

# The Anaphoric Potential of Weak Definites<sup>1</sup>

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**Abstract.** Weak definites (WDs) as in *Max went to the cinema* differ from regular definites insofar as *the cinema* does not refer to a uniquely identifiable cinema. In this paper I propose that investigating the discourse properties of WDs helps us to distinguish and decide between various theories of WDs that have been proposed. I present two experiments in German. The first shows that WDs can be referred to by pronoun but less straightforwardly than anaphoric reference to indefinites lending support to the model initially proposed by Krifka & Modarresi (2016) for anaphoric potential of pseudo-incorporated nouns. The second experiment shows that anaphoric reference to WDs is distinct from associative anaphora, in contrast to predictions that analyze weak definites as reference to kinds.

**Keywords:** weak definites, referentiality, discourse properties, anaphora

## 1. Properties of Weak Definites

An expression is definite, by standard definition, when it refers to a uniquely identifiable referent (Russell, 1905; Neale, 1990), potentially restricted to a set of salient or familiar entities (Heim 1982, 1983). In many languages it is often signalled by using definite articles. However, there is a well-known family of definites descriptively referred to as **Weak Definites** (henceforth WDs) that behave differently from standard definites (Poesio 1994, Carlson & Sussman 2005, Bosch 2010, Schwarz 2013, 2014). Crucially, this kind of definites do not seem to require uniqueness. The difference is illustrated in (1) *going to the building* versus (2) *going to the cinema*. In (1a), *building* is marked by a definite article and refers to a uniquely identifiable building. In the continuation sentence (1b), it is stated that Mary went to the same (uniquely identifiable) building. In (2a), on the other hand *the cinema* does not necessarily refer to a uniquely identifiable cinema. In the continuation sentence (2b), Mary could have gone to a different cinema. The definite marked noun *cinema* in (2) is an example of a WD.

- (1) a. Max went to **the** building. (single salient uniquely identifiable building)  
b. Mary did too. (it has to be the same building)
- (2) a. Max went to **the** cinema. (not necessary for the referent to be identifiable cinema)  
b. Mary did too. (they possibly went to different cinemas)

WDs exhibit other peculiar properties such as **narrow scope** with respect to other quantifiers as shown below in (3a) in contrast with regular definite in (3b). As such, WDs appear to be like narrow scope **indefinites** (IDs) as in *going to a cinema*.

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- (3) a. Everybody went to the cinema. (perhaps everybody went to a different cinema)  
 b. Everybody went to the building. (it has to be the same building everyone went to)

While (3a) makes WD look like indefinites, WDs have a **number-neutral reading** as in *Max took the train to Munich* (it could be that he took one or more train) and in this respect they are different from indefinites e.g. *Max took a train to Munich*. WDs also contribute to an **enriched meaning** referring to a conventionalized activity; for instance, *going to the hospital* means not only going to the relevant location but also for the purpose of receiving medical care (Aguilar-Guevara, 2014; Schwarz, 2014). In these properties, WDs are similar to so-called pseudo-incorporated objects (cf. Massam 2017).

## 2. How do we account for the behavior Weak Definites?

Various theories have attempted to capture the properties of WDs. A successful theory should be able to address all the properties of WDs, preferably without violating the standard analysis of definiteness as a marker of uniqueness. In this paper I propose that investigating the discourse properties, in particular the **anaphoric accessibility** of WDs, is a key feature to distinguish between different theories. In what follows I start with investigating discourse properties of WDs and then discuss different theories in terms of their predictions concerning anaphoric potential of WDs.

### 2.1. Discourse properties of weak definites:

Previous accounts take Weak Definites as not supporting anaphoric reference in subsequent discourse, or at least not to the same extent as regular definites (see Scholten and Aguilar-Guevara, Schwarz 2014). However, Scholten & Aguilar-Guevara 2010 present examples showing that “although pronouns referring back to WDs do not sound as ‘natural’ compared to pronouns referring back to definites and indefinites, they are certainly more acceptable than those with bare singulars as antecedents”. Examples from Scholten & Aguilar-Guevara 2010:

- (4) I checked the calendar when I was planning my appointments and put it back in my desk.  
 (5) ??Lola is still at school because today her class had to help to clean it.

Discussing the properties of WDs in English is difficult, as they are expressed in the same way as regular definites. For example, *the calendar* in (4) could also be a regular definite, referring to a unique calendar. In order to discuss the properties of WDs it is useful to switch to a language that has a particular morphosyntactic marking of WDs that sets them apart from regular definites. This is at least partially the case for German, and more generally in German dialects (cf. Schwarz 2009); it was first identified for North Frisian (Ebert 1971). Standard German has a morphosyntactic means to distinguish between regular definites as in (6a) and WDs as in (6b), when in the complement of certain prepositions, which combine with the definite article (e.g. *in das* > *ins*). They are contrasted to indefinites as in (6c) (cf. Nübling 2005, Schwarz, 2014).

## The anaphoric potential of Weak Definites

- (6) a. Max ist **in das Kino** gegangen. Regular definite  
       ‘Max went to the cinema’  
       b. Max ist **ins Kino** gegangen Weak definite; enriched meaning  
       ‘Max went to movies’  
       c. Max ist **in ein Kino** gegangen. Indefinite  
       ‘Max went to a cinema’

(6b) represents a WD with the enriched meaning ‘going to a cinema to do the stereotypical activity, i.e. to watch a movie’. However, even this sentence is ambiguous because *ins Kino* can also refer to a unique or most salient entity given by the world knowledge of the interlocutors (as e.g. in *zum Mond* ‘to the Moon’). But in a context of a larger city with many cinemas, this potential reading of *ins Kino* can be neglected. Even when excluding the referring reading, anaphoric reference to the cinema is possible:

- (7) Max ist gerne in Berlin, da es dort viel zu erleben gibt. Gestern ist er **ins Kino** gegangen. **Es** war riesig groß und hatte weiche Plüschessel.  
       ‘Max likes to be in Berlin, as there are many things to do. Yesterday he went to the cinema. It was very large and had soft velvet armchairs.’

Krifka & Modarresi (2016) observe other discourse properties for WDs that sets them apart from indefinites. First, WDs allow for possibly plural anaphoric reference despite their singular morphology, as illustrated in (8) and (9). Here, the combination of prepositions with the definite article is not visible in standard orthography (*mit dem*) but could be realized in spoken varieties (*mit'm*).

- (8) Max ist **mit dem Zug** nach Paris gefahren. **Der Zug / die Züge** waren aber nicht pünktlich.  
       ‘Max went by train to Paris. But the train / the trains were not on time.’  
       (9) Max ist **mit einem Zug** nach Paris gefahren. **Der Zug / ??die Züge** waren aber nicht pünktlich.  
       ‘Max went with a train to Paris. But the train / ?? the trains were not on time.’

Another difference is that WDs lead to a maximality interpretation. In (10), *mit dem Zug* is understood as referring to all the trains that were used by Max to go to Paris.

- (10) Max ist **mit dem Zug** nach Paris gefahren. ??Er musste dazu einen zweiten Zug nehmen.  
       ‘Max went by train to Paris. He had to take a second train for that.’  
       (11) Max ist **mit einem Zug** nach Paris gefahren. Er musste dazu einen zweiten Zug nehmen.  
       ‘Max went with a train to Paris. He had to take a second train for that’

In the following, I will discuss various theoretical proposals that have been developed for WDs, in particular with respect to their prediction about their anaphoric potential, as illustrated in (7). This includes proposals that have been made for pseudo-incorporated objects, as they show similarities to WDs. In particular, I will discuss theories that analyze them as **reference to kinds**, cf. Aguilar-Guevara & Zwart (2010); as denoting a **property**, cf. van Geenhoven

(1998), as involving meaning compositions by **restriction and saturation**, cf. Ladusaw & Chung (2003), as involving **reference to unique entities in situation**, cf. Dayal (2011), Schwarz 2014), as **introducing number neutral discourse referents**, cf. Modarresi (2015), and as involving **event kinds**, as in Schwarz (2013).

We will see that these approaches predict either that WDs do not support anaphora at all, or that they support anaphora just as easily as indefinites do. The only theory that clearly predicts a more nuanced pattern of anaphoricity is Krifka & Modarresi (2016), according to which WDs can be taken up by anaphora but in a more complex way that leads to a slightly reduced anaphoric potential. I will discuss this analysis and provide experimental evidence to support it. In the next section I present different predictions by the current proposals, considering anaphora as a key feature in our discussion then I present experimental data to support it.

## 2.2. WDs as reference to kinds?

One proposal for weak definites and pseudo-incorporated nouns assumes that they refer to kinds rather than object entities (Aguilar-Guevara & Zwart 2010). The kind analysis accounts for the occurrence of the definite article in spite of the apparent lack of uniqueness, as kinds are typically related to many specimens (cf. the account of Carlson 1977 for generic and episodic sentence). While the kind analysis appears plausible when considering it in isolation, it fails to account for the anaphoric behavior of such nominals.

Aguilar-Guevara & Zwarts couch their kind analysis within an event semantics. It is illustrated in ((12), where L represents the subject argument *Lola*, the Agent of the event. R is a relation that relates specimens to their kinds; R(x,k) states that x is a specimen of the kind k. Th(e) is the theme of the event e; it stands in a specimen-relation to C, the kind of Calendar. U(e,C) states that e is a “stereotypical usage” of the calendar kind C. The definite DP *the calendar* is type-shifted to kinds, following Chierchia (1998).

- (12) *Lola checked the calendar.*  
 $\exists e[\text{check}(e) \wedge \text{Ag}(e)=L \wedge \text{R}(\text{Th}(e),C) \wedge \text{U}(e,C)].$

Without going into further details, we see that this representation is taken to predict that uptake of C as in (4) is not possible (also see Schwarz (2014) and Espinal & Cyrino (2017) for a critical discussion of the kind-referring analysis of weak definites). The representation (12) only provides for the kind Calendar, not for the particular calendar, the theme of e Th(e), that Lola checked.

To be sure, anaphoric reference to kinds is possible when the anaphoric uptake is itself an argument of a kind level predicate, as with *it* in (13). It is also possible to introduce a new specimen with the partitive anaphor *one*, or several new specimens with *some*, as shown in the third sentence of (13). However, reference to a particular specimen is excluded.

- (13) Shockley invented the transistor. **It** revolutionized the economy. My grandfather bought \*it / one / some.

## The anaphoric potential of Weak Definites

However as shown before and repeated in (14), anaphoric reference to weak definites object is in fact possible, hence different from anaphoric reference to kinds as in (13).

(14) *Lola was about to check the calendar but then dropped it / # one* (in intended reading)

Thus, it seems, with respect to anaphoric uptake, the kind account does not represent WDs in an appropriate way.

### 2.3. WDs as reference to properties?

I now turn to a close relative of the kind proposal. According to this proposal, WDs denote properties, e.g. *the cinema* denotes the property  $\lambda x[\text{cinema}(x)]$ , which is rendered here extensionally for simplicity (Van Geenhoven 1992, Mc Nally 1995, Cohen & Erteshik-Shir 2002, Dayal 2011, Espinal & Mc Nally 2011, Carlson & Sussman, 2005; Dayal, 2011). These properties are incorporated into the verbal predicate, similar to the phenomenon of noun incorporation in West Greenlandic (Van Geenhoven, 1992). The verbal predicate contains an existential quantifier that introduces a variable that satisfies both the argument position of the verbal predicate and the nominal property. This is illustrated in (15).

(15) *Zoe went to the cinema.*  
 $\lambda P \exists x [P(x) \wedge \text{go-to}(x)(z)] (\lambda x [\text{cinema}(x)])$   
 $= \exists x [\text{cinema}(x) \wedge \text{go-to}(x)(z)]$

Although proponents of the property analysis do not discuss the anaphoric potential of these nominals, the account predicts that anaphoric uptake to the entity is impossible, as the existential quantifier has narrow scope with respect to the verbal predicate. However, if we turn to a dynamic framework and assume that the existential quantifier is dynamic, as proposed by van Geenhoven (1998), we do predict that anaphoric uptake is possible. But now we have the opposite problem: We predict that anaphoric uptake should be as easy as with regular indefinite nominals, as they are represented by dynamic existential quantifiers as well.

In sum, under the Property account, WDs are predicted to either not supporting anaphoric reference at all, or to be easily picked up just like indefinites. I will test this prediction in the sections 3.

### 2.4. Restriction and Saturation?

Chung & Ladusaw (2004) develop a proposal to deal with incorporated objects that could be extended to WDs. In their theory, an incorporated object does not fill the argument position of a verbal predicate but “restricts” it. In a second step, called “saturation”, the argument position is existentially quantified over. For WDs this would result in the following representation:

(16) a. RESTRICT (*cinema*,  $\lambda x[\text{go-to}(x)(z)]$ ) =  $\lambda x[\text{cinema}(x) \wedge \text{go-to}(x)(z)]$   
b. SATURATE( $\lambda x[\text{cinema}(x) \wedge \text{go-to}(x)(z)]$ ) =  $\exists x[\text{cinema}(x) \wedge \text{go-to}(x)(z)]$

As for anaphoric reference, the prediction again depends on the nature of the existential quantifier: If it is static, anaphoric uptake is not possible; if it is dynamic, anaphoric uptake should be as straightforward as the antecedent were an indefinite DP.

## 2.5. Reference to unique entities in a situation?

Schwartz (2014) proposed that regular definite nominals denote functions from situations to unique entities, e.g. *the newspaper* would have the meaning  $\lambda s.u(\text{newspaper}(s))$ , the function that maps situations  $s$  to the unique calendar in  $s$  (this is defined iff in  $s$  there is one, and only one, calendar). For WDs, this is shifted to a property, in particular, a function from entities to propositions. For example, the weak definite version of *the newspaper* is interpreted as  $\lambda y\lambda s[y = \iota(\text{newspaper}(s))]$ , a function that maps entities  $y$  to a function that maps situations  $s$  to truth iff  $y$  is the unique newspaper in  $s$ . This is now combined with the proposal of Dayal (2011) for incorporated arguments, which is a version of the property account as discussed in Section 2.3. In particular, on Dayal’s account, the property-taking version of a predicate involves sum formation, expressed by the operator “\*”, over events, as in (17):

$$(17) \textit{read} \text{ (with property argument):} \\ \lambda P\lambda s \iota * \{e \mid \textit{read}(e) \wedge \exists x[P(x)(e) \wedge \textit{Th}(e)=x] \wedge e \leq s\}$$

Applied to the WD interpretation of *the newspaper* gets us (18) (where Schwarz tacitly assumes that events are of the same type of situations). This is a function that maps situations  $s$  to the sum of all events  $e$  in  $s$  that are reading events such that the theme of  $e$  is the unique newspaper in  $e$ . In short,  $s$  is mapped to the sum of all reading events in  $s$  of the unique newspaper in those events. As there might be multiple such events, there also might be multiple newspapers involved.

$$(18) \textit{read the newspaper} \\ \lambda s \iota * \{e \mid \textit{read}(e) \wedge \exists x[x = \iota(\textit{newspaper}(e)) \wedge \textit{Th}(e) = x \wedge e \leq s\}$$

This is technically an event kind, in the framework of Chierchia (1998). If we want to specify the subject, it has to be reduced to specimens of this event kind. Glossing over details, we end up with the following interpretation, for the WD reading:

$$(19) \textit{Max read the newspaper} \\ \lambda s \exists e'[\textit{Ag}(e') = M \wedge \\ e' \leq \iota * \{e \mid \textit{read}(e) \wedge \exists x[x = \iota(\textit{newspaper}(e)) \wedge \textit{Th}(e) = x \wedge e \leq s\}]$$

This maps situation  $s$  to truth iff there is an event  $e'$ , with agent Max, that is a part of the sum of all reading events in  $s$  of the unique newspapers in those events.

Schwarz states explicitly that this representation prevents anaphora from occurring, and he is right: The newspaper(s) of the event(s) are introduced within the sum operation over all events  $e$ , and even if the existential quantifier  $\exists x$  were dynamic, it is difficult to see how it could extend over the sentence.

## The anaphoric potential of Weak Definites

I would like to point out that anaphoric reference perhaps could be handled via the situation  $s$ , if this is accessible for follow-up sentences. After all, the newspaper(s) in question are part of the individual reading events  $e$ , which are themselves part of the situation  $s$ . Due to the summation operation expressed by  $\iota^*\{e \mid \dots\}$ , we could even hope to explain the observations made in (8) and (10), that plural reference is possible and that there is a maximality effect. Plural reference is clearly possible:

(20) In the cafe, Max read the newspaper. They // The newspapers had similar headlines.

A maximality effect appears in the following example when restricting the interpretation of the first sentence to the WD reading (the example is fine with ordinary definites).

(21) In the cafe, Max read the newspaper. ?? He also read a second newspaper.

In our analysis in section 2.7 I will also assume a summation operation but within a dynamic theory that was designed to model anaphoric uptake.

### 2.6. Number-neutral discourse referents?

Modarresi (2015) proposes that bare noun objects in Persian are pseudo-incorporated objects and introduce number-neutral discourse referents. This predicts a possible plural interpretation of such bare nouns. When extended to WDs, we would predict a possible plural interpretation of WDs as well. as we have seen in (20).

Modarresi proposes an implementation in Discourse Representation Theory (DRT, Kamp & Reyle 1993), which provides for such number-neutral discourse referents (DRs). Her interpretation is illustrated in (22) with a WD, and in (23) for an indefinite nominal. Greek  $\delta$  represents DRs that are number-neutral, whereas Latin  $d$  represents DRs that are anchored to atomic entities. The usual box notation of DRT is avoided here for a leaner representation in angular brackets.

(22) Max read the newspaper.      [ $d_1 \delta_2 \mid d_1 = \text{Max, newspaper}/s(\delta_2), \text{read}(d_1, \delta_2)$ ]  
 He put it / them back.            it if  $\#(\delta_2) = 1$ , then if  $\#(\delta_2) \geq 2$

(23) Max read a newspaper.        [ $d_1 d_2 \mid d_1 = \text{Max, } \#(d_2) = 1, \text{newspaper}(d_2), \text{read}(d_1, d_2)$ ]  
 He put it / \*them back.            it, as  $\#(d_2) = 1$

Modarresi shows how general expectations may push the interpretation towards predicting that null anaphora, lacking a number specification, can pick them up more easily. Also, if world knowledge suggests a singular or plural interpretation of the number-neutral DR, overt singular or plural anaphora should be acceptable.

However, this theory predicts that WD objects support anaphoric uptake with null anaphora similar to indefinites and with singular or plural anaphora, depending on world knowledge (Modarresi 2014, 2015). The only reason why uptake with anaphora might be slightly disadvantaged with WDs, in comparison with singular indefinites, may consist in the fact that anaphoric pronouns are always specified for number (as singular or plural), which might be

problematic if the antecedent is number-neutral. However, such additional semantic specification with anaphoric expressions is acceptable in other cases. For example, sex-based pronouns are possible even if the sex of the antecedent is unspecified, as in *A strange person was standing in front of the building. She / He shouted at us.*

## 2.7. Abstraction and summation of event-dependent definites?

Thus far the proposals predict that either anaphoric reference is similar to indefinites or anaphoric uptake is not possible. I now will turn to a proposal that predicts intermediate accessibility, Krifka & Modarresi (2016). It was developed primarily for pseudo-incorporated nominals in Persian (cf. also Modarresi & Krifka 2021).

The proposal is built on Discourse Representation Theory (DRT) in the format of Kamp & Reyle (1993). This format has also been used by Farkas & de Swart (2003) to model pseudo-incorporation in Hungarian. They assume that pseudo-incorporated nominals do not introduce any DRs immediately but that DRs can be accommodated by a special rule of creation of a discourse referent in hindsight, if the anaphoric element is phonologically null. However, it is unclear why overt anaphora (with more descriptive power than null anaphora) cannot achieve this; if the DRs are accommodated, we should also expect a preference for definite descriptions as anaphoric expression. Also, there are technical problems with the implementation of this account that has been discussed in Yanovich (2008) and Krifka & Modarresi (2016).

Krifka & Modarresi (2016) introduce a theory that predicts a more nuanced pattern for anaphoric potential of WDs that does not result in predictions like uptake is impossible, or as easy as with indefinites. They combine Kamp & Ryle (1993), Diesing (1982) and Yanovich (2008) to a theory that predicts anaphoric uptake to be **possible but slightly reduced** compared to indefinites. This theory was originally developed for bare nouns in Persian (Modarresi, 2014; Krifka & Modarresi (2016). Based on this theory, weak definites do introduce a discourse referent, but it is embedded in the scope of a quantifier from which it can be retrieved by an otherwise established mechanism, which makes it less accessible than the DRs introduced by indefinites.

I first start with an introduction to DRT, as the best-known framework for the modelling of discourse referents (DRs), cf. Kamp & Reyle (1993). In DRT, sentences and discourses are interpreted as discourse representation structures (DRSs). A DRS is technically a pair of a set of variables, or DRs, and a set of conditions which will be represented here in angled brackets,  $\langle \text{DRS} \mid \text{conditions} \rangle$ . For instance, in (24) the two arguments introduce two object DRs  $d_1$ ,  $d_2$  where  $d_1$  is anchored to the person *Max* and  $d_2$  has the property of being a *calendar* and being of cardinality 1.

(24) Max took out a calendar.       $[ d_1 d_2 \mid d_1 = \text{Max}, \text{calendar}(d_2), \text{take-out}(d_1, d_2) ]$   
       It was black.                     $[ d_1 d_2 \mid d_1 = \text{Max}, \text{calendar}(d_2), \text{take-out}(d_1, d_2), \text{black}(d_2) ]$

In contrast, the theory predicts that indefinites in the scope of quantifiers as in the first sentence in (25) do not introduce DRs that are accessible beyond the scope of the quantifier. Indeed, uptake by a singular DR is impossible in this case (even though it might be possible in cases



### The anaphoric potential of Weak Definites

of modal subordination, cf. Sells 1985, Roberts 1989). However, we find that uptake with a plural pronoun is perfectly possible.

(25) Everyone took out a calendar. \*It was/They were black

Kamp & Reyle 1993 present a solution for cases such as (25) by a combination of two rules, Abstraction and Summation. (26) shows the discourse referents as exhibited in DRT:

(26) Everyone took out a calendar.	[   [d <sub>1</sub>   person(d <sub>1</sub> )] ⇒ [d <sub>2</sub>   calendar(d <sub>2</sub> )]
They were black.	[d <sub>3</sub>   [d <sub>1</sub>   person(d <sub>1</sub> )] ⇒ [d <sub>2</sub>   calendar(d <sub>2</sub> )],
	$d_3 = \Sigma d_2 [d_1 d_2   \text{person}(d_1), \text{calendar}(d_2)] \text{black}(d_3)$

Abstraction is a non-compositional device requiring copying of structure with subsequent interpretation, but it likely can be made compositional, e.g., in the continuation semantics of Qian & Amblard 2013). I propose that weak definites are in VP-internal position and under an existential quantifier over the event variable, which is independently motivated as “existential closure” in Diesing (1992); this was also assumed by Modarresi (2014) for pseudo-incorporation in Persian. We furthermore assume that weak definites specify a unique entity relative to a situation, similar to Schwarz (2014), cf. Section 2.5. For instance, in (29) it is presupposed that e<sub>1</sub> is an event for which a unique calendar is defined. The apparent indefinite reading of WDs is due to this dependency on the event existential closure.

Let us see the ingredients of this proposal step by step. I assume existential quantifier in DRT as illustrated (27a). This is interpreted with respect to a variable assignment g as being satisfied in a model iff g can be extended to include d in its domain that makes the condition [...d...] true. The truth conditions are similar to cases in which d is a discourse referent in the upper DRS, but the DR d it is not accessible outside of the DRS with the existential quantifier.

(27) a. Existential quantifier:	[   ∃[ d   ... d ... ] ]
b. DR in maximal DRS:	[ d   ... d ... ]

We furthermore assume event discourse referents, illustrated in (28a). The discourse referents of WDs are dependent on events, similar to Schwarz (2014), as illustrated in (b).

(28) a. Event discourse referents	[ e <sub>1</sub>   check(e <sub>1</sub> ,d <sub>1</sub> ,d <sub>2</sub> ) ]
b. Definite dependent on the event variable	d <sub>2</sub> = calendar(e <sub>1</sub> )

We also assume existential closure over the VP that binds the event variable, as in Diesing (1992), for the representation of sentences with WDs, where the WD necessarily occurs inside the scope of the existential quantifier, as otherwise it could not access the event variable, cf. (29a). Anaphoric uptake is possible after abstraction and summation, as illustrated in (b).

(29) a. Max checked the calendar.	[d <sub>1</sub>   d <sub>1</sub> =Max, ∃[e <sub>1</sub> d <sub>2</sub>   d <sub>2</sub> =calendar(e <sub>1</sub> ), check(e <sub>1</sub> ,d <sub>1</sub> ,d <sub>2</sub> )]
b. It was black.	

$$[d_1 d_3 \mid d_1=\text{Max}, \exists[e_1 d_2 \mid d_2=\text{calendar}(e_1), \text{check}(e_1, d_1, d_2)]] \\ d_3 = \Sigma d_2[e_1 d_2 \mid d_2=\text{calendar}(e_1), \text{check}(e_1, d_1, d_2)], \text{black}(d_3)]$$

This account thus predicts that WDs can be taken up by anaphora, but only after abstraction and summation. The accessibility to such DRs is more complex than the standard uptake of DRs that are introduced by an indefinite antecedent. Thus, WDs introduce DRs but they are less accessible than DRs introduced by indefinites. In other words, anaphoric reference to WD antecedents is possible but more complex, and we should expect that they are less salient than the DRs introduced by indefinites.

The theory also predicts that uptake by singular or plural anaphors is possible, and that uptake by number-neutral anaphors such as null anaphors is possible as well. The theory also predicts a Maximality interpretation, due to the summation operation, that is, a reference to all calendars checked, as shown in (29). In this, WD antecedents differ from indefinite antecedents. Also, I would like to point out that abstraction and summation are rules that are independently established in Kamp & Reyle (1993), they are not just invented for the current purpose.

An example of anaphoric uptake of a WD antecedent from German is presented in (30). Here, the contracted form of definite article or WD *ins Kino gehen* ‘going to the cinema’ is used to refer to a stereotypical activity. Notice that the interpretation of WD in this example is,  $\text{cinema}(e_1)$  the (unique) cinema of event  $e_1$ . This **presupposes** that  $e_1$  is an event for which a cinema is defined, which is satisfied if  $e_1$  is seen as an event referring to a stereotypical activity like ‘going to a cinema to watch a movie’. Thus, the presupposition expressed by the WD, that the event has a unique object of the required type, goes some way to establish that the event is an activity where this object is involved in a stereotypical way. In (31) we show the uptake of the event-dependent definite by established rule of abstraction and summation:

(30) *Max ist [VP ins Kino gegangen].*  
 $[d_1 \mid d_1=\text{Max}, \exists[e_1 d_2 \mid d_2=\text{cinema}(e_1), \text{go-to}(e_1, d_1, d_2)]]$

(31) *Es war klein.*                       $[d_1 d_3 \mid d_1=\text{Max}, \exists[e_1 d_2 \mid d_2=\text{cinema}(e_1), \text{go-to}(e_1, d_1, d_2)]] \\ d_3=\Sigma d_2[e_1 d_2 \mid d_2=\text{cinema}(e_1), \text{go-to}(e_1, d_1, d_2)], \text{klein}(d_3)]$

Note that, in contrast to Schwarz (2014), we do not assume summation (which is the operation  $*\iota(\dots)$  in that account) as part of the interpretation of the sentence that contains the antecedent, (30). Rather summation happens at the point where the anaphoric expression is interpreted. Also, notice that anaphoric uptake to the event discourse referent of the preceding sentence would also require abstraction and summation.

This account predicts various properties of WDs, in particular narrow scope interpretation, as the object discourse referent  $d_2$  is related to the event bound by the existential quantifier, and hence has to have the same scope. It also predicts that the anaphoric uptake is more complex, different from indefinite DP, as  $d_2$  is introduced in a dependent DRS and can be made accessible only by abstraction and summation.

The proposal also accounts for number neutrality of WDs, just as for incorporated nominals, as  $\exists[e_1 d_1 \mid \dots]$  allows for multiple ways of making the DRS  $[e_1 d_1 \mid \dots]$  true. This is different

## The anaphoric potential of Weak Definites

from the representation of indefinites like in *Max went to one cinema*, as the numeral *one* is in competition with other numerals like *two*, *three* etc., which would lead to a scalar implicature that strengthens the meaning to ‘exactly one’. Diesing’s existential closure  $\exists$  does not have plural alternatives. The present framework also predicts Maximality effects due to summation.

### 2.8. Existing proposals and their prediction with respect to anaphoricity

I have discussed a number of proposals that have been made for the semantic representation of WDs (or for pseudo-incorporated nominals, which may have a similar interpretation). We looked, in particular, at the predictions these theories make with respect to the anaphoric uptake of DRs that are associated with these WD antecedents. The following table summarizes our results.

Theories	Prediction about anaphoric uptake
Kind Theory	reference is only possible to kind individual
Property-denoting incorporated object	either no uptake or with dynamic quantifier uptake is possible as easy as indefinite nominal
Restriction & Saturation	either no uptake or with dynamic quantifier uptake is possible as easy as indefinite nominal
Kinds of events	no anaphoric uptake
Farkas & de Swart (2003)	no uptake except for null anaphora by accommodation
number neutral discourse referent	anaphoric uptake with null anaphora similar to indefinites and with singular or plural anaphora, depending on world knowledge
Abstraction & Summation for event dependent definites	anaphoric uptake is possible as WDs are event-dependent definite, but it is somewhat reduced as it has to be retrieved with special rules.

In what follows we present two experiments that will, in general, lend support to the analysis of Krifka & Modarresi (2016).

### 3. Experiment 1: Weak definites vs. indefinite antecedents

In this experiment I compare the ease of reference to weak definites (WDs) and indefinite (IDs) antecedents in similar contexts, which leads to relatively subtle differences. Here I report on an experiment that uses a novel technique involving competing antecedents. The first sentence contains both an ID antecedent and a second antecedent that is realized either as ID or as WD. The second sentence contains a pronoun that is compatible with either antecedent in its gender and its plausible interpretation. Consider the example below, where the pronoun *Es* ‘it’ can be a reference to either *Museum* or *Kino*:

- (32) a. Nora hat sich gestern **ein Museum** angeschaut, bevor sie **ins Kino** gegangen ist. **Es** war gerade neu eröffnet worden.  
 ‘Nora went to a museum yesterday before going to the cinema.  
 It was recently opened’
- b. Nora hat sich gestern **ein Museum** angeschaut, bevor sie in **ein Kino** gegangen ist. Es war gerade neu eröffnet worden.  
 ‘Nora went to a museum yesterday before going to a cinema.  
 It was recently opened.’

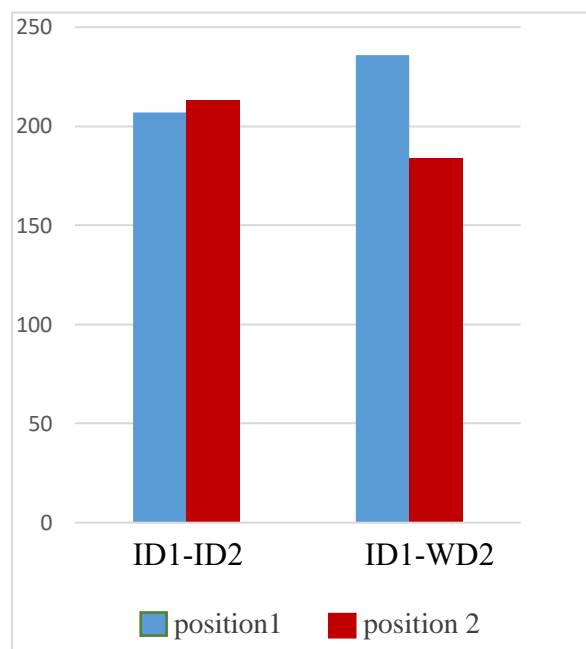
**Method and Participants.** 60 students from Humboldt University participated in an online survey. All participants were native speakers of German between 18 to 29.

**Procedure.** In an online survey with 14 experimental items and 7 fillers, randomized using Latin Square, the participants task was to read the antecedent clause as in the sample items (32a) or (b), followed by a subsequent sentence with a pronoun that potentially refers to either one of the antecedents. The participants are then asked, in a separate slide on the screen, to decide whether the pronoun refers to the first or the second antecedent:

- (33) Was ist gerade neu eröffnet worden? Select between Museum or Kino!  
 ‘What was opened recently? Select between: Museum or Cinema!’

As a general principle of recency, one expects the last discourse referents for *ins / in ein Kino* be more accessible than *ein Museum* due to recency. The theory by Krifka & Modarresi (2016) predicts that discourse referents introduced by the indefinite noun *in ein Kino* is more accessible than > the weak definite *ins Kino*. It also predicts substantial number of uptakes for WDs *ins Kino* even though slightly less than indefinites. Most other theories as explained before, predict either no or highly limited accessibility by the WD *ins Kino* or an uptake for WDs similar to indefinites (*in ein Kino = ins Kino*)

Figure 1: Anaphoric Reference to competing antecedents, absolute numbers; ID1 ID2: two indefinites, ID1 WD2: Indefinite followed by Weak Definite



## The anaphoric potential of Weak Definites

**Results.** The results illustrated in Figure 1, shows that WDs are taken up quite often but slightly less so than indefinites (significant difference, chi square  $p = 0,01$ ). When the two antecedents are both indefinite the only difference being their position in the sentence (ID1 first position versus ID2 second position), the participants responses seem to be at chance level, referring to both antecedents with nearly equal probability, although the most recent antecedent is taken up slightly more often (though it is not significant). With the presence of a WD (WD2) antecedent, reference to first indefinite noun (ID1) is much higher, as participants choose WDs less favorably compared to the competing indefinite antecedents. WD in the second position (WD2) is also picked up less often compared to cases where the indefinite noun is in the second position (ID2).

The result contradicts the accounts that predict no anaphoric reference to WDs as well as the theories that predict WDs similar to indefinites (chi square= 0.01).

This experiment shows that WDs are anaphorically accessible (otherwise, uptake of WD2 would be non-existing or much rarer). Furthermore, it shows that WDs are less accessible than singular indefinites, everything else being equal. Hence it is in support of the theoretical account presented in Section 2.7.

### 4. Experiment 2: Anaphoric Uptake by Associative Anaphora?

In this section I will consider whether there is an alternative way to explain our empirical findings, that WDs can be taken up by anaphora, but not as easily as indefinites. A possible alternative is associative anaphora or bridging (cf. Clark 1975). This is responsible for the anaphoric uptake in cases like *I walked into the ballroom. The chandeliers sparkled brightly*, where the chandeliers are given because they are stereotypically associated with ballrooms.

Associative anaphora has been proposed for anaphoric reference to arguments that are implicit or embedded in a compound. In (34) we can use the bridging mechanism to account for anaphoric reference to *apple-picking*, a compound that arguable is not able to introduce a DR. Here, *the apples* can refer as the accessible antecedent *apple-picking* introduces an event of apple-picking, and every such event comes, by its very meaning, with corresponding apples.

(34) Mary went apple-picking. **The apples** /#**They** were delicious (cf. Ward et al.1991).

In fact, associative anaphora have been proposed by Asudeh & Mikkelsen (2000) to explain anaphoric uptake for pseudo-incorporated objects in Danish. According to their proposal, such nominals do not introduce DRs but may allow for “inferential pronominalization” (cf. also Schwarz 2019). But the problem with this explanation is that it predicts a preference for anaphoric uptake by full DPs rather than overt pronouns, as shown in in (34) and (35), in which reference by pronoun seems to be much degraded.

(35) Max flew to Costa Rica. He was afraid when he saw **the airplane** / **\*it**.

However, there are rare cases where anaphoric reference to implicit arguments with pronouns is possible, as in the following examples. They typically rely on the pronouns *he* and *she* that are semantically more specific, as they carry a sex-based gender feature.

(36) Max met the Millers yesterday. **She** was nice, but **he** was a bore.

(37) John married. **She** is beautiful.

The experimental items in Experiment 1 used pronouns, which makes it unlikely that the findings can alternatively be based on bridging. However, I investigated this alternative possibility in a second experiment.

In Experiment 2, I investigated whether WD uptake could be due to bridging. We did this with examples like (38), which comes in two varieties: One with a WD antecedent (here *mit dem* (or *mit'm*) *Flugzeug* ‘the airplane’), and one with a bare verb (here: *geflogen* ‘flew’) that is strongly associated with the same entity as the WD antecedent, as flying, for humans, is stereotypically done with airplanes. We have seen that associative anaphora preferably is done by full definite DPs, not with pronouns. Hence we investigate the preferred type of pronominal uptake with respect to the two versions of the text.

(38) Susanne ist Journalistin bei einem Nachrichtensender.

‘Susanne is a journalist at a news broadcaster.’

a. Gestern ist sie **mit dem Flugzeug** nach Costa Rica **geflogen**.

‘Yesterday she flew with the plane to Costa Rica.’

b. Gestern ist sie nach Costa Rica **geflogen**.

‘Yesterday she flew to Costa Rica.’

Da über dem Atlantik starke Stürme herrschten, geriet **es /das Flugzeug** öfters in Turbulenzen.

‘As there were strong storms, it / the airplane often faced turbulences.’

The prediction is that if anaphoric uptake of WDs is due to associative anaphora, then there should be no difference between WD antecedents like *mit dem Flugzeug geflogen* and simple verb antecedents like *geflogen*; both cases should strongly prefer definite DPs like *das Flugzeug*. If WDs are taken up along the mechanism of abstraction and summation suggested in Section 2.7, we should expect that this uptake is more often in the form of pronouns, as the simpler expressions, while uptake by definite DPs are still possible.

**Participants.** 36 students from the University of Humboldt participated in an online survey. All participants were native speakers of German between 18 to 29.

**Materials.** We constructed 25 experimental items similar to sample item in (38). The first sentence either contains a weak definite (WD) or the object remained implicit ( $\emptyset$ ). The second sentence was contains either anaphoric reference with a pronoun or a full DP. The items were randomized using Latin square design in two lists.

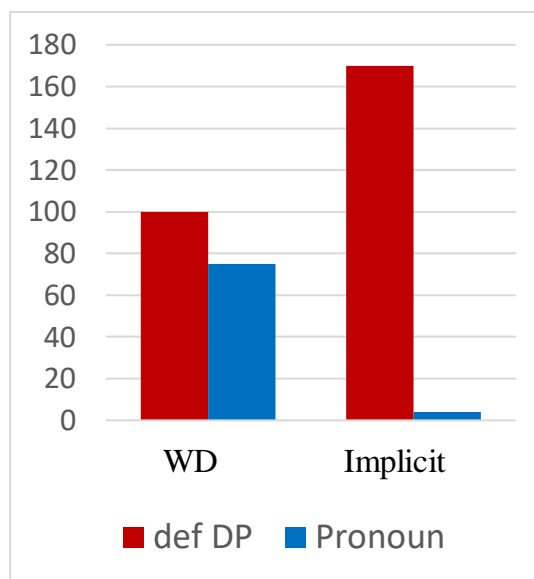
**Procedure.** In an online survey, participants task was to read the antecedent clause containing either a WD or a simple verb, as described above, and then select the best anaphoric expression

## The anaphoric potential of Weak Definites

(pronoun or the full DP) for the subsequent sentence, as potentially referring to the antecedent in each trial.

**Results:** As shown Figure 2 below, participants continued items consisting of WD antecedents frequently with pronouns; definite DPs were chosen only slightly more frequently. However, cases in which there was no explicit antecedent nearly always required a full DP. The difference is highly significant.

Figure 2: Uptake of sentences with a WD antecedent or with an implicit antecedent by full definite DPs or pronouns, absolute numbers.



Experiment 2 shows that anaphoric uptake of WDs is different from associative anaphora. To be sure, it does not rule out associative anaphora in this case, but there must be either another option for anaphoric uptake, or associative anaphora in case of WDs must have some special property that is absent in case the antecedent clause only invokes an object implicitly. Defenders of the associative anaphora account would have to spell out the precise mechanism that is behind this facilitation.

## 5. Conclusion

In this paper I investigated the anaphoric uptake of weak definites (WDs) vs. indefinites (IDs). I proposed that investigating the anaphoric potential of WDs is helpful in distinguishing between the various theories for weak definites that have been proposed. Current theories of WDs and pseudo-incorporated nominals either predict that WDs are not accessible at all, or that WDs are as accessible as indefinites. Krifka & Modarresi (2016), which was developed for pseudo-incorporated nominals, predict WDs to be accessible but by a more complex process (abstraction and summation). I presented two experiments. The first experiment investigates two competing antecedents in the same clause, WDs vs. IDs. It was shown that WDs are easily accessible to anaphora, but less so than IDs; this pattern is consistent with the theoretical assumptions of Krifka & Modarresi (2016). In the second experiment I tested whether

associative anaphora (bridging) is an alternative way to explain anaphoric uptake of WDs. I found that this is not the case; true cases of associative anaphora show a different pattern, as they strongly disfavor uptake by pronouns, which is not the case for uptake of WDs.

A further research question would be testing experimentally whether the uptake of WDs is similar to the uptake of indefinites under other quantifiers, as treated by Kamp & Reyle 1993 for abstraction or summation. Also, for comparison with the anaphoric potential of other expression types, see Modarresi & Krifka (2022) and Krifka & Modarresi (2023).

### **Appendix: Experimental Items of Experiment 1**

1. Marie hat ihrem Chef mitgeteilt, dass sie am Mittwoch zu einem / zum Arzt gehen musste. Er fährt nächste Woche in den Urlaub.
2. Nora hat sich gestern ein Museum angeschaut, bevor sie in ein / ins Kino gegangen ist. Es war gerade neu eröffnet worden.
3. Elisa konnte gestern einen großen Koffer transportieren, weil sie einen / den Bus genommen hat. Er war sehr voll, daher war es etwas mühsam.
4. Arno möchte wissen, was in der Welt los ist. Heute Morgen hat er eine Sendung im Radio gehört, bevor er eine / die Zeitung gelesen hatte. Sie war ihm empfohlen worden.
5. Lorenz ist ein älterer Junggeselle. Dieses Jahr hat er eine Aufführung der Matthäuspasion erlebt, als er an Ostern in eine / die Kirche gegangen ist. Sie war sehr eindrucksvoll.
6. Leon hatte heute frei. Er wollte mit seiner Freundin in ein Konzert, weswegen er eine / die U-Bahn genommen hat. Sie war leider unpünktlich.
7. Birgit hat ein Wochenende in einem schicken Hotel in München verbracht, bevor sie mit einem / dem Flugzeug weiter nach Hamburg geflogen ist. Es war beinahe komplett ausgebucht.
8. Das Restaurant hat Florian, den Koch, beauftragt, bei einem / beim Bäcker Baguette zu kaufen. Er versteht sein Handwerk gut.
9. Heinrich ist niemals aus seiner Geburtsstadt herausgekommen. Er hat 81 Jahre in seinem Elternhaus gelebt, bevor er zwölf Jahre in einem / im Altersheim verbracht hat. Es ist eines der schönsten Häuser in der ganzen Stadt.
10. Otto hatte sofort nach dem Kauf eines Gebrauchtwagens einen Unfall, sodass er in ein / ins Taxi gestiegen ist, um nach Hause zu kommen. Es war ein etwas älterer Mercedes.
11. Marco hat eine Pizza gebacken, wobei er die Tomatensoße in einer / der Pfanne vorgewärmt hat. Leider hatte sie ein Loch im Boden und ein Teil der Soße ist durchgelaufen.
12. Lena hat ihren Fitnesstrainer getroffen, als sie gerade von einem / vom Friseur kam. Er hatte ihr einen Kurzhaarschnitt empfohlen.
13. Valerie war in einem Park spazieren, bevor sie mit ihren Kindern zu einem / zum Spielplatz gegangen ist. Er liegt am Ufer eines Flusses.
14. Erwin arbeitete sieben Jahre als Kellner in einem Restaurant, bevor er in ein / ins Kloster ging. Es lag in einem kleinen Ort in den Bergen.

Example filler: Ingo ist mit seinem Motorrad beim Ausparken gegen eine Autotür gestoßen. Es hat einen Kratzer bekommen. Was hat einen Kratzer bekommen? Motorrad – Auto.

The full items and the items of Experiment 2 can be accessed at:  
<https://bit.ly/AnaphoricPotentialWeakDefinitesExperimentItems>

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