Ambiguity avoidance in reflexive dependencies: Evidence from Romanian ^{*}

Rodica Ivan & Brian Dillon

Department of Linguistics, University of Massachusetts Amherst

Abstract

The choice of a referring expression targeting a previously introduced discourse referent is affected by its potential ambiguity in a given context (Fukumura et al., 2013; Hwang, 2020): speakers use fewer pronouns in contexts where they would be ambiguous. In this work we investigate whether this effect extends to reflexive pronouns, whose distribution is typically governed by strict syntactic constraints, i.e. the Binding Theory (Chomsky, 1981; Büring, 2005). To ask this question, we turn to Romanian. Unlike English, the regular Romanian pronouns *ea/el* ‘her/him’ can corefer with a local referential antecedent (***Luna** talked about **her***), and be bound by local quantificational antecedents (***Every girl** talked about **her***). However, Romanian also has unambiguous reflexive expressions that may also be used in these contexts. We report two production experiments in Romanian investigating the effect of contextual ambiguity on the choice of referring expression for reflexive dependences with both referential (Experiment 1, e.g. *Luna*) as well as quantificational antecedents (Experiment 2, e.g. *every girl*), using a variant of the gender match paradigm used in previous work (Arnold, 2010). We find that, in unambiguous contexts, regular pronouns were the preferred form for reflexive and non-reflexive dependencies in both experiments. However, whenever a regular pronoun would be formally ambiguous, speakers chose them less often, preferring instead unambiguous reflexive pronouns. Our results show: (1) like reference to non-local antecedents (Ariel,

^{*}The experimental items, data, and analysis are available at: <https://osf.io/p3tmd/>.

1990, 2001; Arnold, 2010), intrasentential reference is also sensitive to discourse considerations, and (2) that potential discourse ambiguity impacts the choice of a referring expression irrespective of whether the dependency is achieved syntactically, i.e. bound variable dependencies, or via discourse computations, i.e. (local) coreference.

Keywords: ambiguity avoidance, Condition B, production, reference, pronouns

1. Introduction

Establishing reference is a key part of discourse in natural language. Speakers routinely introduce new referents and then later refer back to them, either in the same sentence or across sentences in a discourse. A speaker's choice of a referring expression in a given context is affected by multiple factors, such as the grammatical position and information structural status of the antecedent (Ariel, 1990; Arnold, 2001; Fukumura and van Gompel, 2015; Givón, 1983; Grosz et al., 1995). Another factor is the potential ambiguity of the referring expression under consideration (e.g. Givón, 1983; Ariel, 1990; Arnold et al., 2000). Speakers use pronouns less often in sentences like (1) when *she* would be ambiguous, as in (1b), as opposed to contexts where *she* can uniquely identify its referent, as in (1a) (Ariel, 1990; Arnold et al., 2000; Fukumura and van Gompel, 2010; Fukumura et al., 2011, 2013, a.o).

(1) *Cross-sentential reference*

- a. Hermione had dinner with Harry. **She** / **Hermione** talked all night.
b. Hermione had dinner with Luna. **She** / **Hermione** talked all night.

In this study, we investigate whether the principles that regulate the form of a referring expression in discourse also apply to pronouns which participate in a within-clause reflexive dependency. If the gender of the available discourse referents in the local context can affect the choice between *she* and *Hermione* in (1) (Arnold, 1998; Arnold and Griffin, 2007; Fukumura et al., 2011, 2013), can

the choice between pronouns like *her* and reflexive pronouns like *herself* also be affected by whether the pronominal expression would be ambiguous?

In order to test whether speakers use ambiguity avoidance strategies for pro-
 25 nouns targeting clausemate antecedents, we turn to Romanian. Unlike English,
 in Romanian regular pronouns like *him* and *her* can refer to a local antecedent
 (Ivan, 2018, 2020) in sentences like (2). In (2b), for instance, *ea* is ambiguous
 between *Hermione* and *Luna*. A Romanian speaker therefore has several options
 for the referring device in this sentence, for an intended reflexive meaning. They
 30 could use a *reflexive pronoun*, a term we use for pronominals like English *herself*
 and the Romanian simplex reflexive *sine* ‘self’; they could use an *emphatic re-*
flexive, a term we use to refer to morphologically complex reflexive expressions
 like Romanian *ea însăși* ‘her herself’; and again they may also use a *regular*
pronoun for pronouns like *ea* ‘her’. Given this, we can investigate whether lan-
 35 guage users exhibit ambiguity avoidance strategies for within-sentence reflexive
 dependencies by asking whether speakers choose *ea* ‘her’ less often in (2b) than
 they do in (2a) in languages that have multiple reflexive forms at their disposal.

(2) *Intrasentential Reference*

- a. *La cina lui Harry, Hermione a vorbit despre ea / sine*
 at dinner GEN.DEF Harry Hermione has talked about her / self
 40 / *ea însăși toată noaptea.*
 / her herself all night
 At Harry’s dinner, Hermione talked about her / herself all night.
- b. *La cina Lunei, Hermione a vorbit despre ea / sine*
 at dinner Luna.GEN.DEF Hermione has talked about her / self
 / *ea însăși toată noaptea.*
 / her herself all night
 At Luna’s dinner, Hermione talked about her(self) all night.

45 The investigation of the effect of ambiguity for (reflexive) pronouns with
 clausemate antecedents is an extension of existing psycholinguistic work on the
 choice of anaphoric form in larger discourses (Ariel, 1990, 2001; Givón, 1983;
 Arnold, 2010). At the same time, such an investigation also has the poten-
 tial to inform long-standing theoretical debates over the source of grammatical

50 restrictions on coreference associated with referring expressions (e.g. the Bind-
 ing Theory). While Romanian freely allows a regular pronoun to corefer with a
 clausemate antecedent in (2), the English translation equivalent *Hermione talked*
about her does not allow this interpretation. This restriction on interpretation is
 classically explained in Chomskyan Binding Theory by appealing to innate syn-
 55 tactic constraints on coreference (e.g. Principle B; (Chomsky, 1986)). Within
 this theoretical framework, there have been attempts to reckon with apparent
 cross-linguistic variation in whether Principle B effects are observed in examples
 like (2), often appealing to fine-grained differences in the syntactic structure in
 languages like Romanian and languages like English (Safir, 2004; Reuland, 2011,
 60 2017, a.m.o.). However, another proposed explanation of the constraint submits
 that the Principle B restriction reflects a grammaticized ambiguity avoidance
 strategy (Dowty, 1980; Levinson, 1987), applied to intrasentential referential
 dependencies. This latter view predicts that constraints on cross-sentential ref-
 erence (e.g. ambiguity avoidance) should readily be observed for pronouns which
 65 participate in a within-clause syntactic dependency (Ariel, 1990, 2001). Thus,
 while Romanian regular pronouns are not subject to a categorical or grammati-
 cized constraint against reference to a local subject antecedent, it is possible
 that Romanian speakers' choice of a pronominal form targeting a local subject
 is indeed guided by considerations of potential ambiguity in a graded fashion. If
 70 this latter claim is correct, then speakers should avoid using the potentially am-
 biguous regular pronouns when there are multiple referents in the local discourse
 that match the pronoun's features.

This broad question can be further refined by asking whether we observe
 ambiguity avoidance effects with different types of within-sentence pronominal
 75 dependencies. Pronominal dependencies can either be resolved syntactically, i.e.
binding, or with reference to the discourse, i.e. *coreference* (Keenan, 1971; Heim,
 1982; Reinhart, 1983; Heim and Kratzer, 1998). When two expressions corefer,
 they refer to the same entity. When one expression binds another, however,
 the bound variable does not refer to an entity, but instead signals a particular
 80 syntactic relation with its binder. To exemplify this distinction, consider the

the sentences in (3). The interpretation of (3a) is discourse-independent: *her* is bound by *no woman*, and it varies with *no woman* irrespective of the set of available discourse referents. However, the interpretation of *her* in (3b) is discourse-dependent, as it relies on there being a relevant entity in the context.

- 85 (3) a. No woman gave her daughter a useless book.
b. No woman gave her a useless book.

The observation that pronominal dependencies may be more or less dependent on the discourse context raises the question of whether ambiguity avoidance pressures are equally potent for different types of pronominal dependencies.

90 For example, if binding relations can be established independently of discourse context (Heim and Kratzer, 1998; Reinhart, 1983, 2006; Roelofsen, 2010; Reuland, 2011, a.m.o), then we might expect potential ambiguity at the level of the discourse to affect the choice of pronominal expression less for bound variable relations than for coreference.

95 In this paper, we investigate pronoun production in Romanian to determine whether (i) the production of intrasentential reference is subject to ambiguity avoidance effects in cases like (2), and (ii) whether any such an effect obtains for unambiguously syntactic binding relations. To do this, the two production experiments reported in this paper test whether the local discourse context affects the choice of pronominal expression in sentences like (2), where the subject is referential (Experiment 1), as well as in sentences where the subject is quantificational (Experiment 2). The rest of this paper is structured as follows. In the introduction we present an overview of the effect of ambiguity on pronouns targeting cross-sentential referents in 1.1, the motivation for extending this line
100 of research to intrasentential reference in 1.2, and a brief review of Romanian pronouns in 1.3. We present *Experiment 1* in section 2, *Experiment 2* in section 3, and discuss the implications of our results in section 4. Section 5 concludes.

To preview our key findings: our experimental results suggest that both coreference and variable binding are sensitive to potential context-dependent
110 ambiguity in Romanian. In contexts where the gender of a regular pronoun

could identify a unique referent, Romanian speakers preferred to use regular pronouns for all types of pronominal dependencies we investigated: local binding, local coreference, and discourse reference. However, when the presence of multiple gender-matched antecedents in a discourse would render a regular
115 pronoun formally ambiguous, speakers preferred to reflexive forms or proper names. We interpret these results as evidence that the same pressures that regulate the choice of a pronoun apply to local binding and (local) coreference alike in Romanian.

1.1. *Cross-sentential reference and the effect of ambiguity on pronoun produc-* 120 *tion*

Referential forms range from (null) pronouns, e.g. *she*, to proper names, like *Marie*, to complex noun phrases such as *the first woman to win a Nobel Prize*. It is widely assumed (Givón, 1983; Gundel et al., 1993; Chafe, 1976; Ariel, 1990; Arnold, 2010, a.o.) that speakers keep track of potential referents in a men-
125 tal discourse representation, and depending on various factors, some referents are easier to access in that representation than others. The choice of a referring expression reflects in part either how accessible (Ariel, 1990, 2001) or active (Gundel et al., 1993) a referent’s mental representation is, the processing load associated with the referring expression - sometimes related to a referent’s
130 predictability (Arnold, 2010), or a balance between communicative function and processing cost (Sperber and Wilson, 1995; Almor, 1999; Almor and Nair, 2007). A general consensus is that more reduced anaphoric expressions are used for more salient, prominent, or accessible referents (Givón, 1983; Ariel, 1990, 2001; Grosz et al., 1995; Arnold, 1998, 2001, a.o.). Arnold (2010) identifies four factors
135 that contribute to a referent’s accessibility: givenness, recency, syntactic prominence, and thematic prominence. Pronouns are generally more frequently used when their referents are already given, or introduced in the discourse (Prince, 1981), more recently mentioned (Givón, 1983; Ariel, 1990; Arnold, 1998), in *subject* position (Arnold, 2001; Arnold et al., 2000; Fukumura and van Gompel,
140 2010, 2015), topicalized (Givón, 1983; Ariel, 1990; Grosz et al., 1995; Rohde and

Kehler, 2014), or thematically prominent (Stevenson et al., 1994; Arnold, 2001; Rosa and Arnold, 2017).

Importantly for the present study, the number and type of competitors in a discourse context also seems to affect accessibility of a referent (Ariel, 2001; Arnold and Griffin, 2007; Fukumura and van Gompel, 2010; Hwang, 2020).
145 Some theories of reference (e.g Ariel, 1990, 2001; Karttunen, 1969; Chafe, 1976; Givón, 1983; Gundel et al., 1993; Grosz et al., 1995; Almor, 1999; Arnold, 1998; Almor and Nair, 2007) are built on the assumption that, in choosing referring expressions, speakers evaluate the availability of the intended referent in their
150 addressees' discourse model. Under this view, language production is a product of speaker-hearer cooperation (Grice, 1975; Chafe, 1976; Ariel, 1990; Gundel et al., 1993, a.o) and referential forms are seen as a mechanism for helping ensure cooperative communication between interlocutors.

A prediction of the view that speakers plan their utterances for the sake
155 of effective communication is that speakers should aim to avoid ambiguity and preferentially choose unambiguous referring expressions (e.g. Givón, 1983; Ariel, 1990; Arnold et al., 2000). For example, Ariel (1990) argues that ambiguity directly affects the choice of a referring expression, with "lower accessibility markers" (demonstratives, proper names, complex NPs) being preferred to pro-
160 nouns in ambiguous contexts. Similarly, Givón (1983) predicts there to be more difficulty in identifying an antecedent when discourse referents match in features such as gender, and Almor and Nair (2007) claim that the use of more complex definite descriptions is justified in ambiguous contexts where several referents share grammatical features encoded in pronouns, i.e. gender and num-
165 ber. There is evidence that speakers design referring expressions for the sake of efficient communication (Nadig and Sedivy, 2002; Brown-Schmidt and Tanenhaus, 2008), and that complex definite descriptions are used more often when a salient competitor is in the context (Olson, 1970; Nadig and Sedivy, 2002; Brown-Schmidt and Tanenhaus, 2008). For instance, it has been shown as early
170 as Olson (1970) that in a context where two referents overlap in some features, such as when trying to refer to a square in a context with multiple squares,

speakers prefer more explicit referring expressions like *the white square*.

Zooming in on the competition between pronouns and more complex definite descriptions, experimental research has shown that speakers use fewer pronouns
175 to refer to a cross-sentential antecedent when it matches in features with other referents in the discourse (Arnold, 1998; Arnold et al., 2000; Arnold and Griffin, 2007; Fukumura and van Gompel, 2010; Fukumura et al., 2011, 2013; Hwang, 2020, a.o.). To illustrate, consider the following experiment from an Arnold and Griffin (2007) study. In their experiment, participants were asked to continue
180 a story based on a two-panel cartoon featuring two well known animated characters. By manipulating whether the two characters matched or mismatched in gender, Arnold and Griffin (2007) created two conditions: DIFFERENT GENDER and SAME GENDER. In a context where the two characters are *Mickey* and *Daisy*, a continuation featuring a pronoun, such as *He was tired*, would
185 unambiguously refer to Mickey; however, in a context where the two characters match in gender, for instance one with *Mickey* and *Donald*, the same sentence would be formally ambiguous. This difference impacted the speaker’s choice of referring expression in their experiment: Arnold and Griffin (2007) report that in the DIFFERENT GENDER condition, participants produced a sentence with a
190 pronoun 48% of the time, while in the SAME GENDER condition, participants produced a sentence with a pronoun 23% of the time.

However, as Arnold and Griffin (2007) point out, the gender match effect on pronoun production might not necessarily reflect audience design, i.e. the speaker’s consideration of their addressee; instead, this effect might be an arte-
195 fact of the accessibility of a referent in the speaker’s own discourse model. We return to this discussion in section 4. Irrespective of the source of this effect, however, there is strong evidence that speakers use pronouns to refer to previously introduced discourse referents less often in contexts where they would be formally ambiguous. For ease of exposition, we will refer to this as an ambi-
200 guity avoidance effect, but it is important to bear in mind that this does not necessarily imply audience design on the part of the speaker. We now turn to the question of whether speakers employ similar ambiguity avoidance strategies

for pronouns that refer to clausemate antecedents.

1.2. Intrasentential Reference and Ambiguity

205 The canonical case of a within-sentence referring expression is a reflexive pronoun. In languages that allow different referring expressions to serve the referential function of a reflexive pronoun, it is tempting to assume that the same principles that regulate the selection of referring expressions in discourse will apply to these forms as well. However, this is not a necessary conclusion, for several
210 reasons. For one, within-clause dependencies are generally thought to be governed by syntactic constraints, i.e. the Binding Theory (Chomsky, 1981, 1986), where *binding* is understood to be a structural relation between an antecedent and an anaphor. This fact alone might exempt them from the discourse pressures associated with pronouns above (Almor, 1999). One of the consequences
215 of the Binding Theory (Chomsky, 1981, 1986) is that pronouns like *her* cannot refer to the same individual that the nearest subject refers to, whereas this is allowed, and typically required, of reflexives like *herself*. To illustrate, consider the sentences in (4) where *herself* is bound by the local subject, i.e. *herself* is a variable which varies with the local subject, while the pronoun *her* cannot refer
220 to the local subject and must instead refer to some other female entity.

- (4) a. **Hermione**₁ talked about **herself**_{1/*2} / **her**_{2/*1}.
b. **Every witch**₁ talked about **herself**_{1/*2} / **her**_{2/*1}.

There is thus a division of labor between intrasentential and cross-sentential reference, in that the former is often syntactically constrained, e.g. binding,
225 while the latter is discourse-oriented (Almor and Nair, 2007; Avrutin, 1994). Interestingly, speakers do not always attempt to avoid syntactic ambiguity in production. This yields an additional reason that syntactic binding dependencies might be less susceptible to ambiguity avoidance pressures than other types of pronouns. Some studies have reported that speakers do not display am-
230 biguity avoidance effects in the production of temporarily ambiguous garden

path sentences (Ferreira and Dell, 2000; Arnold et al., 2004; Jaeger, 2010; Ferreira and Hudson, 2011). For instance, Ferreira and Dell (2000) show that a speaker’s choice of including an optional *that* complementizer does not depend on whether its addition allows the speaker to obviate a temporarily garden path
 235 structure. On the other hand, speakers can employ ambiguity avoidance strategies when they are aware of the potential ambiguity of their utterances (Schafer et al., 2000; Snedeker and Trueswell, 2003; Ferreira et al., 2005), and identifying whether there is an ambiguity in the case of temporarily ambiguous structures might be harder than identifying ambiguity for referential expressions (Jaeger,
 240 2010; Ferreira and Schotter, 2013).

On the other hand, there are some theoretical grounds to expect potential ambiguity to have similar effects on cross-sentential and intrasentential reference. In Ariel (1990) and Ariel (2001)’s view, for instance, all referring expressions, at the sentence level or at the discourse level, are subject to the
 245 same accessibility considerations (Ariel, 1990, p.97). Ariel (1990) argues that syntactic constraints on pronominal reference in the case of within-clause dependencies, i.e. the binding conditions (Chomsky, 1981), can in fact be viewed as a grammaticalized version of *Accessibility Theory*, whereby reflexives are reserved for the most accessible referents, i.e. sentence subjects (Ariel, 1990, p.97),
 250 and pronouns are used for referents less accessible than those expressed via reflexives, but more accessible than those expressed via names and full definite descriptions. On this view, the use of a pronoun (e.g. *her*) would lead to a preference towards a disjoint reference interpretation in (4a) (e.g. Hermione was talking about Luna) instead of a reflexive or locally coreferent interpretation (e.g. Hermione was talking about Hermione), since pronouns indicate an
 255 antecedent a with lower degree of accessibility than the reflexive *herself* and the local subject is (by hypothesis) highly accessible.

Other scholars have advanced a similar hypothesis that the Binding Principles are a grammaticized version of constraints that regulate choice of referring
 260 expression. In some accounts of pronominal reference in the case of within-sentence dependencies (Dowty, 1980; Levinson, 1987, 2000), the choice between

reflexive and regular pronouns is guided by pragmatic constraints. These views
 hold that reflexive pronouns like *himself* and pronouns like *him* are in competi-
 tion, and this competition is resolved in a way that favors the least ambiguous
 265 form. In a discourse context where *Lockhart admires Lockhart*, for instance,
 speakers should choose *Lockhart admires himself* since it unambiguously renders
 the desired reading - the reflexive wins the relevant competition. Accordingly,
 if speakers choose the arguably ambiguous *Lockhart admires him*, listeners can
 infer that the speaker did not intend a reflexive reading, and the pronoun is
 270 interpreted as disjoint from the local subject. However, this proposal, as well
 as the precise formal details of the relevant competitive processes, remain hotly
 debated (Reuland, 2001; Safir, 2004; Roelofsen, 2010; Reuland, 2011, a.o). For
 instance, Reuland (2011) explicitly argues against the prediction of pragmatic
 approaches to Binding Theory (Dowty, 1980; Levinson, 1987) that the choice
 275 between an anaphor and a pronominal is influenced by the discourse context.
 (Reuland, 2011, p. 3, p. 370). He points out that in a context with only one
 female referent, say *Alice*, English speakers still do not use *Alice talked about her*
 to identify a scenario where Alice was talking about herself. It appears that the
 constraint against local coreference in English is not lifted in a context where
 280 the intended meaning is unambiguous, as would be expected if the ban on local
 coreference was a purely pragmatic phenomenon.

Stepping back, while there is evidence in favor of ambiguity avoidance be-
 ing employed for cross-sentential dependencies, it is not obvious that the same
 pressures should hold of syntactically constrained within-sentence dependen-
 285 cies. The mixed evidence about whether speakers consistently avoid syntactic
 ambiguity in production might provide a plausible reason to expect that within
 sentence reflexive or bound variable pronouns are less susceptible to ambigu-
 ity avoidance effects in production. On the other hand, given that at least
 some proposals claim that discourse factors regulate within-sentence reference
 290 (Dowty, 1980; Levinson, 1987) or posit that reflexive dependencies are subject to
 similar accessibility effects as pronouns more widely (Ariel, 1990, 2001; Arnold,
 2001, a.o), it is very possible that within-sentence pronominal dependencies are

subject to the same pressures as discourse anaphora more widely. Deciding between these two broad perspectives can help situate bound variable pronouns
 295 in a wider theory of anaphora, and so it is theoretically important to ascertain whether ambiguity avoidance strategies extend to within-clause reflexives dependencies. To test this, we turn to Romanian.

1.3. Romanian pronouns

Like its sister Romance languages Spanish and Italian, Romanian is a null subject language, as illustrated in (5), where the subject *ea* is optionally overt.
 300 Romanian also makes use of a full paradigm of clitic pronouns which can code accusative¹ and dative arguments of the verb. Clitics (accusative and dative) are mandatory, while objects are optionally overt, e.g. *el* and *lui* in (5).

- (5) (*Ea*₁) *i*₂ *l*₃- *a prezentat* (*pe el*₃) (*lui*₂).
 (she) DAT.CL MASC.ACC.CL has introduced (ACC him) (him.DAT)
 305 ‘She introduced him to him.’

Regular pronouns like *el* ‘him’ do not exhibit Condition B effects as English regular pronouns do: As shown in (6a), a regular pronoun may be used to refer to the local subject. While the regular pronoun itself can be used to refer to the local subject, note that clitic pronouns do not exhibit a similar ambiguity.
 310 In this example, the interpretation of the reflexive clitic *se* is unambiguously reflexive, and accordingly the overt regular pronoun *el* is also unambiguously reflexive in (6a). At the same time, the clitic *îl* in (6b) is unambiguously disjoint in reference from the local subject, and accordingly the overt regular pronoun *el* cannot refer to the local subject. Note that the same pronoun, *el*, is used in
 315 both sentences: This suggests that it is not the pronoun itself, but the clitic, that is responsible for the constraints on possible interpretations.

- (6) a. **Lockhart**₁ *se*_{1/*2} *admiră* (*pe el*_{1/*2}).
 Lockhart REFL.CL admires (ACC him)

¹The accusative case marker *pe* illustrated in (5) is analyzed as differential object marking in Romanian (Cornilescu, 2000).

‘Lockhart admires himself.’

- b. **Lockhart**₁ *îl*_{2/*1} *admiră* (*pe el*_{2/*1}).
 Lockhart MASC.SG.CL admires (ACC him)

320

‘Lockhart admires someone else.’

When there is no clitic present, as in the case of non-transitive predicates, regular pronouns are formally ambiguous between a reflexive and a locally disjoint reading. The sentence in (7a) includes the same pronoun as in (6), *el*, but no clitic, and is therefore ambiguous. It is possible to encode this same intended
 325 meaning using an unambiguous pronominal form, however, as illustrated in (7b). Romanian speakers in fact have at least two reflexive expressions, the simplex reflexive *sine* and the emphatic reflexive *el însuși*, which can deliver an unambiguous reflexive reading.

- (7) a. **Fiecare profesor**₁ / **Lockhart**₁ *a vorbit despre el*_{1/2}.
 every professor / Lockhart has talked about him

330

‘Every professor / Lockhart talked about himself / someone else.’

- b. **Fiecare profesor**₁ / **Lockhart**₁ *a vorbit despre sine*_{1/*2} /
 every professor / Lockhart has talked about self /
*el însuși*_{1/*2}.
 him himself

‘Every professor / Lockhart talked about himself’.

Thus, Romanian presents an opportunity to investigate the effect of ambiguity
 335 on intrasentential reference more generally, and also whether such an effect is observed for dependencies which are typically constrained by Condition B in languages like English. If, when choosing a pronominal expression in sentences like (7), speakers are indeed sensitive to potential ambiguity, this would provide some support for the view that within-sentence reference is also subject to
 340 discourse considerations (Dowty, 1980; Levinson, 1987; Ariel, 1990).

2. Experiment 1: Referential Subjects

The goal of our first experiment is to determine whether within sentence referential dependencies are subject to the same discourse-dependent pressures

as cross-sentential anaphoric reference. We test this question by adapting the
 345 ‘gender match effect’ (Arnold and Griffin, 2007) paradigm to Romanian. To
 clearly measure the gender match effect with respect to the production of reg-
 ular pronouns, we look at intransitive predicates with prepositional objects in
 Romanian, which allow both reflexive and non-reflexive readings of regular pro-
 nouns. In (8) for instance, *el* has two possible interpretations: (a) a pronoun in
 350 a local coreference relation with the referential subject *Andrei*, or (b) a pronoun
 disjoint in reference from the local subject, i.e. it corefers with *Mihai*.

- (8) *Acasă la Mihai, Andrei a vorbit despre el.*
 home at Mihai Andrei has talked about him
 At Mihai’s house, Andrei talked about him(self).’

The main question we addressed in *Experiment 1* is whether the presence
 355 of multiple gender-matched characters in a context would lead speakers to use
 fewer pronouns to refer to the local subject, e.g. *Andrei*. We call this the LOCAL
 COREFERENCE configuration, and it is illustrated in (9).²

(9) LOCAL COREFERENCE

- 360 *Acasă la Mihai, Andrei a vorbit despre ...*
 home at Mihai Andrei has talked about ...
 At Mihai’s house, Andrei talked about ...’

²Referential DPs, like *Andrei*, may either corefer with or bind an anaphoric expression. Quantified DPs, like *every boy*, cannot enter a coreference relation. Hence, we label the configuration in (9) LOCAL COREFERENCE because it is the only condition we test which allows for this relation, although binding is not excluded.

As a point of comparison, we also tested for a gender match effect in contexts where a pronoun in the same syntactic position does not corefer with the local subject. Because, in this context, the pronoun does not corefer with the local subject, we refer to this as the LOCAL DISJOINT REFERENCE condition:

(10) LOCAL DISJOINT REFERENCE

Acasă la Mihai, Andrei a vorbit despre ...
 home at Mihai Andrei has talked about ...

‘At Mihai’s house, Andrei talked about ...’

Our primary research question centers on whether speakers show a gender match effect in the LOCAL COREFERENCE conditions. The LOCAL DISJOINT REFERENCE condition is important for two reasons. First, it allows us to test whether Romanian speakers show gender match effects for object pronouns that refer to an antecedent previously introduced in the discourse, but which are not the local subject. This is expected given previous findings (e.g. Arnold and Griffin, 2007), and will serve to validate our methodology in Romanian. Second, including this condition in a within-subjects design allows us to directly compare the magnitude of the gender match effect in the LOCAL DISJOINT REFERENCE conditions to the LOCAL COREFERENCE conditions. This would allow us to explore whether the gender match effect is quantitatively comparable in the two contexts.

Our main hypothesis is that a generic sensitivity to ambiguity holds of pronouns in both LOCAL COREFERENCE and LOCAL DISJOINT REFERENCE environments. Under this hypothesis, we make the following predictions. First, participants are expected to use regular pronouns like *el* ‘him’ and *ea* ‘her’ less

often in gender match contexts. Second, we predict a higher rate of reflexive pronouns in gender match LOCAL COREFERENCE conditions, since reflexives would unambiguously identify a local subject reference. Third, we predict that participants will use more names in gender match LOCAL DISJOINT REFER-
 390 ENCE contexts, as seen for similar gender effects in discourse reference (Arnold et al., 2000; Fukumura and van Gompel, 2010; Fukumura et al., 2011; Arnold and Griffin, 2007, a.o).

2.1. Participants

Sixty-eight undergraduates (62 female) from the University of Bucharest took
 395 part in the experiment in exchange for monetary compensation (30 RON - roughly \$8 USD). All participants were native speakers of Romanian and gave informed written consent for the use of their data. The age range was between 18 and 30, with an average age of 20.4. Two participants were excluded from the analysis due to a low rate of target responses ($< 50\%$), and one participant due
 400 to a PsychoPy crash during the experiment. The remaining 65 participants had an average rate of 91.7% target responses, which individually ranged between a minimum of 50% and a maximum of 100%.

2.2. Design

Experiment 1 was a picture description task with a 2×2 within subjects fac-
 405 torial design crossing PICTURE TYPE and AMBIGUITY. The PICTURE TYPE factor manipulated the picture that was presented to the participants, and had two levels: LOCAL COREFERENCE and LOCAL DISJOINT REFERENCE. LOCAL COREFERENCE trials presented participants with a target picture that included a speech (or thought) bubble depicting an event in which the speaker is think-
 410 ing or speaking about themselves. In LOCAL DISJOINT REFERENCE trials the character in the speech/thought bubble was the other co-present character. The AMBIGUITY factor, following Arnold and Griffin (2007), manipulated whether the mentioned characters had the same gender (MATCH) or different genders (MISMATCH). An example of a single item, in all four experimental conditions,
 415 is illustrated in *Table 1*.

2.3. Materials

16 experimental items were constructed. Each item had four variants consisting of a target sentence and a target picture, one for each experimental condition in our design. Each item also included a pre-critical context screen, which
420 introduced the two referents in each sentence in a random order. For a given item, the target screen included both the picture and the sentence in the form of a written completion prompt. An example of an entire trial, including the context screen, is given in (11) below.

(11) a. **Context Screen:**

425
Acesta este Andrei.
this is Andrei
'This is Andrei.'

Acesta este Mihai.
this is Mihai
'This is Mihai.'

b. **Target Screen:**

430

Acasă la Mihai, Andrei a vorbit despre ...
home at Mihai, Andrei has talked about ...
'At Mihai's house, Andrei talked about ... '

For a given item, each of the four conditions was associated with a different target picture. The context and target sentence lead-in remained constant across

the levels of the PICTURE TYPE factor, but differed from each other with respect
435 to the the MATCH and MISMATCH conditions of the AMBIGUITY factor. *Table*
1 illustrates this contrast for the item in (11).

In order for both characters to be referenced in a single sentence, each target
sentence consisted of a topic prepositional phrase (PP) which named one of the
referents (*at X's party, in X's garden*), and an overt subject which referred to
440 the other antecedent by name. The predicate of the target sentence always took
a PP object (*laugh at, cook for*) and was equally plausible with a reflexive and
non-reflexive continuations. The experimental stimuli were carefully constructed
so as to allow for both reflexive and disjoint interpretations and to avoid biasing
the speaker and their intended hearer towards one particular interpretation or
445 one particular pronominal form. We confirmed that both reflexive and disjoint
interpretations were plausible for the 16 items by checking with 4 naive native
speakers prior to running the experiment. Eight of the predicates used in the
16 items were communication verbs (*vorbi* 'talk', *povesti* 'tell-stories', *trăncăni*
'chatter', etc.) The rest can be translated as follows: *minți despre* 'lie about',
450 *găti pentru* 'cook for', *scrie despre* 'write about', *glumi despre* 'joke about', *visa*
despre 'dream about', *gândi la* 'think about', *citi despre* 'read about', *râde de*
'laugh at'. No transitive verbs were used.

We designed the materials so that both antecedents were reasonably acces-
sible, given previous research. One factor that affects accessibility is topicality
455 (Gordon et al., 1993; Grosz et al., 1995; Gundel, 1999; Rohde and Kehler, 2014).
Accordingly, both both *Mihai* and *Andrei* were introduced in topic positions:
Mihai is the object of a preposed topic prepositional phrase. In addition, *An-*
drei is the preverbal sentence subject, which is a syntactic position associated
with topics in Romanian (Cornilescu, 2000). Furthermore, both the sentence
460 initial PP position and the subject position are independently associated with
features that arguably increase their accessibility: subjecthood (Gordon et al.,
1993; Kaiser and Trueswell, 2008; Fukumura and van Gompel, 2015; Järvisikivi
et al., 2005) and early *order of mention* (Gernsbacher and Hargreaves, 1988;
Gernsbacher et al., 1989; Järvisikivi et al., 2005) have both been argued to in-

	<div> <div>COREFERENT MISMATCH</div> </div> <div> <div>DISJOINT MISMATCH</div> </div>
MISMATCH SENTENCE	<p><i>Acasă la <u>Irina</u>, Andrei a vorbit despre ...</i> home at Irina, Andrei has talked about ... ‘At Irina’s house, Andrei talked about ...’</p>
	<div> <div>COREFERENT MATCH</div> </div> <div> <div>DISJOINT MATCH</div> </div>
MATCH SENTENCE	<p><i>Acasă la Mihai, Andrei a vorbit despre ...</i> home at Mihai, Andrei has talked about ... ‘At Mihai’s house, Andrei talked about ...’</p>

Table 1: *Sample Item Pictures & Target Sentences by Condition for Experiment 1.*
Female character names are underlined, male character names are in bold.

crease a referent's accessibility.

Across the experiment, there was a total of eight characters: 4 male and 4 female. These characters were reused across items to ensure familiarity with the characters in the experiment. The gender of the local subject referent was counterbalanced across the items: 8 items had a male local subject, 8 had a female local subject. The referent pairs were also balanced across the experiment: Each of the eight characters served as the local subject only for two items, and they never co-occurred with the same character in more than one item.

The variants of each item set were distributed in four Latin Squared Lists and interspersed with 20 fillers, which were all grammatical and similar to the test items in terms of structural complexity. The filler items only introduced one character in the context preceding the picture-sentence set. 10 of the fillers introduced objects or abstract concepts in the speech/thought bubble, disallowing a reflexive interpretation. 8 of the fillers used an adjective phrase predicate (*proud of, disappointed in*, etc.) which could be construed as reflexive, though not necessarily (*proud of his achievement, proud of himself*). Thus, each participant would be exposed to at most 16 reflexive scenarios (out of a total of 36 sentences). The majority of the fillers (18 out of 20) did not include a topic PP.

2.4. Procedure

The experiment took place at the Faculty of Foreign Languages and Literatures (*Facultatea de Limbi și Literaturi Străine* - FLLS) of the University of Bucharest. Participants were recruited through flyers, class announcements and on the online platform of FLLS. Most of the participants were female FLLS students (62 out of 68 participants self-identified as female).³

The experiment was coded in *PsychoPy* on a 2013 *Macbook Air* and run on the same laptop. After giving informed consent, participants' responses were recorded using the *Macbook's* audio recorder, as well as a *Tascam DR-60DmkII*

³The student body of FLLS is predominantly female: around 9 in 10 FLLS students are female. This led to our participants being predominantly female as well.

Figure 1: *Sample Trial in Experiment 1.*

recorder with a *Shure* omnidirectional lavalier microphone. Participants were walked through the instructions in PsychoPy and told that their task is to identify the topic of conversation or contemplation depicted in the speech or
 495 thought bubble of each picture.

The timeline for each trial is schematically represented in *Figure 1*. For each item, the context introducing the relevant discourse referents (alongside their portraits) remained on screen for 9 seconds. The context screen was followed by a one second break (blank screen) after which the target picture and target
 500 sentence were displayed at the same time. Participants were instructed to examine the target picture and silently read the target sentence before choosing a continuation that described the picture they saw. This was done in order to minimize prosodic breaks between the completion prompt and the rest of the sentence. After repeating back the prompt and their preferred continuation to
 505 describe the image, participants pressed the space bar to continue to the next item (again, with a 1 second break between trials). Both the target picture and sentence prompt stayed on the screen until the participant pressed the space bar.

At the beginning of the experiment, participants were presented with instructions, and two practice items that were similar to but distinct from the critical items. After completing all 36 items trials, they were given 2 exit poll items, and, finally, an exit interview with the experimenter. The instructions and practice items did not repeat any of the 16 critical items or fillers. The entire process lasted on average around 45 minutes for each participant. Of this time period, approximately 15-20 minutes were taken up by the experiment itself.

2.5. Analysis

Participant responses were transcribed and annotated. Responses were coded as ‘on target’ when they correctly identified the referent in the target picture. Target responses consisted of regular pronouns, emphatic reflexive pronouns, simple reflexive pronouns, demonstrative pronouns, NPs, and names that referred to the character in the speech/thought bubble. Examples of non-target responses were sentence completions such as ‘*how he feels*’, nouns that did not identify the character in the bubble (e.g. ‘*feelings*’), pronominal constructions which referred to the wrong antecedent, and possessive constructions. Non-target responses were excluded from further analysis. In addition, 2 other responses were lost due to a *PsychoPy* error. In total, 11.27% responses out of the collected data were excluded prior to statistical analysis. Consequently, of the 1073 total responses, data analysis was performed on 952 target responses.

Our hypothesis targets the rate of regular pronoun production in the different experimental contexts. Thus, the dependent variable for statistical analysis was whether or not a regular pronoun (*ea/el*) was used. To model these responses, we used a logistic mixed effects regression with fixed effects of AMBIGUITY, PICTURE TYPE, and their interaction. Item and participants were included as random effects. We attempted to include random intercepts and random slopes for all fixed effects justified by the design, and adopted the most complex model

that would converge⁴ (Matuschek et al., 2017). With respect to contrast coding for the two fixed effect factors, we coded *Mismatch* as -0.5, *Match* as 0.5 for AMBIGUITY, and for PICTURE TYPE we coded *Local Coreference* as -0.5 and
540 *Disjoint Reference* as 0.5.⁵ In addition, we also fitted a second nested logistic regression model with a fixed effect of AMBIGUITY nested within each level of PICTURE TYPE⁶ with the same contrast coding as in the main analysis.

After inspecting our results, we also decided to run a post-hoc, exploratory model to test for differences between conditions in the rate of on-target re-
545 sponses. In this model, the dependent variable was whether the response was ‘on target’, with PICTURE TYPE and AMBIGUITY as fixed effects, and item and participants as random grouping factors.

2.6. Results

To summarize the data, we coded on target responses into six different response
550 type categories. We labeled sentence continuations *el/ea* ‘him/her’ as PRONOUN. Three of the six categories fall under the REFLEXIVE umbrella term: emphatic reflexives *el însuși / ea însăși* ‘him himself / her herself’, the simplex gender neutral reflexive *sine* ‘self’, and a less frequent form of expressing reflexivity, namely *propria persoană* ‘own person’. We coded proper name continuations like *An-*
555 *drei / Mihai / Irina* as NAME and continuations with demonstrative pronouns *acesta/aceasta* ‘this one’, used to convey non-local reference, as DEMONSTRATIVE. The rate of production for each response type within the four conditions is given in Table 2. The highlighted column represents the rate of *regular pronoun* production. Significantly fewer pronouns were used in the *Match* conditions for

⁴ $\text{Pronoun.Rate} \sim \text{Ambiguity} * \text{Picture.Type} + (1 + \text{Ambiguity} + \text{Picture.Type} || \text{Subject}) + (1 + \text{Ambiguity} * \text{Picture.Type} || \text{Item})$

⁵Given that most of the participants were female, *gender* was also added as a factor in the generalized linear model analysis (with female coded as 1 and male as 0): the gender of the participants was not significant. We also checked for order effects for the items by including the item order as a factor in the analysis: item order was not significant.

⁶ $\text{Pronoun.Rate} \sim \text{Picture.Type} / \text{Ambiguity} + (1 + \text{Ambiguity} + \text{Picture.Type} || \text{Subject}) + (1 + \text{Ambiguity} * \text{Picture.Type} || \text{Item})$

RESPONSE TYPE	PRONOUN	REFLEXIVE			OTHER	
	<i>el</i>	<i>el însuși</i>	<i>sine</i>	<i>propria persoana</i>	NAME	DEMONSTRATIVE
COREFERENT MISMATCH	54.5%	33.9%	5%	2.5%	4.1%	0%
COREFERENT MATCH	39.1%	48.9 %	6.7%	1.3%	3.5%	0.5%
DISJOINT MISMATCH	49.6%	0%	0%	0%	45.9%	4.5%
DISJOINT MATCH	23%	0%	0%	0%	73.2%	3.8%

Table 2: *Rate of Production by participant Response Type in Experiment 1.*

Translations of Participants’ Responses as follows. PRONOUN: ‘him’ / ‘her’ - *el* / *ea*;
 REFLEXIVE: ‘himself’ / ‘herself’ - *el însuși* / *ea însăși*, ‘self’ - *sine*, ‘own person’ - *propria*
persoană; DEMONSTRATIVE: ‘this one’ - *acesta* / *aceasta*.

560 both *Local Coreferent* and *Local Disjoint* contexts. To visualize this effect more
 clearly, *Figure 2* illustrates the rate of regular pronoun production across the
 four conditions. *Table 3* lists the results of the main analysis.

Logistic mixed effects regressions revealed a main effect of AMBIGUITY (β
 = 1.24, $z = 5.05$, $p < 0.001$), a main effect of PICTURE TYPE ($\beta = -0.82$, z
 565 = -2.82, $p < 0.01$) and an interaction between the two factors ($\beta = 0.85$, $z =$
 2.37, $p < 0.05$). The nested model revealed a reliable effect of AMBIGUITY for
 both LOCAL DISJOINT REFERENCE ($\beta = 1.67$, $z = 5.34$, $p < 0.001$) and LOCAL
 COREFERENCE ($\beta = 0.81$, $z = 2.75$, $p < 0.01$) conditions. This suggests that
 the interaction we see seems to be driven by a more modest gender match effect
 570 for LOCAL COREFERENCE than for LOCAL DISJOINT REFERENCE scenarios.
 With respect to LOCAL COREFERENCE, in the *Match* condition there was an
 increase in the use of reflexive pronouns (15% increase for emphatic reflexives) in
 comparison to the *Mismatch* condition and almost no names were observed. In
 the LOCAL DISJOINT REFERENCE conditions, the opposite is true: no reflexive
 575 pronouns were used and there was an increase in the use of proper names (27.2%)
 when comparing the *Match* condition with the *Mismatch* condition.

With respect to our post-hoc analysis of the on-target responses, the *Local*
Coreferent Match condition had the lowest rate of on-target responses (86.5%),
 while the other three conditions ranged between 91.9% and 94.6%. The on-

Figure 2: Rate of regular pronoun production in Experiment 1.

<i>Factor</i>	Logistic Mixed Effects Model		
	<i>Estimate</i>	<i>SE</i>	<i>z value</i>
AMBIGUITY	1.24	0.24	5.05***
PICTURE TYPE	-0.82	0.29	-2.81**
AMBIGUITY X PICTURE TYPE	0.85	0.36	2.37*

<i>Picture Type</i>	Nested Model: Effect of Ambiguity		
	<i>Estimate</i>	<i>SE</i>	<i>z value</i>
LOCAL COREFERENT	0.81	0.29	2.75**
LOCAL DISJOINT	1.67	0.31	5.35***

Table 3: Logistic Mixed Effects Model Estimates in Experiment 1.

All significant effects are bolded. Legend: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

	ON-TARGET RATE	TARGET RESPONSES
COREFERENT MISMATCH	93.8%	242
COREFERENT MATCH	86.5%	225
DISJOINT MISMATCH	94.6%	246
DISJOINT MATCH	91.9%	239

Table 4: *On-Target Response Rate by Condition in Experiment 1.*

target response rate and the counts of target responses for each condition is given in *Table 4*. Our post-hoc exploratory logistic regression on these data revealed an effect of AMBIGUITY ($\beta = 0.928$, $z = 2.46$, $p < 0.05$), but no effect of PICTURE TYPE and no interaction.

2.7. Discussion

This experiment revealed three primary results of interest. First, we observed an overall gender match effect: participants used fewer regular pronouns in contexts with two characters of the same gender, compared to contexts where the characters had different genders. In other words, participants used regular pronouns less often in contexts where the use of a pronoun would be ambiguous, as predicted. Importantly, this gender match effect was seen in both LOCAL COREFERENCE and LOCAL DISJOINT REFERENCE conditions: participants were less likely to produce regular pronouns in contexts where they would be ambiguous even for within-clause referential dependencies.

Second, as expected, the referring expression that participants chose instead of regular pronouns depended on the type of scenario presented. In LOCAL DISJOINT REFERENCE conditions, the gender match effect resulted in participants using more proper names, which avoided the ambiguity associated with a regular pronoun. In contrast, the gender match effect in the LOCAL COREFERENCE contexts was reflected in more productions of the emphatic reflexive forms in gender match contexts than in gender mismatch contexts. Interestingly, the emphatic reflexive form was preferred to other grammatically available options

for unambiguously expressing a reflexive meaning, such as the simple reflexive form *sine*, and the expression *propria persoana*, ‘own person’.

Third, we observed a main effect of PICTURE TYPE, indicating that participants generally used more regular pronouns in *Local Coreference* contexts than
605 in the *Local Disjoint Reference* contexts. In fact, the results suggest that the regular pronoun *el/ea* was in fact the preferred means (>50% of the on-target response types, on average) of expressing reference in our gender mismatch contexts, with names and emphatic reflexives being the preferred form only in the
610 gender match contexts. We have no basis to generalize beyond the specific task context tested here, but it is an interesting finding to explore in future work. For example, this finding could indicate that regular pronouns are reserved for the most accessible referents, with reflexive pronouns being more often employed when the intended referent is less accessible. This potential hierarchy reflects
615 a different state of affairs than the one suggested by (Ariel, 1990) for English, according to whom reflexive pronouns are used to refer to the referent with the highest accessibility.

The significant interaction between the two factors, PICTURE TYPE and AMBIGUITY, suggests that the gender match effect was stronger for *Local Dis-*
620 *joint Reference* than for *Local Coreference*. This might indicate that there is a potentially smaller effect of ambiguity on local reflexive dependencies than other types of pronominal reference, but we refrain from interpreting this interaction too strongly given the results from *Experiment 2*. We return to this discussion in subsection 4.

Finally, one unexpected finding was that the participants seemed to produce
625 more on-target responses in the MISMATCH conditions. We interpret this result with caution, as it was not predicted and was established in a post-hoc, exploratory model. Still, it is notable. One speculative possibility is that MATCH contexts overall created more difficulty for participants in selecting the form of
630 the referring expression, and the increased rate of non-target responses indicates yet another strategy of coping with this difficulty.

The results of *Experiment 1* provide evidence that the principles that guide

pronoun choices across sentences carry over to pronoun choice in within-sentence contexts, as predicted by some accounts of reference, like (Ariel, 1990). In *Experiment 1* the local subject was always a proper name, which means that it is possible that the pronoun was linked to its antecedent through discourse-mediated coreference, rather than syntactic binding. If this is how speakers encoded this dependency in our experiment, then an effect of context in the case of coreference relations might not be necessarily surprising, since coreference, local or non-local, is resolved at the level of discourse (Reinhart, 1983; Grodzinsky and Reinhart, 1993; Reinhart, 1983; Roelofsen, 2010; Reuland, 2011, a.m.o). That is, it is reasonable to expect that context might impact the choice of referring expression, even if that context comes from material that occurs within the same clause as the pronoun.

Thus, to push farther on our core question of whether discourse context has an effect on within-sentence dependencies more broadly, in *Experiment 2* we modify the design of experiment to test a syntactic pronominal dependency whose meaning is resolved independently of context: bound variable anaphora.

3. Experiment 2: Quantified Subjects

In *Experiment 1*, we observed a gender match effect on the choice of referring expression for within-clause dependencies that mirrored effects seen in similar paradigms for discourse-level referential dependencies (e.g. Arnold et al., 2000; Arnold and Griffin, 2007; Fukumura et al., 2013): participants chose regular pronouns less often when the two discourse participants matched in gender. While there are some accounts which suggest that context plays a role in the case of intrasentential reference (Dowty, 1980; Levinson, 1987; Ariel, 1990), it is not obvious that this should be true for *all* within-sentence reference relations.

Binding theorists (Keenan, 1971; Evans, 1980; Heim, 1982; Reinhart, 1983; Grodzinsky and Reinhart, 1993; Roelofsen, 2010; Reuland, 2011, a. m. o) have argued that there are two crucially different types of referential dependencies: binding, whereby a syntactic-semantic dependency is achieved between an an-

tecedent and a variable, and coreference, whereby two referring expressions, both free variables, (happen to) refer to the same referent. Evidence that these two types of referential dependencies are distinct can be found in ellipsis contexts.
 665 A sentence like (12), for instance, has two different readings (Ross, 1967).

(12) Hermione thinks she deserves an *Outstanding* and Draco does too.

a. **Sloppy Interpretation (via Binding):**

Hermione thinks Hermione deserves an *Outstanding*
 and Draco thinks *Draco* deserves an *Outstanding*.

670 b. **Strict Interpretation (via Coreference):**

Hermione thinks Hermione deserves an *Outstanding*
 and Draco thinks *Hermione* deserves an *Outstanding*.

In order to obtain the so called *sloppy* reading, where Draco thinks that Draco deserves an *Outstanding*, the elided predicate employs variable binding (Heim,
 675 1982; Reinhart, 1983; Heim and Kratzer, 1998, a.m.o). The *strict* reading, in which Draco thinks that Hermione deserves an *Outstanding*, is obtained via a coreference relation. Quantified antecedents like *every witch* do not refer to a particular discourse referent and can thereby only establish binding relations with anaphoric expressions. Therefore, in (13), *every witch* binds the pronoun
 680 *she* and thus gives rise to a sloppy interpretation under ellipsis, but *every witch* cannot corefer with *she*, and thus the strict reading (13b) is unavailable.

(13) Every witch thinks she deserves an *Outstanding* and Draco does too.

a. **Sloppy Interpretation (via Binding):**

Draco thinks *Draco* deserves an *Outstanding*.

685 b. **Strict Interpretation (via Coreference):**

Draco thinks *every witch* deserves an *Outstanding*.

Crucially, coreference is established at the level of discourse, while binding dependencies can be computed without reference to discourse (Reinhart, 1983, 2006; Safir, 2004, 2014; Reuland, 2001, 2011, a.o). If discourse is not taken into

690 account when computing bound variable relations, this leads to the prediction
that pronouns whose meaning is resolved independently of context should be
free of discourse effects. In this sense, the choice between pronouns like *her* and
reflexives like *herself* in (14) might not be affected by discourse context, or the
effect of context might be diminished relative to free variable pronouns.

- 695 (14) a. **Every witch₁** talked about **her₁**.
b. **Every witch₁** talked about **herself₁**.

It is thus possible that the effect of ambiguity observed for local referential
dependencies in *Experiment 1* was only obtained when participants computed a
coreference relation between the two referring expressions. In *Experiment 2*, we
700 test the limits of this effect by investigating whether it extends to bound variable
dependencies, as in (15). Bound variable dependencies are widely thought to
be syntactically mediated (Reinhart, 1983, 2006; Safir, 2004; Reuland, 2011,
a.o), and therefore provide a strong test of whether the discourse dependent
ambiguity avoidance effects we observed in *Experiment 1* can apply to syntactic-
705 semantic relations. Thus, the goal of *Experiment 2* is to determine whether
contextual ambiguity affects the rate of regular pronouns in the case of variables
bound by a local subject.

(15) LOCAL BOUND

710 *Acasă la bunica Laura, fiecare fată a vorbit despre ...*
home at grandma Laura, every girl has talked about ...

‘At Grandma Laura’s house, every girl talked about ... ’

To ensure that participants are interpreting the object pronoun as a locally
bound variable, we modified the design from *Experiment 1* to make the local

subject always a *quantified* expression, as in (15). In order to be able to compare
 715 the results of *Experiment 1* and *2*, the latter also asks if a similar ambiguity
 avoidance effect is obtained for pronouns which are disjoint in reference from a
 local quantified subject, as in (16).

(16) LOCAL DISJOINT REFERENCE

720 *Acasă la bunica Laura, fiecare fată a vorbit despre ...*
 home at grandma Laura, every girl has talked about ...
 ‘At Grandma Laura’s house, every girl talked about ... ’

Under the hypothesis that the gender match effects seen above reflects a
 generic ambiguity avoidance constraint, we predict that speakers should avoid
 ambiguity in the computation of all types of reference relations: bound variables,
 725 coreference and disjoint reference. The predictions parallel those in *Experiment*
1: speakers will attempt to choose less ambiguous forms when the context is
 open to interpretation. Consequently, the expectation is that the production
 rate of regular pronouns *el* and *ea* will be lower in ambiguous conditions, for
 both disjoint reference and locally bound scenarios. Once again, a higher rate of
 730 names and reflexive expressions is expected in ambiguous disjoint and ambiguous
 bound contexts, respectively. If, on the other hand, bound variable dependencies
 are computed without reference to the discourse (e.g. Reinhart, 2006; Reuland,
 2011, i.a.), then we may expect diminished sensitivity to ambiguity avoidance
 pressures. In our design, this would predict a smaller gender mismatch effect
 735 for LOCAL BOUND configurations.

3.1. Participants

Sixty-eight undergraduates (60 female) from the University of Bucharest took
 part in the experiment in exchange for monetary compensation (30 RON -

roughly \$8 USD). All participants were native speakers of Romanian and gave
740 informed written consent for the use of their data. In order to ensure that the
results of the two experiments did not differ solely because we sampled from
different populations, twenty participants were included in both *Experiment 1*
and *Experiment 2*. The experiments were conducted 4-5 months apart, so it
is unlikely that the performance of these participants was affected by having
745 been exposed to the items in *Experiment 1*. The age range was between 18
and 33, with an average age of 21.28. No participants were excluded from the
analysis. The average rate of target responses was 98.2%. This ranged between
a minimum of 81.2% and a maximum of 100%.

3.2. Design

750 We used the same 2 x 2 within subjects factorial design as in *Experiment 1*,
crossing PICTURE TYPE and AMBIGUITY. In *Experiment 2*, where item local
subjects are quantified expressions like *every boy*, the levels of the PICTURE
TYPE factor are LOCAL BOUND and LOCAL DISJOINT REFERENCE. An exam-
ple of a single item, in all four experimental conditions, is illustrated in *Table*
755 *5*.

3.3. Materials

16 experimental items were constructed. Each item consisted of four variants
with a target sentence and a target picture, one for each experimental condition.
Each target picture and sentence set was preceded by a two-sentence context
760 to introduce the relevant discourse referents. The first sentence in the context
introduces one of the discourse referents and sets the location for the event; the
second sentence presents the other three referents and their connection to the
context. A sample item set is given in (17).

(17) a. **Context Screen:**

765 *Bunica Laura a fost vizitată recent de către familie.*
grandma Laura has been visited recently by family
Monica, Elena și Irina au fost și ele prezente.
Monica Elena, and Irina have been and them present

‘Grandma Laura was recently visited by his family. Monica, Elena and Irina were present too.’

b. **Target Screen:**

770

Acasă la bunica Laura, fiecare fată a vorbit despre ...
 home at grandma Laura, every girl has talked about ...
 ‘At Grandma Laura’s house, every girl talked about ... ’

The sentence subject is quantified DP (e.g. *every girl*) denoting a set of three discourse referents which match in gender and age (3 boys or 3 girls), while the
 775 topic PP refers to an older relative by name (e.g. *at Aunt Diana’s house, in Grandpa Paul’s library*). With the exception of the referents, the item target sentences mirrored those in *Experiment 1*. For constraints related to consistent picture size and exposition in *PsychoPy*, the predicates in the *citi despre* ‘read about’, *scrie despre* ‘write about’ and *visa despre* ‘dream about’ items were
 780 replaced with 3 other communication predicates. Thus, *Experiment 2* used *talk*, *chatter* type verbs in 11 out of the 16 items. The topic PPs for the 3 replaced items were also changed to match the sentence context.

For a given item, each of the four conditions was associated with a different target picture. The context and target sentence lead-in remained constant across
 785 the levels of the PICTURE TYPE factor, but differed from each other with respect to the MATCH and MISMATCH conditions of the AMBIGUITY factor. *Table 5* illustrates this contrast for the item in (17). The target contexts differed solely in the name (and gender) of the older relative.

Across the experiment, there was a total of 14 characters: eight older char-

790 actors (2 grandmas, 2 grandpas, 2 aunts, 2 uncles) and six younger characters
 (3 boys and 3 girls). For each item, the speakers are invariant across the 4 con-
 ditions. The topic PP referent either has the same gender (MATCH) or differs in
 gender (MISMATCH) with the three speakers. In eight of the sixteen items the
 speakers were all female (*Monica, Elena, Irina*), while in the other eight they
 795 were all male (*Mihai, Daniel, Andrei*). The relational noun *nepot / nepoată*
 stands both for *nephew / niece* and *grandchild* in Romanian. Consequently,
 the subjects were referred to by *every boy, every girl, every nephew* and *every*
niece, each construction being used in four different items. In order to avoid
 associating a particular interpretation with the position of the characters in the
 800 picture, we also manipulated the order of the characters in the target picture
 as follows. The order of the younger characters is randomized, but consistent
 with the relative order in which they were introduced in the context sentence.
 The picture position of the older character is counter-balanced across the ex-
 periment: the older relative in the second position (from left to right) in half of
 805 the items, and in the third position in the picture in the other half.

The variants of each item set were distributed in four Latin Squared Lists
 and interspersed with 20 fillers. Given the increased complexity of the target
 items (universal quantifiers, 4 characters per item) compared to *Experiment 1*
 (proper names, 2 characters per item), we also increased the complexity of the
 810 fillers. The filler items included between 2 and 4 characters in each picture
 and preceding context. Thirteen of these depict three young characters which
 never match in gender (2 girls and one boy *or* 2 boys and one girl), unlike the
 experimental items where the young characters always match in gender. Six of
 the fillers could be construed as reflexive events, three necessarily as disjoint, and
 815 eleven necessarily referenced objects and abstract concepts. 10 filler items used a
 range of quantifiers like *some, two of the nephews*, etc. accompanied by pictures
 with 3 young characters. Five of the filler sentences started off with a topic PP
 which referenced one of the characters, similarly to the experimental items; for
 five of the fillers, the sentence initial topic PP did not refer to a character (e.g.
 820 *after the movie*); the other ten were subject initial. Of the latter, five fillers used

	<div> <div>BOUND MISMATCH</div> </div> <div> <div>DISJOINT MISMATCH</div> </div>
MISMATCH SENTENCE	<p><i>Acasă la <u>bunicul Paul</u>, fiecare fată a vorbit despre ...</i></p> <p>home at grandpa Paul, every girl has talked about ...</p> <p>‘At Grandpa Paul’s house, every girl talked about ...’</p>
	<div> <div>BOUND MATCH</div> </div> <div> <div>DISJOINT MATCH</div> </div>
MATCH SENTENCE	<p><i>Acasă la bunica Laura, fiecare fată a vorbit despre ...</i></p> <p>home at grandma Laura, every girl has talked about ...</p> <p>‘At Grandma Laura’s house, every girl talked about ...’</p>

Table 5: *Sample Item Pictures & Target Sentences by Condition for Experiment 2.*

Figure 3: Screen introducing all the *Experiment 2* characters in the Instructions.
Names (in order): *Monica, Elena, Irina, Andrei, Daniel, Mihai, Uncle Vlad, Uncle George, Aunt Raluca, Aunt Diana, Grandma Maria, Grandma Laura, Grandpa Radu, Grandpa Paul.*

sentence embedding (*One of the nephews told Uncle George that he's interested in...*).

3.4. Procedure

The experimental procedure was identical to *Experiment 1* with the following
825 changes. Due to the increased complexity of *Experiment 2* (four different discourse referents in each item), the portraits of the characters were not included on the context screen - it was decided that this display would be overwhelming to the participants. Instead, participants were simply introduced to all of the 14 characters (6 children, 8 older relatives) once during the instructions: their
830 names and respective portraits were presented on the same screen, as in *Figure 3*.

The timeline for each trial is schematically represented in *Figure 4*. For each item, the two-sentence context introducing the relevant discourse referents remained on the screen for 7.5 seconds. Unlike in *Experiment 1*, there is no
835 delay between the context and the target picture due to the fact that the context screen no longer includes images. The context screen was immediately followed by a screen with the target picture. After 2 seconds, the target sentence was displayed below the picture. Participants were instructed to examine the target picture and silently read the target sentence before choosing a continuation that

Figure 4: *Sample Trial in Experiment 2.*

840 described the picture they saw. This was done in order to minimize prosodic breaks between the completion prompt and the rest of the sentence. After repeating back the prompt and their preferred continuation to describe the image, participants pressed the space bar to continue to the next item, which would be displayed on the screen after a 0.5 second break (blank screen). Both
 845 the target picture and sentence prompt stayed on the screen until the participant pressed the space bar.

At the beginning of the experiment, participants were presented with instructions, and two practice items that were similar to but distinct from the critical items. After completing all 36 items trials, they were given 4 exit poll
 850 items, and, finally, an exit interview with the experimenter. The instructions and practice items did not repeat any of the 16 critical items or fillers. The entire process lasted, on average, around 45 minutes for each participant, 15-20 minutes of which were taken up by the experiment itself.

3.5. Analysis

855 We transcribed and annotated participant responses and used the same coding procedure as in *Experiment 1*. Non-target responses were excluded from the

analysis. No participants were excluded from the analysis, as the lowest on-target rate by participant was 81.25%. The improved rate of target responses in comparison to *Experiment 1* may be in part due to one change in the instructions
860 from *Experiment 1* to *Experiment 2*; in *Experiment 2*, the instructions included an additional remark that the experiment was not a test of participants' creativity. In total, only 1.83% of the collected data was excluded. Consequently, of the 1088 total responses, data analysis was performed on 1068 target responses.

For *Experiment 2*, we used the same planned (nested) logistic mixed effects
865 regression models and post-hoc exploratory models as in *Experiment 1*.⁷

3.6. Results

We coded the target responses in the same six categories as in *Experiment 1*. The rate of production for each response type within the four conditions is given in *Table 6*. The rate of *regular pronoun*, which can be used to measure the effect
870 of AMBIGUITY across all conditions, is highlighted. *Figure 5* illustrates the rate of regular pronoun production across the four conditions, while *Table 7* lists the results of the main analysis.

Logistic mixed effects regression revealed a main effect of AMBIGUITY ($\beta = 1.61, z = 6.77, p < 0.001$), a main effect of PICTURE TYPE ($\beta = -1.5, z = -3.12, p < 0.01$), but, unlike in *Experiment 1*, the analysis did not reveal a significant
875 effect of the interaction between the two factors. The nested model reveals a reliable effect for both *Local Bound* ($\beta = 1.56, z = 5.21, p < 0.001$) and *Local Disjoint* ($\beta = 1.66, z = 5.09, p < 0.001$) conditions; the effect of AMBIGUITY was of comparable magnitude across the two picture types.

⁷Main Model:

Pronoun.Rate $\sim$ Ambiguity * Picture.Type + (1+Ambiguity+Picture.Type||Subject) + (1+Ambiguity*Picture.Type||Item)

Nested Model:

Pronoun.Rate $\sim$ Picture.Type/Ambiguity + (1+Ambiguity+Picture.Type||Subject) + (1+Ambiguity*Picture.Type||Item)

Like in *Experiment 2*, upon adding participant gender and item order as factors in the main

RESPONSE TYPE	PRONOUN	REFLEXIVE			OTHER	
	<i>him</i>	<i>himself</i>	<i>self</i>	<i>own person</i>	NAME	DEMONSTRATIVE
BOUND MISMATCH	52.6%	35.6%	11%	0.8%	0%	0%
BOUND MATCH	32.5%	48.7 %	16.5%	2.3%	0%	0%
DISJOINT MISMATCH	34.2%	0%	0%	0%	54%	11.8%
DISJOINT MATCH	16.6%	0%	0%	0%	70.1%	13.3%

Table 6: *Rate of Production by participant Response Type in Experiment 2.*

Translations of Participants' Responses as follows. PRONOUN: 'him' / 'her' - *el / ea*;
 REFLEXIVE: 'himself' / 'herself' - *el însuși / ea însăși*, 'self' - *sine*, 'own person' - *propria persoană*; DEMONSTRATIVE: 'this one' - *acesta / aceasta*.

Figure 5: *Rate of regular pronoun production in Experiment 2.*

<i>Factor</i>	Logistic Mixed Effects Model		
	<i>Estimate</i>	<i>SE</i>	<i>z value</i>
AMBIGUITY	1.61	0.24	6.77***
PICTURE TYPE	-1.5	0.48	-3.12**
AMBIGUITY X PICTURE TYPE	0.1	0.4	0.246

<i>Picture Type</i>	Nested Model: Effect of Ambiguity		
	<i>Estimate</i>	<i>SE</i>	<i>z value</i>
LOCAL BOUND	1.56	0.3	5.21***
LOCAL DISJOINT	1.66	0.32	5.09***

Table 7: *Logistic Mixed Effects Model Estimates in Experiment 2.*
All significant effects are bolded. Legend: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

	ON-TARGET RATE	TARGET RESPONSES
BOUND MISMATCH	97%	264
BOUND MATCH	96%	261
DISJOINT MISMATCH	100%	272
DISJOINT MATCH	99.6%	271

Table 8: *On-Target Response Rate by Condition in Experiment 2.*

880 Similarly to *Experiment 1*, the *Bound Match* condition had the lowest rate of on-target responses (96%), however the target rates for the other three conditions were not significantly higher, ranging between 97% and 100%. The on-target response rate and the counts of target responses for each condition is given in Table 8. The post-hoc exploratory model over the rate of target
885 responses revealed no significant effects of AMBIGUITY, PICTURE TYPE, and no significant interaction.

3.7. Discussion

Like *Experiment 1*, *Experiment 2* revealed three primary results of interest. First, we observed an overall gender match effect: participants produced fewer
890 regular pronouns in contexts where all characters matched in gender, than in contexts where the gender of the referents in the local subject and the gender of the fourth character differed. This effect was seen in both LOCAL BOUND and LOCAL DISJOINT REFERENCE conditions: participants were less likely to produce regular pronouns in contexts where their use would lead to ambiguity for
895 within-clause referential dependencies established syntactically (*Local Bound*) as well as for dependencies established at the level of discourse (*Local Disjoint Reference*).

Second, as expected, and similarly to *Experiment 1*, the referring expression that participants chose instead of regular pronouns depended on the type of
900 scenario presented. In LOCAL DISJOINT REFERENCE conditions, the gender match effect resulted in participants using more proper names, whereas participants avoided the ambiguity associated with a regular pronoun by producing more emphatic reflexive forms LOCAL BOUND contexts. Once again, the emphatic reflexive form was preferred to other grammatically available options for
905 unambiguously expressing a reflexive meaning, such as the simple reflexive form *sine*, and the expression *propria persoana*, ‘own person’.

Third, as in *Experiment 1*, there was a main effect of PICTURE TYPE: there

analysis, we found that participant gender and item order were not significant.

was an overall higher rate of regular pronouns *el/ea* in the *Local Bound* conditions than in *Local Disjoint Reference* contexts.

910 There was one notable difference from *Experiment 1*: in *Experiment 2*, we saw no significant interaction between the AMBIGUITY and PICTURE TYPE factors. While the interaction obtained in *Experiment 1* indicated that the gender effect might be stronger for *Local Disjoint Reference* than for *Local Coreference* contexts, *Experiment 2* yielded no evidence that within-sentence bound variable
915 dependencies were any less sensitive to the gender match effect than the locally disjoint pronouns were. The lack of this interaction in *Experiment 2* is in line with the hypothesis that ambiguity avoidance is a generic strategy taken into account in selecting the most appropriate form of a referring expression, irrespective whether this relation is thought of as a syntactic-semantic dependency
920 (as in the *Local Bound*) or a matter of linking a pronoun to a referent in the discourse (*Local Disjoint Reference*).

The results from *Experiment 2* also suggest that the regular pronoun *el/ea* is the preferred surface form of bound variables in Romanian, with respect to the task syntactic context. If this observation generalizes outside of the experimental
925 task, it would suggest that regular pronouns might be the preferred means of expressing a bound variable in a PP object position.

4. General Discussion

4.1. Intrasentential Reference & Ambiguity

A general aim of our study was to determine whether the choice of a referring
930 expression in the case of intrasentential reflexive dependencies is subject to considerations of potential ambiguity. We tested the hypothesis that the choice of a referential form expressing a binding dependency, a relation thought to be established independently of discourse, is similarly impacted by potential ambiguity as local and non-local coreference. The two experiments provided evidence that,
935 when choosing a pronominal form to refer to a clausemate antecedent, speakers display sensitivity to context-dependent ambiguity. We found an effect of

ambiguity in all three reference relations: local disjoint reference (targeting the referent introduced in the topic PP), local coreference (targeting a local referential subject), and variable binding (targeting a local quantificational subject).

940 In the case of all three reference relations, speakers chose a regular pronoun (ambiguous between the relevant readings) less often when the intended referent matched in gender with other referents in the local discourse. Furthermore, in the case of local disjoint reference, participants used names more often in gender match contexts than they did in gender mismatch contexts, and in the case of
945 local coreference and binding, speakers chose reflexive pronouns more often in gender match contexts than they did in gender mismatch contexts. Lastly, the gender match effect for the two referential dependencies is of similar magnitude, consistent with the hypothesis that binding and other reference relations are similarly affected by discourse considerations. These results are consistent with
950 the hypothesis that the same discourse-dependent pressures apply with similar force to all types of referential dependencies.

4.2. Local Disjoint Reference & the Gender Match effect

Syntactic constraints on reference, i.e. the binding conditions, do not apply to dependencies between pronouns and clausemate antecedents which do not c-
955 command them (Chomsky, 1981, 1986; Büring, 2005). In this sense, in our experiments, the referential dependency between the topic PP referent and the target referring expression is not subject to syntactic binding constraints. Given previous gender match effects found for reference to non-local antecedents (Arnold et al., 2000; Fukumura et al., 2013, a.o), we expected a similar effect
960 to obtain in the disjoint reference conditions in our experiments. As shown in *Figure 6*, there was a significant effect of AMBIGUITY in the case of local disjoint reference. These results mirror existing experimental evidence concerning pronouns targeting a referent in a previous sentence (Arnold et al., 2000; Fukumura et al., 2011, a.o.). This effect is also qualitatively and quantitatively
965 similar to the one reported in Arnold and Griffin (2007) for pronouns in English which refer to a cross-sentential antecedent. The effect of AMBIGUITY with re-

Figure 6: Rate of regular pronoun production for disjoint reference across experiments: Experiment 1 (Referential Subjects) vs. Experiment 2: (Quantified Subjects).

spect to the production of pronouns which express local disjoint reference is of comparable magnitude across the two experiments, whether the local subject is referential or quantificational.

970 As mentioned in the introduction, although the “gender match effect” appears to indicate some type of ambiguity avoidance, it does not necessarily reflect explicit audience design on the part of the speaker. Arnold and Griffin (2007) point out that same-gender competitors may be more similar than different-gender competitors, and that this additional similarity makes the referent’s representation less accessible to the speaker in their own discourse model.
 975 This hypothesis is referred to by Fukumura et al. (2011) as *similarity-based interference*⁸. Consistent with this view, Arnold and Griffin (2007) show that the presence of an additional character in the discourse, irrespective of their

⁸A processing counterpart of this view *Informational Load Hypothesis* (Almor, 1999; Almor and Nair, 2007). The argument is that the amount of semantic overlap between referential expressions leads to memory interference in the retrieval of the correct referent, which in turn lowers accessibility.

gender, can also lead to the use of pronouns less often when compared to a
 980 context with only one referent. The authors propose that the *two-character*
effect (Arnold and Griffin, 2007, p. 532) stems from a speaker internal con-
 straint, as an artefact of the competition between the two different gendered
 characters for cognitive resources, and not from consideration to their listener’s
 discourse model. Arnold and Griffin (2007) and Arnold (2010) argue that the
 985 mental representation of the second character lowered the accessibility of the
 first character by consuming additional resources (see Fukumura et al. (2011)
 and Fukumura and van Gompel (2012) for further evidence and discussion).⁹

However, the audience design and the similarity-based interference perspec-
 tives on the gender match effect are not mutually exclusive. Indeed, Fukumura
 990 et al. (2013), replicating Fukumura et al. (2011) in a study with Finnish speak-
 ers, find evidence of similarity-based interference, as well as of an ambiguity
 avoidance effect, suggesting that the gender match phenomenon may plausibly
 reflect both pressures. Similarly, Hwang (2020), in studies on Mandarin, finds
 evidence of both ambiguity avoidance as well of similarity-based interference.
 995 Specifically, Hwang (2020) replicates the two character effect reported in Arnold
 and Griffin (2007), with Mandarin speakers using pronouns more often in con-
 texts with one referent than in contexts with two characters. However, Hwang
 (2020) also shows that ambiguity avoidance is a distinct phenomenon by investi-
 gating the gender match effect in two-character contexts in written and spoken
 1000 Mandarin. The 3rd person pronoun is specified for gender only in written Man-
 darin, while in spoken Mandarin it is gender-ambiguous: it can only be used
 to disambiguate in written Mandarin. Thus, if participants produce less pro-
 nouns in spoken Mandarin in scenarios where the characters match in gender,
 this effect cannot be attributed to ambiguity avoidance, but to similarity-based

⁹Under the *Expectancy Hypothesis* (Arnold, 1998, 2001, 2010), the use of a pronoun is correlated with the likelihood of an entity being mentioned. Speakers calculate expectancy as an estimate of the accessibility to the listener (Arnold, 2010, p. 193), but this calculation is heavily influenced by speaker’s mental representations.

1005 interference. Crucially, Hwang (2020) observed a gender-match effect on the rate of pronoun production in written Mandarin, but not in spoken Mandarin.

As for the experiments discussed in this paper, they cannot directly distinguish between these two possibilities, given that the source of the gender match effect was not at issue for our study. Participants were instructed to imagine
1010 that they were talking to a friend, which means that our experimental effects could potentially reflect an effect of implicit audience design.

At the same time, a cross-experimental comparison between the 2-character and 4-character *Local Disjoint Reference* contexts yields a pattern that is compatible with a similarity-based interference effect. Although the effect of AM-
1015 BIGUITY was of the same size in the disjoint reference conditions in *Experiment 1* and *2*, participants did produce overall fewer pronouns in the *Disjoint* conditions in *Experiment 2*. Descriptively, while the production rate of pronouns in the *Disjoint Mismatch* condition was of 50% in *Experiment 1*, pronouns were used in the same condition in 34.2% of the target responses in *Experiment 2*.
1020 One salient possibility for this difference is the number of referents in the given context: there were more characters in the scenarios in *Experiment 2* than in *Experiment 1*. Since there were more characters to maintain in working memory in *Experiment 2* than *Experiment 1*, it stands to reason that the accessibility of any given character was reduced in *Experiment 2*, which would in turn lower
1025 the rate of pronoun of the regular pronoun. In this way, the difference in regular pronoun usage across our experiments is reminiscent of the difference between one-character and two-character contexts found in Arnold and Griffin (2007) and Hwang (2020).

However, although similarity-based interference due to an increase in the
1030 number of characters might be responsible for the difference in pronoun use in the *Disjoint* conditions across *Experiment 1* and *Experiment 2*, we saw no such effect when comparing the *Local Coreferent* and *Local Bound* conditions. In these conditions, the rate of regular pronoun usage for local coreference and locally bound contexts did not differ significantly across the two experiments.

1035 This unexpected difference raises an interesting, but speculative possibil-

ity. If pronoun production is constrained by both speaker-internal similarity-based interference as well as ambiguity avoidance as an effect of audience design (Fukumura et al., 2013; Hwang, 2020), then the fact that the "additional character" effect only seems to obtain in the *Disjoint* conditions might indicate that syntactic-semantic binding dependencies are not subject to similarity-based interference effects in the same way, although they are pragmatically constrained by ambiguity considerations. A follow-up experiment controlling for the number of referents directly (e.g. 2 characters vs. 4 characters) would be necessary to put this hypothesis to a more direct test.

Lastly, there was an effect of PICTURE TYPE across both experiments, with participants producing less pronouns, overall, in the *Disjoint Reference* conditions than they did for the *Local Coreferent* or *Local Bound* conditions, respectively. One possible motivation behind this difference might be that referents introduced in subject position are more prominent than the first mentioned referents, i.e. those introduced in the topic PP (Kaiser and Trueswell, 2008; Fukumura and van Gompel, 2015). If regular pronouns favor more prominent referents (Ariel, 1990, 2001; Givón, 1983; Arnold, 2010, a.m.o), and if referents in subject position are more prominent (Kaiser and Trueswell, 2008; Fukumura and van Gompel, 2015), then the preference to use a pronoun might be stronger in the *Coreferent/Bound* conditions, i.e. when the target is the local subject, than in the *Disjoint* conditions.

4.3. Regular & Reflexive Pronouns

Our results also have the potential to illuminate the question of how antecedent accessibility modulates the choice between a reflexive pronoun and a regular pronoun. According to Ariel (1990), reflexives are typically reserved for the most accessible referents, namely sentence subjects (Ariel, 1990, p.97), with pronouns being used for less accessible referents. This prediction is the opposite of what we observed. In gender mismatch coreferent and bound contexts, the regular pronouns *el/ea* were the preferred pronominal form, with a rate of roughly 50% cross-experimentally, as illustrated in *Figure 7*. Crucially, in these unambigu-

Figure 7: Rate of regular pronoun production for local coreference (Experiment 1: Referential Subjects) and locally bound variables (Experiment 2: Quantified Subjects).

ous environments, reflexive expressions were not the preferred referring device. However, in pragmatic contexts where using a regular pronoun would have led to potential ambiguity, the emphatic reflexive was the most frequent. A side-by-side comparison of the production rates for reflexive forms (including the emphatic reflexive *el însuși*, the simplex reflexive *sine*, and rare constructions *propria persoana* ‘own person’) in the *Local Coreferent* and *Local Bound* conditions in the two experiments is given in *Figure 8*. If this result holds, then it suggests that reflexives are actually used to express lower accessibility referents than are regular pronouns in Romanian.

5. Conclusion

The aim of the two production experiments was to assess whether Romanian speakers were sensitive to contextual ambiguity when choosing a referring expression for a within-sentence reflexive dependency. Despite the large body of work in the psycholinguistic literature showing that ambiguity avoidance affects the choice of referring expression cross-sententially, it remained unclear whether

Figure 8: Overall rate of reflexive production for local coreference (*Experiment 1: Referential Subjects*) and locally bound variables (*Experiment 2: Quantified Subjects*).

similar pressures should apply with equal force to within-sentence pronominal dependencies. The two experiments provided evidence for a generic ambiguity avoidance constraint, which applies to all types of reference (bound variables, local coreference, disjoint reference). The effect of contextual ambiguity was qualitatively the same as the ambiguity avoidance effect found in the psycholin-

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More broadly, the results of these two experiments may also have implications for theoretical research on the syntactic constraints on within-sentence reference. Although it has sometimes been argued that binding dependencies allow speakers to compute referential dependencies without reference to the dis-

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course (Reinhart, 1983; Grodzinsky and Reinhart, 1993; Roelofsen, 2010; Reuland, 2011), in our experiments we saw that bound variable dependencies were impacted by contextually-mediated ambiguity effects. These results are incompatible with the assumption (Reuland, 2001, 2011) that binding dependencies

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are established before discourse-level computations take place.

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7. Appendices

7.1. The reflexive pronoun *sine*

One surprising finding of both experiments concerned the low production rates of the simplex reflexive *sine*. In *Experiment 1*, *sine* made up 5% of the target responses in the *Coreferent Mismatch* condition, and 6.6% of the target responses in the *Coreferent Match* condition. Similarly, in *Experiment 2*, participants produced *sine* in 11% of the target responses in the *Bound Mismatch* condition and in 16.5% of the target responses in the *Bound Match* condition.

Like the emphatic reflexive, *el însuși*, the reflexive *sine* is a bound anaphor which unambiguously refers to the local subject. If simplex reflexive pronouns are somehow more economical than complex reflexives (Reuland, 2001; Safir, 2004, 2014; Rooryck and vanden Wyngaerd, 2011), the simplex reflexive *sine* should be preferred over *el însuși* from the standpoint of its morphosyntactic form. However, as post-experimental interviews with the participants in the two experiments suggest, the simplex reflexive *sine* is now infrequent in spoken Romanian, particularly in informal environments (participants were instructed to imagine they were speaking to a friend). The average age of the participants

1125 was 20.4-21.4. Older generations, including that of the main author, use *sine*
more frequently in natural speech. We surmise that the Romanian anaphora
system is in flux. This potential development regarding language change, at
least at the level of register, might have played a role in how often the reg-
ular pronouns *el/ea* take on reflexive interpretations. According to Rooryck
1130 and vanden Wyngaerd (2011), languages with dedicated reflexive anaphora, like
Romanian *sine*, should exhibit Condition B effects for regular pronouns, like
el / ea. Romanian *does* employ a variety of reflexive expressions, however, if
the simplex reflexive *sine* is becoming underutilized, then *sine* is not an active
competitor when it comes to expressing bound variables. On the other hand,
1135 this cannot be the only factor: participants who used *sine* also used regular
pronouns in *Local Coreferent* and *Local Bound* scenarios, suggesting that the
mere activation of *sine* does not lead to grammaticized disjoint reference effects
for regular pronouns. A longitudinal corpus study regarding pronominal expres-
sions and the reference of *el/ea* in older versions of Romanian might shed some
1140 light on whether stronger disjoint reference effects for pronouns, if found, were
correlated with the frequency of reflexive *sine*.

7.2. Repeated Participants

Twenty of the 68 participants in *Experiment 2* had also taken part in *Experiment*
1. This subsection is an exploratory posthoc analysis which compares the results
1145 of the two subgroups: naive participants and repeat participants. Including
repetition as a factor in the analysis of the results from *Experiment 2* did not
prove to be statistically significant. However, due to the low sample size, a
statistical analysis should be taken at face value and not assumed to generalize.

Descriptively, the pattern is as follows. *Figure 9* provides a side-by-side
1150 comparison of the performance of the 20 participants in *Experiment 1* (on the
left), and of their performance in *Experiment 2* (on the right). The results
indicate that the same 20 participants used more regular pronouns in the *Local*
Coreferent conditions in *Experiment 1* (54.3% *Mismatch*, 35.4% *Match*) than
they did in the *Local Bound* scenarios in *Experiment 2* (35.4% *Mismatch*, 13.9%

Figure 9: *Repeated Participants: Experiment 1 (left) vs. Experiment 2 (right).*

Figure 10: *Experiment 2: Repeated Participants (left) vs. New Participants (right)*

1155 Match). In the case of the *Local Disjoint* conditions, there was a comparable rate of regular pronoun production (*Experiment 1*: (45.5% *Mismatch*, 20.9% *Match*; *Experiment 2*: (55% *Mismatch*, 29.1% *Match*). Given the small sample size, this difference between the two experiments might be due to factors other than their exposure to the first experiment.

1160 However, when comparing the performance of the 20 repeat participants to that of the naive 48 participants in *Experiment 2*, as shown in *Figure 10*, it appears that the participants who also took part in *Experiment 1* used fewer regular pronouns in the *Local Bound* conditions and more pronouns in the *Local Disjoint* conditions than the group of naive participants. The difference between the two populations suggests that the exposure to the first experiment

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on ambiguity avoidance led to participants using regular pronouns to express reflexive readings less often, and preferring to use these pronouns in disjoint reference scenarios. This observation is once again related to competition: if a speaker consistently uses a regular pronoun to express a bound variable reading, then the use of this pronoun in disjoint reference environments decreases (naive participants in *Experiment 2*). Similarly, if a speaker develops a type of Condition B effect, whereby regular pronouns are dispreferred as expressions of bound variables, pronouns are selected to express disjoint reference more often (repeated participants in *Experiment 2*). Nevertheless, both populations exhibit ambiguity avoidance effects.

Although interesting, the results reported in this subsection are not statistically informative. However, this pattern is related to the assumption of syntactic competition based accounts of the Binding Theory (Safir, 2004, 2014; Rooryck and vanden Wyngaerd, 2011, a.o.) that the competition between pronouns and reflexive pronouns is at the level of their morphosemantic content.

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