Selectional Restrictions and the Meaning of Reciprocal Alternations

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1 Introduction

Reciprocal verbs like *fight*, *talk* and *meet* involve three different argument realizations that lead to contrasts as in the following sentences:

(1) a. Sue fought the disease.
 b. ?Sue fought with the disease.
 c. #Sue and the disease fought.

The inanimate object in the transitive sentence (1a) is fully acceptable. By contrast, the reciprocal intransitive form (1c) exhibits a strong selectional violation ('#'). The acceptability ('?') of the *with* construction (1b) is somewhere in between (1a) and (1c). Similar three-way distinctions have also been observed in languages where the class of verbs that exhibit reciprocal alternations is much richer than in English (see Rákosi 2008 on Hungarian, Bar-Asher Siegal 2015 on Hebrew). Rákosi proposes a straightforward approach to contrasts as in (1), postulating different thematic roles for different argument positions. Thus, while the role of *the disease* is standardly 'Patient' (or 'Theme') in (1a) and 'Agent' in (1c), its position in (1b) is assigned a different role. Rákosi refers to this thematic role as 'Partner'. The contrasts in (1) are then described using the assumption that different thematic roles lead to different verb meanings and introduce different selectional restrictions.

While this is surely a proper description, it must be semantically elaborated. We should like to have a systematic account of the way in which contrasts in selectional restrictions as in (1) are related to meanings of parallel sentences without any selectional violation:

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(2) a. Sue fought Dan.
     b. Sue fought with Dan.
     c. Sue and Dan fought.

We may reasonably expect the pattern of (non-)violations in (1) to follow from the way speakers and hearers understand the sentences in (2). Rákosi (2008:p.424) proposes that certain semantic properties like volition, sentience and being the cause of the event are obligatory for the agent but only optional – though, presumably, still preferred – for the 'partner'.[1] If successful, this idea should allow us to analyze the violations in (1b-c) on the basis of the interpretation of the parallel sentences (2b-c). For the analysis we focus on cases where Sue has all relevant Agent properties – she volitionally and sentiently causes the fighting event, whereas Dan takes part in the event but does not have all these properties. In such situations we expect sentence (2c) to be interpreted as false, whereas (2b) may still be true. This kind of asymmetric situations is the basis for the experimental work in Kruitwagen et al. (2017) on the semantics of reciprocal verbs. In Kruitwagen et al.'s work, truth-value judgements of speakers on sentences like (2a-c) in asymmetric situations serve as core pieces of evidence about the semantics of reciprocal alternations. On the basis of their experimental results, Kruitwagen et al. follow Rákosi and characterize the semantic features of verbs according to their *salience* for different arguments. This salience of semantic features can be expressed on a scale between *obligatory* (or highly salient), through *preferential*, to *contingent* (=fully optional). This idea harmonizes well with Dowty's (1991) approach to thematic roles as bundles of prototypical properties, as well as with theories of lexical concepts in cognitive psychology (Hampton, 2007, Hampton and Winter, 2017), where vagueness, graded membership and family resemblance are core theoretical notions. The aim of the present paper is to develop further the conceptual semantics of reciprocal verbs, so to account for contrasts in selectional restrictions as illustrated in (1).

The paper is structured as follows. Section 2 reviews some relevant cross-linguistic data and introduces a generalization about the pattern of selectional resrictions with reciprocal verbs. Section 3 develops ideas from previous work that treat selectional restrictions as *presuppositions* (McCawley, 1968, Asher, 2011). More specifically, we treat selectional restrictions as following from a general semantic scheme that presupposes the *possibility* of predication. Section 4 proposes that contrasts in selectional restrictions as in (1) follow as a corollary from the presuppositional treatment of selectional restrictions in Section 3 and a theory of reciprocal alternations, relying on experimental results from Kruitwagen et al. (2017) and the proposal in Winter (2018). It is concluded that a well-developed theory of reciprocal alternations and the lexical concepts that they involve may directly account for the selectional restrictions on different realizations of the verb's argument. It is hypothesized that a similar conclusion may hold with other types of verb alternations and selectional restrictions.

2   The Reciprocal Selection Generalization

The examples below demonstrate a cross-linguistic pattern with selectional restrictions, of the same type that is illustrated by (1) above.

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[1]For a related idea on preferential symmetry see Gleitman et al. (1996), remarked on in note 12 below.

English:

(3) a. Sue *talked/gossiped/chatted/made love* to/?with a tree.
    b. #Sue and the tree *talked/gossiped/chatted/made love*.

(4) a. ?The drunk *conversed* with the tree.
    b. #The drunk and the tree *conversed*.

(5) a. Dan *agreed* with the statement.
    b. #Dan and the statement *agreed*.

(6) a. Sue *collided* with the tree.
    b. #Sue and the tree *collided*.

Dutch (Imke Kruitwagen and Joost Zwarts, p.c.):

(7) a. Suus *vocht* tegen   de slaap.
       Suus fought against the sleep
       "Suus fought against her sleep"
    b. ?Suus *vocht* met de slaap.
       Suus fought with the sleep
       "Suus fought with her sleep"
    c. #Suus en   de slaap *vochten*.
       Suus and the sleep fought
       "Suus and her sleep fought"

(8) a. Jan heeft het kussen *geknuffeled*.
       Jan has   the pillow hugged
       "Jan hugged the pillow"
    b. ?Jan heeft met het kussen *geknuffeled*.
       Jan has   with the pillow hugged
       Roughly: "Jan behaved as if he and the pillow hug"
    c. #Jan en   het kussen hebben *geknuffeled*.
       Jan and the pillow have   hugged
       "Jan and the pillow hugged"

(9) a. De autochauffeur is tegen/?met   de boom *gebotst*.
       the driver   is against/with   the tree   collided
       "The driver hit/had a mutual collision with the tree"
    b. #De autochauffeur en   de boom zijn *gebotst*.
       the driver   and the tree   are collided
       "The driver and the tree collided"

Hebrew:

(10) a. ha-shikor *xibek*   et   / *nishek* et   / *laxash*   l- / *litef*   et   ha-pesel.
         the-drunk hugged ACC / kissed ACC / whispered to / caressed ACC the-statue
         "the drunk hugged/kissed/whispered to/caressed the statue"

  b. ?ha-shikor *hitkabek* / *hitnashek* / *hitlaxesh* / *hitlatef*   im   ha-pesel.
         the-drunk hugged   / kissed   / whispered / exchanged caresses with the-statue
         Roughly: "the drunk behaved as if he and the statue hug/kiss/whisper/exchange caresses"

  c. #ha-shikor ve-ha-pesel   *hitxabku* / *hitnashku* / *hitlaxshu* / *hitlatfu*.
         the-drunk and-the-statue hugged   / kissed   / whispered / exchanged caresses
         "the drunk and the statue hugged/kissed/whispered/exchanged caresses"

(11) a. ha-matos *hitnagesh* b-/?im ha-karka.[2]
         the-plane collided   in/with the-ground
         "the plane hit/had a mutual collision with the ground"

  b. #ha-matos ve-ha-karka   *hitnagshu*.
         the-plane and-the-ground collided
         "the plane and the ground collided"

Hungarian (Rákosi 2008 and Anna Szabolcsi p.c.):

(12) a. János *csókol-gat-ta*   a   szobor-t.
         Janos kissed-ITER-PAST the statue-ACC
         "Janos kissed the statue repeatedly"

  b. ?János *csókol-óz-gat-ott*   a   szobor-ral.
         Janos kissed-RCP-ITER-PAST the statue-WITH
         "Janos engaged repeatedly in a mutual kiss with the statue"

  c. #János és a   szobor *csókol-óz-gat-ott*   (egymással).
         Janos and the statue kissed-RCP-ITER-PAST (with each other)
         "Janos and the statue kissed repeatedly (with each other)"

Greek (Dimitriadis 2004 and Stavroula Alexandropoulou p.c.):

(13) a. O Nikos *filise* to aghalma.
         the Nick   kissed the statue

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[2]Despite empirical claims to the contrary in (Siloni, 2012:p.299), examples with inanimate objects following the Hebrew form *hitnagesh im* 'collided with' are not ruled out by Hebrew the speakers I consulted. For instance:

 (i) nahag ha-masa'it asher *hitnagesh* im   ha-gesher shel kvish 4.
      driver the-truck   that collided   with the-bridge of   road 4

 "the truck driver who hit the bridge over Road 4" (http://sharonsharaby.blogspot.com/2017/10/7.html Accessed: 6 July 2019)

Acceptability here is similar to other cases of inanimate objects following Hebrew *im* 'with', as illustrated above and in Bar-Asher Siegal (2015). Similar examples to (i) are found online with inanimate nouns like 'wall', 'ground', 'frame', 'cubes', 'house' and 'pole'. Siloni is probably right that the form *hitnagesh b-* ("hit", lit. 'collided in') is preferred in such cases, which is supported by Google counts, but such preferences do not seem to follow from a grammatical rule.

"Nick kissed the statue"

b. ?O Nikos *filithike*   me to aghalma.
   the Nikos kissed-RCP-SG with the statue
   "Nick engaged in a mutual kiss with the statue"

c. #O Nikos kje to aghalma *filithikan*.
   the Nick and the statue kissed-RCP
   "Nick and the statue kissed"

From these examples we derive the following generalization:

(14) **The Reciprocal Selection Generalization** (**RSG**): *Let* verb$_1$, verb$_2$ *and* verb$_w$ *be three forms of a reciprocal verb:*[3] *an intransitive-collective form, a binary (transitive/'to'/'against') form and a 'with' form, respectively. Observing that the subject SRs of the three forms are the same, we let* N *be a noun that is acceptable as heading the object of* verb$_2$ *form, but not the subject of any of the forms. We have the following acceptability scale:*

$$\text{verb}_2\ \text{N} \quad > \quad ?\text{verb}_w\ \text{N} \quad > \quad \#\text{N}\ \text{verb}_{1/2/w}$$

In words: N *is more acceptable in objects of the binary form than it is in 'with' PPs, which are in turn more acceptable than cases where* N *appears in the subject position (of any of the forms).*

Accounting for the RSG first involves having an account of SRs in general. This is the subject of Section 3. The next step is to derive the SRs of reciprocal verbs from their meanings. This involves accounting for the fact that SR violations that are triggered by the 'with' form are milder than those that are triggered by the subject, although still noticeable compared to the object of the binary form. This step will be taken in Section 4.

3 Selectional restrictions as presuppositions

To treat the selectional restrictions (SRs) of reciprocal verbs, it is useful to first make some assumptions about the nature of SRs in general. For example, let us consider the following simple case of SR violation:

(15) #Fido drank the meat.

In linguistics there is a fairly long tradition assuming that violations as in (15) directly follow from the verb's meaning. Thus, understanding what *drink* means – say, to take liquid into the mouth and swallow it – should lead speakers to consider (15) unacceptable, provided that they, reasonably, do not categorize meat as liquid. This line of account also explains why SRs support semantic entailments as in (16):

(16) Fido drank what was left in the bowl $\Rightarrow$ What was left in the bowl was liquid

In (16), the SRs of *drink* allow us to conclude that the pseudo-cleft *what was left in the bowl* refers to a liquid.

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[3]By referring to the verb as "reciprocal", we assume that the meanings of the sentences *A and B verb$_1$*, *A verb$_2$ B and B verb$_2$ A*, and *A verb$_2$ with B* (*B verb$_2$ with A*) are roughly the same. Cases of comitative *with* (*Sue ate with Dan*) and instrumental *with* (*Sue ate the pizza with a fork)* are thus ignored.

SRs as illustrated (15) and (16) act as parts of the verb's meaning, which we consider as *presuppositions* of that meaning (McCawley, 1968, Asher, 2011). One reason for this classification is that SRs show projection behavior that is typical of presuppositions and not of other types of inference. This is observed with SR violations as in the following sentence:

(17)   #If Fido drank the meat he got poisoned.

The SR violation in (17) is embedded in the antecedent of the conditional. This violation does not lead here to a conditional statement like "if the meat is liquid and Fido took it into his mouth and swallowed it, he got poisoned". Rather, the violation gets "projected" as unacceptability of the embedding conditional, with the infelicitous implication about liquid meat. We observe the same projection behavior in setups where SRs are not violated. Consider for instance the felicitous conditional sentence (18), and the two possible conclusions from it in (18a-b):

(18)   If Fido drank what was left in the bowl he got poisoned.
     a. $\Rightarrow$ What was left in the bowl was liquid.
     b. $\nRightarrow$ Fido took what was left in the bowl into his mouth.

The sound entailment in (18a) again demonstrates that the "liquid" SR gets projected as a conclusion of the conditional sentence, this time without leading to any infelicity. By contrast, (18b) demonstrates that the conditional does not entail the "take into mouth" part of the meaning of *drink*. This is a classical distinction between presuppositions, which "project" out of antecedents of conditionals, and other inferences, which do not (Chierchia and McConnel-Ginet, 1990). Thus, we conclude that SRs are presuppositional, unlike other ingredients of verb meaning.[4]

Having seen some presuppositional properties of SRs, let us now address the origins for their difference from other ingredients of verb meaning. For example, what principle determines that the "liquid" part of the meaning of *drink* should be an SR (hence a presupposition), whereas the "take into mouth" ingredient should be part of what is being asserted?[5] Rick Nouwen (p.c.) proposes a simple general answer to this question. According to Nouwen's proposal, SRs manifest a *possibility presupposition about predication*. Importantly, this proposed presupposition is assumed to be a general formal scheme that concerns *all* ingredients of a verb's meaning, not just SRs. For instance, let us assume that the core meaning of *drink* contains all conceivable semantic ingredients of that verb's meaning, as formalized in (19) below:

(19)   **Core meaning**:

$$\text{DRINK}_C(e,x,y) \;=\; liquid(y) \land take\_into\_mouth(e,x,y) \land swallow(e,x,y)$$

In words, the core meaning of the verb *drink* requires: x drinks y in an event e if and only if y is liquid, and e is an event where x takes y into her mouth and swallows y.

This does not give us yet any SR. Nouwen's proposal is that the SRs of a verb are systematically derived from its core meaning by applying a possibility operator. Thus, for the verb *drink* we get:

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[4]There are familiar presuppositional ingredients of verb meanings that are not standardly classified as SRs. For instance, the "had smoked" ingredient of aspectual verb phrases like *stopped smoking* and *continued smoking* is presuppositional, unlike the "no longer smokes" and "still smokes" ingredients of their respective meanings, which are part of their contribution to assertion.

[5]This is the *triggering problem* for presuppositions (Schwarz, 2019), when applied to SRs.

(20) **Presuppositional meaning**:

$$\mathbf{drink}_P(e,x,y) \;=\; \diamond(\exists e'.\mathrm{DRINK}_C(e',x,y))$$

In words: the presuppositional part of the meaning of *drink* is a statement about the possibility of having an event where the core meaning holds of the thematic arguments. Based on the core meaning in (19), we conclude:

(21) $\mathbf{drink}_P(e,x,y) \;=\; \diamond(\exists e'.liquid(y) \wedge take\_into\_mouth(e',x,y) \wedge swallow(e',x,y))$

The presupposition in (21) still seems quite far from the SRs that are actually manifested with the verb *drink*. Specifically, the clauses $take\_into\_mouth(e',x,y)$ and $swallow(e',x,y)$ require the possibility of "take into mouth/throat", which are not clearly manifested as SRs of *drink*. By contrast, the clause about the *possibility* that y is liquid seems to require too little: in usages of *drink*, the object is *actually*, not just possibly, required to be liquid. To get an idea of the full picture we need to also take into account additional semantic factors:

(22) (i) The predicate *liquid* is a stative predicate, which is presumably constant across the possible situations that are relevant for (21). Thus, something that is required to "possibly" be a liquid may be forced to actually *be* liquid, since liquidity (like any other stative property) is part of what is intensionally constant about an entity. Thus, an ice cube is viewed as epistemically different from the water that was put in the freezer.

(ii) The eventive predicates $take\_into\_mouth(e,x,y)$ and $swallow(e,x,y)$ have their own stative SRs: $have\_mouth(x)$ and $have\_throat(x)$, respectively.

(iii) Once the three stative SRs "liquid", "mouth" and "throat" are satisfied, we may reasonably assume that the modal statement in (21) is trivially satisfied: any agent x that has a mouth and a throat can *possibly* take any liquid y into her mouth and swallow it.

It would take us too far afield to derive (22i-iii) from more basic semantic or pragmatic assumptions. However, I take it that they are plausible enough, and for one thing, they are sufficient for our current purposes. Based on these three points, we assume that Nouwen's proposal can derive the following actual meaning for *drink* using its core meaning in (19):

(23) **Actual meaning**:

$$\mathbf{drink}(e,x,y) =$$
$$liquid(y) \wedge have\_mouth(x) \wedge have\_throat(x) : take\_into\_mouth(e,x,y) \wedge swallow(e,x,y)$$

With the presuppositional and assertive elements separated by ':', the formula in (23) expresses the proposal that stating that x drinks y in an event e presupposes that y is liquid and that x has a mouth and a throat, and asserts that e is an event where x takes y into her mouth and swallows y.[6]

More generally, we assume that each verb has a core Davidsonian meaning VERB_C, which maps any event and entity arguments to a truth-value. This core meaning is mapped to an actual meaning **verb** using Nouwen's principle:

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[6]The formula (19) takes $liquid(y)$ to be part of the core meaning of *drink*, from which the corresponding presupposition is derived by Nouwen's proposed principle. Once a stative predicate like that is part of a verb's meaning, its treatment as a presupposition masks its assertive content. For a similar point about "masked assertive contents" in other cases see Klinedinst (2016), Zehr and Schwarz (2018).

(24)   **verb**$(e, x_1, \ldots, x_n) = \lambda e.\lambda x_1. \ldots \lambda x_n. \diamond (\exists e'.\text{VERB}_C(e', x_1, \ldots, x_n)) : \text{VERB}_C(e, x_1, \ldots, x_n)$

In words: a verb's actual meaning **verb** applies its core meaning VERB_C to the event and thematic arguments, with a possibility presupposition triggered by that core meaning.

Importantly, "core meanings" as tentatively formalized in (19) should not be seen as logical definitions. Rather, they should be seen as meaning postulates, or semantic templates (Rappaport-Hovav and Levin, 1998). The scheme in (19) establishes a connection between the meaning of the verb *drink* and the meanings *liquid*, *take_into_mouth* and *swallow*. Schemes like that encode assumptions about *concepts*, whose detailed study is a big enterprize, only partially linguistic (Laurence and Margolis, 1999). For our purposes here, two general properties of concepts are important: their *fuzzy boundaries* and reliance on *non-essential properties*. Fuzzy boundaries are illustrated by vague adjectives like *red*, *loud* or *expensive*. Obviously, it is impossible to define once and for all what counts as red, loud or expensive. The same holds for verbs. What are the circumstances under which you would say that *the artillery thundered*? Quite loud circumstances to be sure, but whatever the boundaries of the verbal concept THUNDER may be, they are no less fuzzier than those of the adjective *loud*.

Non-essential properties are another well-known aspect of concepts, at least since the classical works by Wittgenstein (in Philosophy) and Rosch (in Cognitive Psychology). The classes of objects that we categorize as *games*, *fruits* or *furniture* not only have fuzzy boundaries, but are also determined using complex considerations of family resemblance. A well-known example by Wittgenstein is the concept GAME, which involves competition as a common salient property. However, competition is not an essential property of games: many activities that are classified as games are not considered competitive (a Google search yields impressive lists of such games). Thus, we say that "being competitive" is a *preferential* property of the concept GAME. Other properties of this concept, like "improve skills", "relieve boredom" or "entertain" are similarly non-essential. In this respect, the meaning of a verb like *play* are not less multi-dimensional than that of the noun *game*: to the extent that the verb concept PLAY is related to the noun concept GAME, it must involve non-essential but preferential properties. Such preferential properties are distinguished from a property like "take something into mouth" of the verb concept DRINK, which is prominent enough to be considered as essential for practical purposes.

These remarks come to hint at the possibility that principles of meaning alternation with reciprocal verbs as illustrated in Section 2 may also involve fuzzy boundaries and non-essential properties. The next section argues that this is indeed the case, which has direct implications for the analysis of SRs with reciprocal predicates.

4   Selectional restrictions with reciprocal alternations

In this section we get back to the Reciprocal Selection Generalization of Section 2, with the aim of accounting for it using the general ideas about selectional restrictions in Section 3. To do that, we have to spell out the meaning of intransitive verbs like *fight*, *hug* and *collide*, and analyze their semantic relations with the corresponding binary forms. Much previous work has assumed that such collective verbs require strong reciprocity in the sense of Dalrymple et al. (1998). Thus, for instance, the sentence *Sue and Dan hugged* is supposed to require that the sentence *Sue hugged Dan and Dan hugged Sue* holds in one "semantically irreducible" event (Dimitriadis, 2004, 2008, Siloni, 2012). However, recent experiments by Imke Kruitwagen cast doubts on the assumption

that reciprocal intransitive verbs generally require this kind of symmetric participation (Kruitwagen et al., 2017, Kruitwagen, 2019). Consider for instance the following Dutch examples:

(25) a. Violet en   Mark zijn *gebotst*.
          Violet and Mark are collided
          "Violet and Mark collided"

      b. Mark is tegen   Violet *gebotst*.
          Mark is against Violet collided
          "Mark hit Violet"

According to previous accounts, we might expect binary statements as in (25b) to be necessary conditions for the truth of collective sentences like (25a). Kruitwagen (2019) tested this expectation on two groups of 59/53 Dutch speakers, who were requested to make a truth-value judgement on sentence (25a/b) respectively. Each participant was shown a short video film where Violet rides her bicycle and hits Mark's bicycle, while Mark is standing still. 69% of the participants in the first group accepted sentence (25a) as true in this situation, while only 4% of the participants in the other group accepted (25b) as true. From such results we conclude that for the majority of speakers, symmetric participation is not necessary for judging sentences like (25a) as being true. Kruitwagen's experiments show similar results with the verbs *knuffelen* 'hug', *vechten* (*tegen*) 'fight (against)' and *fluisteren* (*tegen*) 'whisper (to)'. The conclusion is that for many speakers symmetric participation is not obligatory with reciprocal verbs, at least not in certain circumstances.

A weaker logical requirement that is empirically sounder than symmetric participation is what we may call "disjunctive participation". For two objects to be considered as *fighting*, *hugging* or *colliding*, a necessary requirement is that at least one of them is fighting, hugging or hitting the other. Spelling out minimal requirement for the core intransitive meaning of *collide*, we get the following disjunctive rule:

(26) **Requirement from core meaning of intransitive *collide*/*botsen*:**[7]

$$\text{COLLIDE}_C(e, x{+}y) \Rightarrow hit(e,x,y) \lor hit(e,y,x)$$

In (26) we assume that the agent denotes a sum $x{+}y$ of two entities (Link, 1983). In words, (26) states that an event e is a collision with the sum $x{+}y$ as its agent *only if* x hits y in e and/or y hits x in e. The kind of disjunctive requirement is weak enough so that, arguably, it describes one part of the meaning of reciprocal verbs that all speakers adhere to in all circumstances (Winter, 2018).[8]

Despite its partiality, the disjunctive rule in (26) is still general enough to account for one of the puzzles we encountered with the SRs of reciprocal verbs. Consider for instance the following examples:

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[7]The concept that is here denoted *hit* could also be denoted *collide_with* with no substantial difference in intention. However, for purposes of cross-linguistic comparison, that might be misleading because in other languages, usages of expressions like *botsen met* in Dutch (lit. 'collide with', meaning roughly: 'come into a mutual collision with') usually involve more participation from the indirect object than in English. For this reason I here use the label *hit* for the relevant binary concept. For a more general discussion of the use of 'with' in different languages, see below.

[8]To simplify things, the discussion here ignores collective subjects with more than two members. The analysis could be extended to such cases using a requirement like $\text{COLLIDE}_C(e,X) \Rightarrow \exists x,y \in X . x{\neq}y \land hit(e,x,y)$, where X is a sum of two or more entities.

(27)   a. Sue collided with the wall.

        b. #Sue and the wall collided.

        c. #The wall collided with Sue.

While sentence (27a) is fully acceptable, sentences (27b) and (27c) are not. On a first blush, this pattern may seem inconsistent with Kruitwagen's experimental findings. According to Kruitwagen's results, we expect many speakers to accept the sentence *Sue and Dan collided* if Sue collided Dan. Why is (27b) nevertheless infelicitous for all speakers independently of whether Sue collided with the wall? Apparently, the fact that Dan *could* have hit Sue while the wall could not makes all the difference.

The treatment of SRs in Section 3 as possibility presuppositions follows this simple intuition. According to that proposal, the core meaning COLLIDE_C in (26) is not yet the actual meaning of intransitive *collide*. To have the actual meaning of verbs, we have to take SRs into account, that is to consider the presuppositions that emerge when we apply the possibility operator to the core meaning. In the case of the core meaning (26) of intransitive *collide*, this leads to the following presupposition:

(28)   **Presupposition of intransitive *collide/botsen*:**

$$\textbf{collide}_P(e, x+y)$$
$$= \ \diamond(\exists e'.\text{COLLIDE}_C(e', x+y))$$
$$\Rightarrow \ \diamond(\exists e'.hit(e', x, y) \vee hit(e', y, x))$$

In words: when intransitive *collide* applies to a sum $x+y$, its SRs require the possibility that x hit y or y hit x. Thus, the SR of sentence (27b) entails the following statement:

(29)   #It is possible that [Sue hit the wall or the wall hit Sue].

Sentence (29) is unacceptable, reasonably due to the projection of the SR violation from the second disjunct (=*the wall hit Sue*). Thus, given the SR we derive in (28) for sentence (27b), it is not surprising that (27b) is as unacceptable as (27c) and (29) are. According to our account, the actual meaning of intransitive *collide* presupposes the possibility that each of the agent's members hits the other. We conclude that each of the agent's members is presupposed to be a moveable object, hence the SR violation in (27b).

The examples in (30) below show more disjunctive entailments from core meanings of intransitive reciprocals:

(30) $\text{FIGHT}_C(e, x+y) \ \Rightarrow \ fight(e, x, y) \vee fight(e, y, x)$

        $\text{HUG}_C(e, x+y) \ \Rightarrow \ hug(e, x, y) \vee hug(e, y, x)$

        $\text{KISS}_C(e, x+y) \ \Rightarrow \ kiss(e, x, y) \vee kiss(e, y, x)$

        $\text{TALK}_C(e, x+y) \ \Rightarrow \ talk\_to(e, x, y) \vee talk\_to(e, y, x)$

In a similar way to the account of the SR violation in (27b), the entailments in (30) allow us to explain SR violations in corresponding sentences with reciprocal verbs in different languages, as exemplified above for English *fight* and *talk* (1c,3b), Dutch 'fight' and 'hug' (7c,8c), Hebrew 'hug' and 'kiss' (10c), Hungarian 'kiss' (12c), and Greek 'kiss' (13c).

More generally, our account so far explains why certain nouns that are acceptable as objects of a binary verbal form *verb*$_2$ are unacceptable in subjects of the reciprocal form *verb*$_1$, violating

one of the SRs of the subject position.[9] This is one part of the Reciprocal Selection Generalization (14). The other part concerns cases like the English verb *fight*, which, in addition to their reciprocal intransitive form, have both a binary (transitive) form and a 'with' form. As we saw in Section 2, we often find nouns N that show SR violations in the post-'with' position, but these violations are milder than the SRs that appear when N is promoted to the subject. To analyze the semantic reasons for this behavior, let us again consider one of Kruitwagen's experiments, this time with the following Dutch sentence:

(31)　Violet heeft met　Mark *gevochten*.
　　　 Violet has　 with Mark fought
　　　 "Violet fought with Mark"

Kruitwagen's experiment involved a group of 28 Dutch speakers who were requested to make a truth-value judgement on sentence (31). The participants were shown a short video film where Violet attacks Mark violently, while he responds to her verbally but not physically. 75% of the participants accepted sentence (31) as true in this situation. Based on this result, we hypothesize that in the *vechten met* 'fight with' construction, it is preferred that the post-*met* participant fights the other participant, but this preference is relatively weak, hence it is ignored by many participants. As mentioned in Section 3, the existence of such preferential but non-essential properties is a rather common phenomenon with natural concepts.

　　Given that the activity of the post-'with' participant is only a semantic preference, the SRs that are triggered by this preference are expected to be weaker than the SRs triggered by features that are semantically required.[10] This accounts for the weakness of the SR violations that are observed for NPs in the position following the 'fight with' construction (7b) as well as for other NPs in the post-'with' position (1b,8b,10b,11a,12b,13b). By contrast to this weak preference, we have seen that the collective agent of intransitive entries is strictly required to show disjunctive participation. Thus, the SRs that ensue are manifested as strong requirements of intransitive *vechten* 'fight' in Dutch (7c) and other similar intransitive reciprocal entries (1c,8c,10c,11b,12c,13c).

　　The discussion above analyzes the reasons for the Reciprocal Selection Generalization (14). An additional point that does not directly concern SRs of reciprocal verbs can be observed using the following Dutch sentence:

(32)　Violet en　 Mark hebben *gevochten*.
　　　 Violet and Mark have　　fought
　　　 "Violet and Mark fought"

Truth-value judgements on sentence (32) were tested by Kruitwagen on 53 Dutch speakers, in the same situation where sentence (31) was tested: a film that shows Violet violently fighting Mark, while Mark only responds verbally. In contrast to the 75% acceptability of (31) in this situation, only 40% of the participants accepted sentence (32) as true in the shown film. The theoretical reason for such contrasts is quite clear. When the subject is a singular NP as in (31), most speakers require it to be active while only preferring the post-*met* participant to reciprocate. When the subject is a conjoined NP as in (32), symmetric participation is still a preference. However, since

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　　[9]As mentioned in (14), these SRs are the same for all three entries: *verb*$_1$, *verb*$_2$ and *verb*$_w$.

　　[10]In the theory of presuppositions, this is the distinction between "weak" and "strong" presuppositions, which is often described using a distinction between "soft" and "hard" triggers (Abusch, 2010).

both participants are now part of a collective agent, the preference that they are both active is stronger than in (31).

The semantic requirements and preferences of the Dutch verb *vechten* 'fight' are formally summarized in Table 1. When *vechten* appears with the preposition *tegen* 'against', its meaning is similar to that of the English transitive verb *fight*, which we here denote using the binary predicate F.[11] When the preposition *met* 'with' is used, it is still required that the relation F holds between the two entities according to the surface form, but now it is also preferred that F holds in the opposite direction, where the post-*met* NP gets the agentive role. In the intransitive collective form of *vechten*, we assume that no special direction of the fighting is required between the two agents, hence the weaker disjunctive requirement $F(x,y) \lor F(y,x)$. It is still preferred that both participants are active, hence the conjunctive preference $F(x,y) \land F(y,x)$. Furthermore, this preference is stronger than in the case of 'with', since both participants are now part of one collective agent.

Verb form	Logical form	Requirement	Preference	Strength of preference
verb + 'against'	$fight_2(x,y)$	$F(x,y)$	–	–
verb + 'with'	$fight_w(x,y)$	$F(x,y)$	$F(y,x)$	weak
intransitive	$fight_1(x+y)$	$F(x,y) \lor F(y,x)$	$F(x,y) \land F(y,x)$	strong

Table 1: semantic requirements and preferences for the Dutch verb *vechten* 'fight'

The pattern in Table 1 is proposed here as a general scheme, holding of all reciprocal verbs that have the three forms: the intransitive-collective entry, the 'with' form, and a binary entry (transitive or using a preposition). As a rule, with such verbs the 'with' form has a meaning that is preferentially (though not logically) symmetric, whereas the other binary form is not symmetric, even not as a preference.[12] However, not all reciprocal verbs in English have the three forms that *fight* has. Reciprocal verbs like *collaborate, converse* and *agree* do not have a relevant binary entry on top of their *with* alternate. Another, smaller, class of English reciprocal verbs includes *hug, kiss* and *divorce*, which have a transitive form (or another binary form) but no *with* form. This distinction between verbs is subject to substantial cross-linguistic variation. Reciprocal verbs that have similar meanings in different languages may show differences in the availability of the binary form or the 'with' form. Table 2 shows some similarities and differences in this domain between English, Dutch and Hebrew. With the verbs 'fight' and 'talk' the three languages have both 'with' and another binary form. As suggested above, the 'with' form in the three languages

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[11]This is a simplification. The meaning of the Dutch verb *vechten* apparently involves more violent action than that of English *fight*. Therefore, we may expect the acceptance rates of the English parallels of sentences (31) and (32) to be somewhat higher than Dutch in the critical situation.

[12]In an attempt to analyze the factors that determine the class of reciprocal verbs (a question that is not studied here), Gleitman et al. (1996) propose that all binary entries that alternate with reciprocal intransitive forms are symmetric, at least as a preference (see also Partee 2008). While this is apparently the first acknowledgement of the centrality of preferences in the semantics of reciprocity, it is doubtful that the transitive entries of reciprocal verbs like *kiss* or *hug* prefer symmetric situations more than transitive entries like *resemble* or *be near*, which have no intransitive reciprocal usages in English. Furthermore, Gleitman et al.'s proposal leaves noticeable cross-linguistic gaps: unlike their English parallels, the Dutch verb *omhelzen* 'embrace' has no intransitive entry, whereas the Greek verb *miázun* 'resemble' is used as an intransitive verb to describe a group of similar objects. As argued by Haspelmath (2007), the factors that affect the determination of lexically reciprocal verbs in different languages require much further research.

is more symmetric than the other binary form, and shows weak agentive SRs on the post-'with' participant. With the verb 'collide', English's most salient binary form uses the preposition *with*. The collocation *collide against* is not ruled out but is much less common than *collide with*, and appears to have a specialized meaning.[13] Interestingly, in correlation with this markedness of *collide against*, English shows much flexibility in the range of nouns appearing in the post-*with* position, including nouns like *wall, bridge* and *tree* that refer to immovable objects. The 'collide' verbs in Dutch and Hebrew easily allow both 'with' and another preposition. Accordingly, these two languages are more restrictive than English concerning the interpretation of the 'with' form and the nouns that are allowed to follow it (on Hebrew, see note 2). The verbal concept *make love* is an opposite case: English allows both *with* and *to*, but prefers *to* for exceptional situations where inanimate objects like trees are involved. Dutch and Hebrew have no colloquial form parallel to *make love to*, and use 'with' for events where people make love to an inanimate object. Another pattern appears with the English verbs *kiss* and *hug*, which have no *with* form, as opposed to the corresponding verbs in Dutch and Hebrew, as well as Hungarian (12) and Greek (13). Accordingly, English has no binary form that expresses preferential symmetry.

Verb	English	Dutch	Hebrew	Translations (Dutch, Hebrew)
FIGHT	with/ACC	'with'/'against'	'with'/'in'	vechten, nilxam
TALK	with/to	'with'/'against'	'with'/'to'	praten, diber
COLLIDE	with/?against	'with'/'against'	'with'/'in'	botsen, hitnagesh
MAKE LOVE	with/to	'with'/-	'with'/-	liefde bedrijven, asa ahava
GET MARRIED	-/to	'with'/-	'with'/-	trouwen, hitxaten
KISS	-/ACC	'with'/ACC	'with'/ACC	kussen/zoenen, nishek/hitnashek
HUG	-/ACC	'with'/ACC	'with'/ACC	knuffelen, xibek/hitxabek

Table 2: some different expressions of reciprocal verbs in English, Dutch and Hebrew

Two examples that were mentioned above involve the verbs *collide* and *make love*, where the SRs of English *with* constructions seem to be substantially different than those of Dutch and Hebrew. The tendency that these two cases illustrate is speculated to be rather general:

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[13]Both Google and COCA/COHA (https://www.english-corpora.org) show an impressive difference between counts of *collided with* and *collided against*. However, examples of *collide against* as illustrated below are attested online (https://www.thefreedictionary.com/collided), and were accepted by the speakers I consulted:

  (i) Several times I *collided against* hard objects, once striking my right knee a terrible blow.
  (ii) Darling *collided against* her, covering his trousers with hairs.
  (iii) On his way he *collided against* Ptitsin's chair, and put his dirty foot on the lace skirt of the silent lady's dress; but he neither apologized for this, nor even noticed it.

(33) **Conjecture**:

    a. If a reciprocal verb allows 'with' as well as another binary entry, then the 'with' form prefers symmetry – i.e. agentive properties for the post-'with' NP. The other binary form shows no preference for symmetry.

        This is the case with English *make love with*/*to* and Dutch (Hebrew) 'collide with/against(in)'.

    b. Conversely: a reciprocal verb that only (or primarily) uses a binary 'with' form may also apply it to non-symmetric situations, where the post-'with' NP lacks agentive properties.

        This is the case with English *collide with* and Dutch/Hebrew 'make love with'.

Further examination of this conjecture requires more research.

5 Conclusions

This paper has addressed a puzzle about selectional restrictions (SRs) with reciprocal verbs. It has been observed when the subject of the reciprocal intransitive entry collectively refers to a sum, its agentive SRs strongly apply to each of the sum's members. Further, when a 'with' form coexists with another binary form, agentive SRs of the subject also apply to the post-'with' argument of the verb, though in a weaker manner. These observations, which were summarized by the Reciprocal Selection Generalization, raise two questions. First, given that symmetric participation is not required for all intransitive entries of reciprocal verbs, it is surprising that SRs symmetrically holds for the members of the agent's collective denotation. To account for this behavior, we argued that once SRs are treated as presuppositions of the lexical meanings, their uniform distribution to the collective agent's members is also expected by the disjunctive semantics that lies at the core of reciprocal verb meanings. Second, we aimed to explain the fact that the agentive SRs triggered by the post-'with' argument are relatively weak. This fact as well was explained by the analysis of SRs as projected from lexical meanings. It was proposed that non-essential preferential ingredients of a verb meaning trigger SRs that are weaker than those that are triggered by the verb meaning's essential elements. Finally, it was conjectured that the strength of agentive properties of reciprocal 'with' correlates with the existence of an alternative binary form. It is expected that, to the extent that these findings and theoretical ideas are further substantiated for reciprocal verb alternations they may also be relevant for analyzing semantic facts about other cases of verb alternations.

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