ThingDeparting		Yes	15	100.0	471.52
against	4(2)	Preceding	EventInFuture		Yes	16	100.0	342.97
agin	4(2)	Preceding	EventInFuture		Yes	0	100.0	0.19

- Srtype shows the types of complements that a preposition selects for. A preposition may have multiple values. According to the Srtype value, I identify three types of temporal prepositions:
- **Event-selecting** prepositions (Srtype = Occasion) only select for event descriptions, but not temporal expressions in general. For example, despite the fact that *on Monday* is possible, **on the time Clay arrived* is not, but *on Clay's arrival* is possible.
 - *On, upon*
- **Point-selecting** prepositions (Srtype = TimePoint, among others) are interpreted with regard to a point in time. For example, though *before* selects a time period in *before November*, the only relevant point for its interpretation is the beginning of November.
 - *after, around, at, beyond, following, from, near, etc.*
- **Period-selecting** prepositions (Srtype = TimePeriod, and not TimePoint) are necessarily interpreted in relation to a period of time, either represented by a temporal expression (*February, the morning*) or an durative event (*during the construction of the building* but **during Clay's arrival*).
 - *across, along, during, for, in, over, throughout, etc.*

2.3 Temporal prepositions selecting verbal gerunds

- Event-selecting prepositions are attested to select both POSS-*ing* and ACC-*ing*.
 - (7) Even my wife, enlightened, but energetically gregarious, upon my expressing my desire not to go to a certain gathering would say, “Normal people like parties, they want to go.”
 - (8) It was thought that the Shropshire Country Council were the owners, but upon them looking through their records, it appears that Major Minton-Beddoes is indeed the owner, but work has once again started.
 - (9) In the case of a freehold this requires a straightforward declaration of trust for the benefit of the partners for the time being of the firm and, possibly, express provision for the retirement of a trustee on his ceasing to be a partner.
- A variety of point-selecting prepositions are attested to select both POSS-*ing* and ACC-*ing*.
 - (10) Well, after them telling me how good Gary Kelly was, they said they had a Leeds youth team member in their squad.
 - (11) They get paper first before you sending them money.
 - (12) Just as we saw a few weeks ago Zaccheus was, er, between him being up the tree and hitting the ground, that man was converted.
 - (13) By his lauding the progressive role of the Red Army Bukharin's audience would have grasped what he had in mind.
 - (14) [...] if so required by the Vendor in writing within 60 days following it being notified, retain solicitors chosen by the Vendor to proceed [...]
 - (15) We're less than twenty-four hours away from you beginning this inquiry, this inquest you have longed for. (COCA)
 - (16) “I don't know whether Dersingham knew him prior to his appointing him.”
 - (17) I didn't see any past... I did see some past papers but it was subsequent to my setting these exam questions, right?
- Observation: Though few cases are attested, many different prepositions select verbal gerunds, and they select both POSS-*ing* and ACC-*ing*. Verbal gerunds can be used to locate the time relative to either an actual event (10) or a potential one (14).

- Verbal gerunds should at least provide a point in time. I will discuss three possible solutions: (1) Verbal gerunds also denote events; (2) Verbal gerunds impose an aspect on the event structure; (3) Verbal gerunds still denote facts, but facts have temporal properties.

3.2 Verbal gerunds as events

- Asher (1993) explores the possibility that POSS-*ing* may also have an event interpretation, because he notices that POSS-*ing* is marginally compatible with eventive predicates:

(22) {?Fred's/*Fred} shooting Bill took place behind the bar/happened yesterday.

(23) Building the Panama Canal took longer than expected.

However, Asher admits that the examples motivating an alternative analysis are fragile:

(24) *?Gathering pecans in Central Texas lasted two months.

- On Asher's analysis, fact/event denotation is dependent on the syntactic structure: verbal gerunds or fact-denoting expressions have a DP-over-IP structure. A structure that only derives the factive reading cannot explain the above observation, so POSS-*ing* may have a DP-over-VP structure, which derives both event and fact readings.
- However, this analysis faces several problems:

- Verbal gerunds that do not have an eventive reading, such as *Clay's having won the game*, should have a different syntactic structure.
- Verbal gerunds are still not compatible with most other narrow containers. My dataset of POSS-*ing* contains only one case of POSS-*ing* with an eventive predicate and none with extensional adjectives.

(25) Line B adds precision to line A, and line G to line B. What is not specified in line A is when Israel's coming to know and hearing is supposed to have taken place.

- ACC-*ing* is not compatible with eventive predicates, but is selected by temporal prepositions.
- It does not explain why period-selecting prepositions do not take verbal gerunds (if this is confirmed).

3.3 Verbal gerunds as non-durative events

- If we focus on making verbal gerunds provide a point in time while not being a full-blown event, a possible solution is to say that the nominalization imposes an aspect on the event. An example is the nominal gerund: it has been claimed that achievements are odd in nominal gerunds (Borer, 2003):

- (26) a. *Kim's reaching of the summit
b. *the arriving of the train (at 5pm)

However, Fonteyn (2020) shows that such cases are attested in the corpus.

- Another example is the nominal infinitive in Spanish, which is necessarily [-perfective] (De Miguel, 1995):

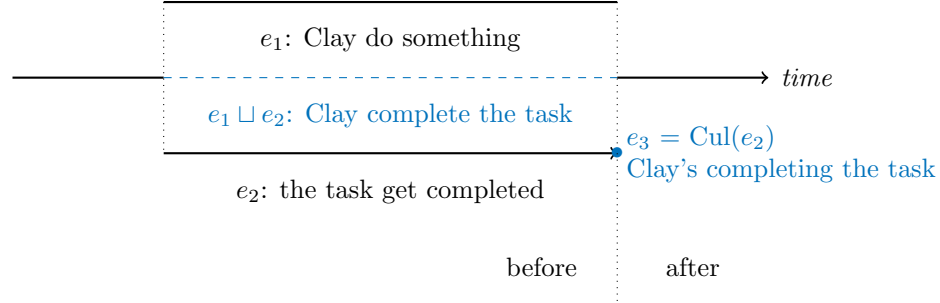
(27) *El llegar tardío de Juan
the to-arrive late of Juan

When an achievement or an accomplishment is used in the nominal infinitive, it is understood as describing an ongoing process or a repeated activity.

- We can hypothesize that verbal gerunds “collapse” accomplishments into their culmination point, using Rothstein's (2004) notation:

(28) Clay complete the task: $\lambda e \exists e_1, e_2 [e = {}^S(e_1 \sqcup e_2) \wedge \text{ACT}(e_1) \wedge \mathbf{Ag}(e_1) = \mathbf{Clay} \wedge \mathbf{Th}(e_1) = \mathbf{the-task} \wedge \text{BECOME-DONE}(e_2) \wedge \mathbf{Arg}(e_2) = \mathbf{Th}(e_1) \wedge \text{INCR}(e_1, e_2, C(e_2))]$

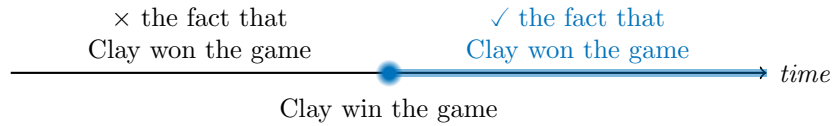
(29) Clay’s completing the task: $\lambda e_3 \exists e, e_1, e_2 [e = {}^S(e_1 \sqcup e_2) \wedge \text{ACT}(e_1) \wedge \mathbf{Ag}(e_1) = \mathbf{Clay} \wedge \mathbf{Th}(e_1) = \mathbf{the-task} \wedge \text{BECOME-DONE}(e_2) \wedge \mathbf{Arg}(e_2) = \mathbf{Th}(e_1) \wedge \text{INCR}(e_1, e_2, C(e_2)) \wedge e_3 = \text{Cul}(e_2)]$



- In a similar way, activities and states can be collapsed into their onset, and achievements remain the same. This explains why most narrow containers that target the duration of the nominal are incompatible with verbal gerunds: *begin, end, take (time), be long/short/slow/fast*. However, it does not explain their incompatibility with eventive predicates like *occur* and *take place*, or extensional adjectives like *bloody*. An ontological distinction between events and the denotation of verbal gerunds is still necessary.

3.4 Verbal gerunds as facts, but facts are located in time

- Intuitively, facts do not exist independent from time. Before the event “Clay completed the task” happens, the fact of “Clay’s completing the task” does not exist. The moment in which “Clay has not completed the task” turns into “Clay has completed the task” is when the corresponding fact comes into existence.
- If the speaker locates an event in relation to a fact, the only thing that is pragmatically useful is to locate it with respect to the moment at which the fact comes into existence.



- This is very similar to **resultant states** discussed in Parsons (1990) and Kratzer (2000). A resultant state of an event is the state of the event having culminated. The state holds forever after the event has culminated. Therefore, the narrow container data can be explained because verbal gerunds, denoting the resultant state of their corresponding event, has no access to the structure of the event itself. Temporal prepositions are interpreted with regard to the starting point.
- Problem: Facts are fine-grained: *Clay’s winning the game* and *Clay’s winning the game with a reverse sweep* may correspond to the same event, but they are different facts. Their resultant states, however, are the same, so we do not want verbal gerunds to *denote* resultant states. A possible solution is to have resultant states as *truthmakers* of facts, such as in Type Theory with Records.

4 Conclusion

- Contra Vendler, corpus data show that verbal gerunds (both POSS-*ing* and ACC-*ing*) can be selected by temporal prepositions. Further data collection is needed to see whether period-selecting prepositions take verbal gerunds. In order for the prepositions to be interpreted, the denotation of verbal gerunds should at least provide a point in time.

- The ontological distinction between perfect and imperfect nominals is still necessary in order to explain the other narrow containers. I do not intend to support one of the ontological proposals for verbal gerunds, but merely point out that any analyses of verbal gerunds should permit the interpretation of such data.

Acknowledgements

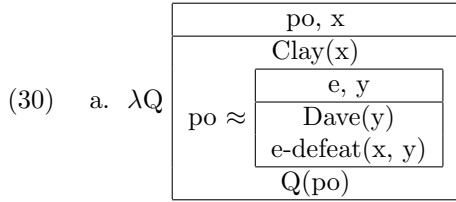
Thanks to my audience when parts of this study was previously presented at JENoM9 and at Humboldt-Universität zu Berlin. This study is supported by an FI-AGAUR grant (2019FI-B00397) and the grant FFI2016-76045-P (AEI/FEDER, EU).

References

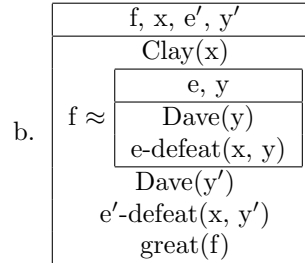
- Asher, N. (1993). *Reference to abstract objects in discourse*. Dordrecht: Kluwer.
- Borer, H. (2003). Exo-skeletal vs. endo-skeletal explanations: Syntactic projections and the lexicon. In J. Moore & M. Polinsky (Eds.), *The nature of explanation in linguistic theory* (pp. 31–67). Stanford, CA: CSLI Publications.
- Carlson, G. (1977). *Reference to kinds in English* (PhD thesis). University of Massachusetts, Amherst. (Published in 1980 by Garland Press, New York.)
- Condoravdi, C. (2010). Npi licensing in temporal clauses. *Natural Language & Linguistic Theory*, 28(4), 877–910.
- Davies, M. (2008-). *The Corpus of Contemporary American English (COCA)*. Available online at <https://www.english-corpora.org/coca/>.
- De Miguel, E. (1995). An aspectual restriction on Spanish nominal infinitives. *Anuario del Seminario de Filología Vasca “Julio de Urquijo”*, 29(1), 245–266.
- Fonteyn, L. (2020). Assessing theory with practice: an evaluation of two aspectual-semantic classification models of gerundive nominalizations. *Corpus Linguistics and Linguistic Theory*, 16(2), 275–302.
- Grimm, S., & McNally, L. (2015). The *-ing* dynasty: Rebuilding the semantics of nominalizations. In S. D’Antonio, M. Moroney, & C. R. Little (Eds.), *Proceedings of the 25th Semantics and Linguistic Theory Conference (SALT)* (Vol. 25, pp. 82–102). Ithaca, NY: LSA and CLC Publications.
- Hamm, F., & van Lambalgen, M. (2002). Formal foundations for semantic theories of nominalisation. *ZAS Papers in Linguistics*, 27, 1–21.
- Kratzer, A. (1989). An investigation of the lumps of thought. *Linguistics and philosophy*, 12(5), 607–653.
- Kratzer, A. (2000). Building statives. In L. J. Conathan, J. Good, D. Kavitskaya, A. B. Wulf, & A. C. Yu (Eds.), *Proceedings of the Twenty-Sixth Annual Meeting of the Berkeley Linguistics Society: General Session and Parasession on Aspect* (Vol. 26, pp. 385–399). Berkeley: Berkeley Linguistics Societ.
- Litkowski, K. (2014). Pattern Dictionary of English Prepositions. In *Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)* (pp. 1274–83). Baltimore, Maryland: Association for Computational Linguistics.
- Parsons, T. (1990). *Events in the semantics of English: A study in subatomic semantics*. Cambridge, MA: MIT press.
- Portner, P. (1992). *Situation Theory and the semantics of propositional expressions* (Unpublished doctoral dissertation). University of Massachusetts at Amherst, Amherst, MA.
- Quirk, R., Greenbaum, S., Leech, G., & Svartvik, J. (1985). *A comprehensive grammar of the English language*. New York: Longman Inc.
- Rothstein, S. (2004). *Structuring events: a study in the semantics of aspect*. Oxford: Blackwell.
- The British National Corpus, version 3 (BNC XML Edition). (2007). Distributed by Bodleian Libraries, University of Oxford, on behalf of the BNC Consortium, URL <http://www.natcorp.ox.ac.uk/>.
- van de Pol, N. (2019). A game of give and take: category change on the border between adverbial verbal gerunds and augmented absolutes in English. *Language Sciences*, 73, 91–104.
- Vendler, Z. (1967). *Linguistics in philosophy*. Ithaca, NY: Cornell University Press.
- Vendler, Z. (1968). *Adjectives and nominalizations*. The Hague: Mouton.
- Zucchi, A. (1993). *The language of propositions and events: Issues in the syntax and the semantics of nominalization*. Dordrecht: Kluwer.

Appendix

When proposing an analysis for verbal gerunds, the literature has never taken temporal prepositions into account. Some analyses are designed not to assign temporal properties to the denotation of verbal gerunds, for example, in [Asher \(1993\)](#), an account based on Discourse Representation Theory, verbal gerunds introduce fact or possibility referents, which stand for a subDRS. Using a temporal preposition with a subDRS (instead of an event referent) is infelicitous.



Clay's defeating Dave



Clay's defeating Dave is great.

Some analyses easily permit the use of temporal prepositions. In [Hamm and van Lambalgen \(2002\)](#), verbal gerunds denote fluents, which are temporal abstracts; nominal gerunds denote events. They introduce predicates that specifically select for events or fluents, like *HoldsAt(f, t)* (a fluent holds at a time), *Initiates(e, f, t)* and *Terminates(e, f, t)* (an event initiates or terminates a fluent at a time). The preposition *after* which selects a fluent can be defined as follows:

$$(31) \llbracket \text{after} \rrbracket = \lambda f \lambda t \exists e_2, t_1 [Terminates(e_2, f, t_1) \wedge t_1 \leq t]$$

In the rest of the appendix I present two main analyses of verbal gerunds and how they potentially account for the use of temporal prepositions with verbal gerunds. Note that none of the analyses discussed here prevents period-selecting prepositions from taking verbal gerunds.

Temporal prepositions in [Grimm and McNally \(2015\)](#)

- [Grimm and McNally \(2015\)](#) propose that verbal gerunds are event kind descriptions. In analogy kinds in the entity domain ([Carlson, 1977](#)), event kinds are sortal concepts that can be instantiated via the realization relation to produce an event token: $\mathbf{R}(e, e_k)$. In contrast, nominal gerunds may denote event kinds or tokens.

$$(32) \text{ Clay's winning the game: } \lambda e_k [\mathbf{win}(e_k) \wedge \mathbf{Agent}(c, e_k) \wedge \mathbf{Theme}(g, e_k)]$$

- They link event types to times when discussing free adjuncts like (33a). They assume an implicit temporal adverb which take an event type as complement, specifying a temporal relation, and at the same time instantiating an event token with \mathbf{R} . They could propose a similar interpretation for temporal prepositions:

(33) a. Mose smiled, blushing.

b. $\text{Adv}_{\text{temp}}: \lambda P_{\langle e_k, t \rangle} \lambda Q_{\langle i, t \rangle} \lambda t \exists t', e, e_k [\mathbf{Adv}(t, t') \wedge P(e_k) \wedge \mathbf{R}(e, e_k) \wedge \tau(e) = t' \wedge Q(t)]$

c. *after*: $\lambda P_{\langle e_k, t \rangle} \lambda Q_{\langle i, t \rangle} \lambda t \exists t', e, e_k [t' < t \wedge P(e_k) \wedge \mathbf{R}(e, e_k) \wedge \tau(e) = t' \wedge Q(t)]$

d. after Clay's winning the game:

$$\lambda Q_{\langle i, t \rangle} \lambda t \exists t', e, e_k [\mathbf{win}(e_k) \wedge \mathbf{Agent}(c, e_k) \wedge \mathbf{Theme}(g, e_k) \wedge \mathbf{R}(e, e_k) \wedge \tau(e) = t' \wedge t' < t \wedge Q(t)]$$

The event type “Clay's winning the game” is instantiated by an event token whose run time is t' , and the time of the clause modified by this *after*-PP follows t' .

- They need to resort to an intensional context where non-actual event tokens can be associated with time.
- Problem: If temporal prepositions can instantiate an event kind, why can't eventive predicates? The event kind analysis has difficulty explaining the narrow container data without forcing event kinds to behave differently from entities kinds (or forcing narrow containers to be different from individual-level predicates).

Temporal prepositions in Portner (1992)

- Portner (1992) applies Kratzer’s (1989) Semantics of Situations and proposes that verbal gerunds denote sets of minimal situations. When used in certain contexts, it is possible that there is only one situation in the denotation of a verbal gerund. Verbal gerunds are not compatible with narrow containers because such predicates require their arguments to be maximally specified situations, which are denoted by perfect nominals.
- Since Portner (1992) introduces a temporal ordering among situations, it is possible to talk about the preceding relation between situations. In the analysis of attitude predicates like *celebrate*, *commemorate* and *regret*, which denote “an attitude towards an event that is over and done with” enable a gerund to be interpreted “perfectly”, the author introduces a point-of-view relation between matrix and gerund situations that is helpful in dealing with temporal prepositions.

- (34) $\llbracket \text{after}(x_1)(p) \rrbracket^{M,u,C,r,g,s} =$ a function $f \in D_{\langle s,t \rangle}$ such that, for any situation s' , $f(s')=1$ iff p is true in s' & $g(x_1)$ precedes s'
- (35) $\llbracket \text{An offensive occurred after Iran's accepting the principle.} \rrbracket^{M,u,C,s,g,s} =$ that function $f \in D_{\langle s,t \rangle}$ such that, for any situation s' , $f(s')=1$ iff $\llbracket \text{Iran's-accepting-the-principle}[x_1] \rrbracket^{M,u,C,r,g,s}=1$ & $\llbracket \text{after}(x_1)(\text{an offensive occurred}) \rrbracket^{M,u,C,r,g,s}(s')=1$
 $=$ (...) iff $\llbracket \text{Iran's accepting the principle} \rrbracket^{M,u,C,s',g,s}(g(x_1)) = 1$ & an offensive occurs in s' & s' is past & $g(x_1)$ precedes s'
 $=$ (...) iff the evaluation situation of *Iran's accepting the principle* s'' has the characteristics of an Iran-accepting-the-principle situation from the point of view of s' and an offensive occurs in s' & s' is past & s'' precedes s'