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When Agreement Isn't Agreement: Deflected Agreement in Najdi Arabic as Aspect

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In modern Arabic varieties, subject-verb agreement is complicated by plural nouns which can occur with both plural and singular verbs. These have been called strict and deflected agreement respectively. In some varieties such as Modern Standard Arabic, this deflected agreement is fixed and determined by animacy or other features; however, in other varieties such as Najdi Arabic (central Saudi Arabia), whether strict or deflected agreement occurs is less predictable. Kramer & Winchester (2017) have argued that the selection of verb form corresponds to a difference in meaning, specifically, a herd/clump as opposed to an individuated interpretation, which they locate in the nominal features of the noun. However, based on the results of two experiments, this paper argues for an alternate analysis that this meaning difference originates on the verb and corresponds to a speaker's mental representation of the event structure. This finding leads to the conclusion that only strict agreement is actually an example of subject-verb agreement, while deflected agreement serves to mark features of the event. This usage of deflected agreement to express event structure, while initially surprising, flows from existing understandings of cognition of number and event semantics.

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1 Introduction

In Arabic,¹ all nouns have both number and gender features. There are two genders, masculine and feminine, and there are three numbers, singular, dual, and plural. In the Modern Standard Arabic (MSA) examples in (1), we can see that when a sentence contains a singular subject, the verb agrees with it (i.e., the verb has the same features that are on the subject noun).

- (1) a. **al-walid** ḏahab-a li-f-faariḥ.
 DEF-boy.M.SG went-M.SG down-DEF-street
 ‘The boy went down the street.’
- b. **al-bint** ḏahab-at li-f-faariḥ.
 DEF-girl.F.SG went-F.SG down-DEF-street
 ‘The girl went down the street.’
- c. **al-kalb** ḏahab-a li-f-faariḥ.
 DEF-dog.M.SG went-M.SG down-DEF-street
 ‘The dog went down the street.’

When human nouns are pluralized as in (2), we can see that the verbs still agree in number and gender with their nominal subject.

- (2) a. **al-ṭawlaad** ḏahab-uu li-f-faariḥ.
 DEF-boy.M.PL went-M.PL down-DEF-street
 ‘The boys went down the street.’
- b. **al-banaat** ḏahab-na li-f-faariḥ.
 DEF-girl.F.PL went-F.PL down-DEF-street
 ‘The girls went down the street.’

The examples given in (1) and (2) present a straightforward agreement relationship in which the verb always has the same number and gender features as the noun. However, nouns referring to non-humans do not necessarily follow this pattern of agreement. Based on the prescriptive rules of MSA, plural nouns that refer to non-humans always receive feminine singular agreement as in (3). This has been called deflected agreement (DAgr) by Ferguson (1989). In MSA, this pattern is robust as it is seen in all agreement environments.

- (3) **al-kilaab** ḏahab-at li-f-faariḥ.
 DEF-dog.M.PL went-F.SG down-DEF-street
 ‘The dogs went down the street.’

¹ In this paper, I will use the term *Arabic* when I am making reference to the family of related languages spoken in this region. Because the present study focuses on certain varieties, I will refer to these varieties by name. This naming convention extends to Modern Standard Arabic (MSA).

However, in some spoken Arabic dialects, the same plural nouns that refer to non-humans are able to receive plural agreement which matches the noun's gender as seen in (4). Ferguson (1989) has called this strict agreement (SAgr) because all of the features of the noun appear on the verb as in the examples in (2).

- (4) **al-kilaab** ḏahab-**uu** li-*f*-faariṡ.
DEF-dog.M.PL went-**M.PL** down-DEF-street
 'The dogs went down the street.'

According to Bettega (2019) and Kramer & Winchester (2017), SAgr and DAgr are both available for all nouns in certain Arabic varieties, such as Najdi Arabic, a variety spoken in central Saudi Arabia. In this paper, I explore the relationship between DAgr and SAgr and what may cause speakers to choose one over the other.

For a morphological relationship to be subject-verb agreement, the nominal features of the noun must determine the form of the verb.² Kramer & Winchester (2017) argue that the two patterns are agreement under this definition and represent a semantic difference. In particular, they argue that normally verbs in Arabic agree with all of the features of their noun as in (2) and (4). However, a herd/clump head intervenes in this normal agreement and provides feminine singular features for agreement in example (3), and this head produces a semantic difference. Namely, in sentences with DAgr, the plural subject has a herd/clump interpretation, meaning that speakers conceive of the nominal subject as a group. Under this interpretation, (3) can be glossed as "The herd of dogs went down the street," while (4) makes no such claims about group structure and is glossed as "The individual dogs went down the street." This situates the difference between DAgr and SAgr on agreement with the nominal features. Kramer & Winchester's proposal can be considered an agreement-based analysis because the features which affect the verb form originate in the noun phrase. However, if the information determining the verb form is located elsewhere, DAgr cannot be considered agreement.

In this paper, I present the results of two experiments and argue that the DAgr seen in (3) is not agreement and should be viewed as aspectual, at least for the Najdi Arabic dialect (NJA). In the first experiment, I test Kramer & Winchester's (2017) hypothesis. Their hypothesis can be broken into two parts: that nouns have herd/clump features and that these features determine the form of the verb. The second experiment tests the hypothesis that DAgr is determined by factors of event structure. I will argue that Kramer & Winchester (2017) are partially correct in that

² Fassi Fehri (1988; 1993; 2000) argues that what I call agreement is a case of an incorporated pronoun on the verb. This proposal is posited to account for the agreement asymmetry between SVO and VSO sentences in Arabic. While I acknowledge this account, I believe arguing against it is outside the scope of this paper. Unlike SAgr, which participates in this asymmetry, DAgr does not, so I will choose to leave this particular issue of agreement aside and refer you to the above works of Fassi Fehri as well as Benmamoun (2000), Ouhalla (1994), and Van Gelderen (1996).

Arabic speakers attend to information about group structure; however, in the first experiment, I do not find that this information affects the selection of DAgr or SAgr. In the second experiment, I explore an alternative hypothesis based on Krifka (1989) that the semantic distinction between SAgr and DAgr reflects event structure. I find that aspects of event structure predict the variation in verb form, suggesting that the variation relates to aspectual information. In this way, I suggest that while the verb form of DAgr looks like the agreement that originates on the noun as seen in (1b), the verb form used in (3) actually conveys aspectual information originating on the verb. Importantly, if the nominal features of the noun must determine the form of the verb in subject-verb agreement, then DAgr is not true agreement under this analysis because it is determined by aspectual information about the verb, namely pluractionality. SAgr, on the other hand, still functions as agreement.

2 The Semantics of Individuation

Given the claims in the literature about the meanings of SAgr and DAgr sentences, it is important to understand the semantics of number and individuation. In this section, I introduce the ideas of number and individuation I use in this paper. Individuation offers a link between the nominal domain and the verbal domain. I also introduce the relationship between individuation and verbal aspect proposed by Krifka (1989). Krifka's proposal will serve to take individuation pertaining to eventualities and extend it to the noun, resulting in interpretations of nominal non-individuation. Along the way, I discuss the treatment of number in semantic theory.

2.1 Semantic notions of number

Starting with Link (1983), work on the semantics of plurality has been dominated by the idea that individuals form a complete join semi-lattice structure. These lattices combine individual entities into sums which can then be predicated upon. Predicates are able to apply to the summation of individual entities as well as to parts of greater wholes. Link provided the mechanisms for probing into these lattices, and he posited sum operations to combine individuals into sums. The plural groups can be ordered into sets or subsets in the lattice.

The mass/count distinction (MCD) refers to the properties and referents of certain nouns and their relationship with the morphological forms available for the noun. Mass nouns (e.g., English *water*, *tea*, or *stone*) are generally unable to be pluralized and refer to substances in English. Meanwhile, count nouns (e.g., *dogs*, *humans*, and *cards*) are able to be pluralized and generally refer to entities that contain atoms. Applying lattices to the distinction between mass and count nouns has also proven fruitful. Link (1983) suggests that the difference between mass nouns and countable plural nouns has to do with the presence of atoms in the lattices of plural count nouns. This has been expanded on in the works of Krifka (1989, 1992). The main properties relevant here are cumulativity and quantization.

Following Krifka (1989), a predicate is cumulative if and only if, whenever the predicate applies to two entities x and y , the predicate applies to the join of those entities (i.e., the set that contains both of the entities). Conversely, a predicate is quantized if and only if for any two entities x and y , if the predicate applies to x and to y , then y cannot be a part of x . Another relevant property is divisivity. A predicate is divisive if and only if, when the predicate applies to any entity, the predicate also applies to any part of that entity. **Table 1** displays how these properties relate to different types of nouns.

	Quantized	Cumulative	Divisive
Singular Count	✓		
Plural Count		✓	
Mass Noun		✓	✓

Table 1: Application of Krifka’s (1989) Properties to Types of Nouns.

For example, a mass noun like *water* has cumulative reference because if you have two separate cups of water, they are still water when one pours them into a bowl together. However, *water* is divisive and not quantized because if you take some water from the bowl, the part that is taken away is still water. In other words, any entity to which the predicate *water* applies contains a part to which the predicate also applies, and thus, *water* is not quantized. Conversely, a count noun like *cat* is quantized because the cat’s paw is no longer a cat; further, the singular count noun is not cumulative because when you put cat a and cat b together, their join does not fall into the extension of the predicate *cat*. Instead, count nouns must use plural forms to refer to the join of entities. The plural version of count nouns, like *cats*, is not quantized because for any entity x such that the predicate *cats* applies to x , then there is a y such that y is a part of x and *cats* does not apply to y . In this example, the y would be any atom of *cats* (i.e., a cat). However, the plural is not divisive because there does exist a part of the set of cats that is no longer the plural noun *cats* but is instead a singular *cat*. Looking at **Table 1**, we can see that no quantized noun is divisive as the two properties are logically incompatible. Quantization relates to semantic singularity. Conversely, divisivity and cumulativity relate to properties of semantic plurality. These properties are important to how scholars have understood the semantic differences between mass and count nouns. Individuation is related to the property of divisivity that underpins the distinction between mass nouns and plural count nouns. Grimm defines individuation as the “propensity of an entity to be construed as an independent individual” (2018: 528).

2.2 Individuation and Aspect

Moving on from nouns, Krifka (1989, 1992) also proposed a relationship between the MCD and verbal aspect. Scholars have noted the similarity between the distinction between mass and

count on one hand and the distinction between atelicity and telicity on the other. Telic verbs are those which refer to events that are conceived of as being finite and have clear endpoints, while atelic verbs refer to events that are conceived of as nonfinite. Krifka (1989) provides a framework for unifying these two phenomena. He uses the properties of quantization, divisivity, and cumulativity to characterize nominal reference and temporal reference. In order to do this, he also relies on measure functions, which map entities to numbers. Following Davidson (1967), Krifka assumes that events are entities which are ordered in lattices similar to those of objects. With events structured in the same way as objects, Krifka can extend the properties which apply to predicates over individuals to predicates over events. In this way, telic predicates are quantized event predicates, while atelic predicates can be understood as cumulative event predicates.

For example, an event described by a telic predicate like *the cat slept* is quantized because if we have two events for which that sentence were true, then the events must be separate. In this example, we know that for the telic predicate to be true, the whole act of sleeping must be completed, and thus the cat must have awoken. Therefore, if two events are described using the same telic predicate, they require the cat to be awake at some point between them. Conversely, if we were to describe two events using an atelic predicate, *the cat was sleeping*, the join of the events can also be described by the same predicate. If someone walks out of a room and affirms that the cat is sleeping, and then an hour later, someone else affirms the same thing, there is no requirement for the cat to be awake between them. Further, atelic predicates can be shown to be divisive; if a cat was sleeping for an hour, we know that for any subdivision of that time, such as for thirty minutes, the cat was also sleeping.

However, Krifka (1989: 91–92) noted another relationship between aspectual semantics and nominal semantics. Through thematic relationships, the properties of nominal reference can affect temporal reference; see Krifka's (1989) examples reproduced in (5).

- (5) a. drank wine
b. drank a glass of wine

Both of these descriptions can be used to refer to the same event of drinking the same wine; however, in (5a), *wine* is a cumulative predicate meaning that the sum of two quantities of wine is still wine. This cumulativity is transferred to the event predicate *drank wine*, which can refer to both the act of drinking the whole glass of wine and any event of drinking part of the glass of wine. Thus, *drank wine* is atelic. Conversely, *a glass of wine* is quantized, as no proper part of a glass of wine is still a glass of wine. Similarly, the quantization is transferred to the event predicate *drank a glass of wine* because it cannot be the case that drinking part of a glass of wine is an event of drinking a glass of wine.

In order to capture these meanings, Krifka proposes a series of properties which connect two-place relations with the properties of single-place predicates. Notably, he proposes summativity

as the corollary of cumulativity for two-placed relations. He also defines properties of relations in order to specify things such as the uniqueness of events and the uniqueness of objects, which are the properties which map part of the event to part of the object and vice versa. With these tools, he is able to prove the relationship between the properties of the entity and the properties of the event.

Krifka's (1989) proposal looks at why the nominal affects event interpretation; however, given the way Krifka sets up this system, there is no reason that the event's interpretation should not be able to affect the interpretation of the noun, should it be ambiguous. Borer (2005) provides a Czech example where this is the case (6).

- (6) a. Petr **na**-pekl housky.
 Petr NA-bake roll.PL.ACC
 'Peter baked a lot of rolls/a batch of rolls.'
- b. Petr **u**-pekl housky.
 Petr U-bake.3.SG roll.PL.ACC
 'Peter baked all of the rolls.'

In (6a), Borer claims that the prefix *na*- assigns telicity to the verb. In doing this, it provides a quantity to the nominal interpretation. Contrast this with (6b), in which the prefix *u*- also provides a telicity value to the verbal phrase but affects nominal interpretation differently.

2.3 Individuation and Arabic

Returning to Arabic agreement, DAgr and SAgr provide different meanings to the sentence. However, the exact semantic contribution is not known. The semantic relationship between verbal aspect and nominal individuation suggests two places that could cause the difference in meaning found under DAgr. The first option is that DAgr is determined by nominal features. Under this interpretation, any aspect-like effects arise as a consequence of the specification of properties of the nominal predicate, and the subject of a sentence with DAgr would carry some covert "collective" feature triggering the agreement. Returning to the example of dogs walking down the street, the noun *kilaab*, 'dogs,' would carry a feature representing that it is non-individuated (i.e., it is a cumulative predicate). This non-individuation feature would then trigger agreement like any number. This option is closest to Kramer & Winchester's (2017) proposal.

The second option is that DAgr is based on aspectual factors and that the aspect affects the interpretation of the noun. In this case, DAgr would function more like aspectual marking than traditional subject-verb agreement. If the event *raah-at*, 'walk,' is a cumulative event predicate, then cumulativity can be transferred to the nominal predicate, *kilaab*, parallel to what Borer (2005) suggests for Czech.

I argue that Kramer & Winchester's (2017) herd/clump interpretation has a cumulative interpretation. Kramer & Winchester provide the following Hijazi examples³ to explain the meaning of herd/clump interpretation.

- (7) a. ʔal-falaafil ʔanħarag-at ʕala ʔal-kaanuun .
 DEF-falafel.PL burned-F.SG on DEF-stove
 'The falafel burned on the stove.'
- b. ʔal-falaafil ʔanħarag-uu ʕala ʔal-kaanuun .
 DEF-falafel.PL burned-PL on DEF-stove
 'The falafel burned on the stove.'

The example in (7a) uses DAgr, while (7b) uses SAgr. According to Kramer & Winchester, if there was only one pan of falafel, speakers preferred to use DAgr. If there are three pans of falafel which burned, then speakers preferred to use SAgr as in (7b), if it was intended that all of the pans of falafel were burned. Following these descriptions, if we have an event with herd/clump interpretation as is described in (7a), subsets of that event could still be considered *al-falaafil ʔanħarag-at*. Using Krifka's criteria, this would mean that herd/clump interpretation is cumulative because *al-falaafil ʔanħarag-at* can refer to both all falafels burning and subsets of that event just like *drink wine*. Conversely, the event without herd/clump interpretation described in (7b) seems to be non-quantized because a subset of the event cannot necessarily be referred to as *al-falaafil ʔanħarag-uu*.

Kramer & Winchester (2017) situate a herd/clump head beneath the DP but above a numP. While this head may carry a singular feature, Kramer & Winchester only require that the head carry a feminine feature because the number features can arise from defaulting since the singular is the default, unlike the feminine feature. This head carries a non-human feature that selects a plural noun and, in turn, stops non-human nouns from participating in plural agreement. Crucially, this proposal focuses on the noun as the locus of DAgr. To put it another way, Kramer & Winchester argue that the features of the noun cause the difference in the agreement morphology on the verb.⁴

Fassi Fehri (2018) provides an analysis of the distribution of nominal morphology in Arabic which captures the herd/clump interpretation. Under his analysis, Arabic's number system

³ Kramer & Winchester (2017) gloss *falaafil* as 'peppers' which highlights that *falaafil* is the plural of *filfil* 'pepper.' However, as a reviewer correctly points out, falafel is what is being discussed in these examples. I have modified the gloss to reflect this.

⁴ Dali & Mathieu (2020) have argued for a proposal in Tunisian Arabic by which broken (non-concatenative) plurals have feminine singular syntactic features. They argue that SAgr is actually the anomalous form of agreement but that it can be understood as agreement with semantic features of the noun. They argue that the feminine feature is associated with a group number feature. Thus, while they situate the DAgr features on the noun and not on a head, their proposal makes similar predictions to Kramer & Winchester (2017).

exists as a conflation of the syntactic features of atomicity and unicity. Kramer & Winchester's (2017) herd/clump head is similar to the unicity feature Fassi Fehri (2018) proposes in the nominal domain. However, Fassi Fehri provides environments that cause these features to change, namely counting environments. When counting in many Arabic varieties, including Najdi Arabic, a morphological change occurs in the noun from low numbers to high numbers. If the number is lower than ten, the plural form of the noun is used; however, above ten, the noun appears in its singular form. Fassi Fehri claims that this change in noun form represents a change in the noun's atomicity and unicity features. The concepts of both herd/clump and unicity refer to the representation of an entity as a single unit, and Kramer & Winchester show that in Saudi Arabic,⁵ this semantic information licenses different morphological forms of agreement. I will use non-individuation to describe both unicity and the herd/clump interpretation.

The historical development of Arabic also provides reasons to think that nominal features like non-individuation might determine DAgr. Bettega (2019) and Bettega & D'Anna (2022) have argued that gender agreement was affected by nominal individuation in earlier forms of Arabic. Under these analyses, when the noun was non-individuated, feminine agreement was more likely. Bettega (2019) claims that as modern Arabic dialects began losing feminine plural verb forms, dialects differed in how they handled individuation. Some varieties shifted the verbal marking of individuation to DAgr. Others lost individuation as a feature, merging it with the newly merged common plural.⁶

Both the nominal proposal and my verbal proposal result in the noun being interpreted collectively; however, they differ in where this information originates. The first option relies on the noun being collective covertly, and DAgr would agree with this covert feature. In the second option, DAgr limits aspectual reference, and this aspectual reference imposes a collective interpretation on the nominal argument.

3 Number Information Does Not Affect Deflected Agreement

This experiment tests the hypothesis that the connection between individuation in nouns and in verbs relates to the number of entities being discussed. In other words, this experiment

⁵ Kramer & Winchester use Saudi Arabic to refer to the macrodialect of Saudi Arabia, including Najdi Arabic, Hijazi Arabic, and Gulf Arabic.

⁶ NJA seems to be of the first type. However, this description simplifies the linguistic landscape of Arabic. Arabic varieties are complicated. For instance, some varieties have all four possible number and gender combinations for the verb, while other varieties collapse the paradigm in different ways. We know that Arabic speakers have access to multiple varieties, including MSA. DAgr could have been borrowed and reanalyzed from MSA into modern varieties, or its use could have diverged over time. While MSA only uses DAgr with non-humans, some modern varieties like NJA use DAgr with all nouns. The actual use of Arabic agreement systems in modern varieties is not well studied, but I think it is very interesting for future study.

is designed to test whether DAgr is related to the number morphology present on the noun, either matching a non-individuative feature or a particular subset of plural features. Nominal features change in counting environments, resulting in different noun forms (Fassi Fehri 2018). The plural form is used with numbers below ten, and the singular is used with numbers above ten. I believe that this morphological change is related to general cognitive principles of how people conceive of groups. A phenomenon called subitizing is well established in psychological literature, which refers to the repeated finding that at low numbers, people can make rapid and accurate judgments of numbers of entities (Kaufman et al. 1949; Mandler & Shebo 1982; Trick & Pylyshyn 1994; Revkin et al. 2008; Piazza et al. 2011). Further, Treisman (2006) argues that individual, object file representations are created for these entities. However, as the number increases, speakers are likely to stop tracking number and create a single ensemble representation. Applying this idea to the counting environment, I argue that speakers mark object file representations of small groups with plural morphology. In contrast, ensemble files are not overtly marked, appearing in the singular form. I will claim that object file representations underlie nominal individuation. Conversely, ensemble representations in the mental representation underlie non-individuation, which I connect to Kramer & Winchester's (2017) herd/clump interpretation. Therefore, DAgr should appear in environments with more than 10 actors because speakers create ensemble representations of the group. The first experiment aims to connect these ideas about subitization and the morphological change seen in counting environments to the use of DAgr.

In particular, this experiment compares participants' morphological choices when shown plural count nouns outside of a counting environment and pictures which differed in the number of actors. Outside of the counting environment, only plural morphology is used for count nouns that have a plural referent. Though only plural morphology appears here, the nominal individuation effects, observed both in counting environments in Arabic and more widely in the psychological literature, are still at work. Suppose DAgr originates on the noun as suggested by Kramer & Winchester. In that case, we expect that participants would select DAgr more when they are shown more than ten actors because speakers have created a non-individuated ensemble representation of the actors. On the other hand, when participants are shown fewer than ten actors, they would be more likely to create an individuated, object file representation of them and would prefer SAgr.

Remember that for a morphological relationship to be subject-verb agreement, the features of the noun must determine the form of the verb. If DAgr stems from agreement with non-individuated features on nouns, then we would expect that DAgr and nominal non-individuation would arise in the same environments. Fassi Fehri (2018) argues that non-individuative features appear on the noun when the actual number of entities is above ten; thus, I hypothesize that the actual number of actors would affect the selection between DAgr and SAgr.

3.1 Participants

Twenty-nine Najdi Arabic-speaking participants were recruited online through personal connections and advertisements on social networking sites, such as Reddit, Twitter, and WhatsApp. All participants were prescreened for dialect before beginning the experiment. All of the participants came from Saudi Arabia; however, in the demographic survey, participants provided more information on their location. Participants came from across the Najd,⁷ and using this information, I categorized participants into groups based on the sub-dialects reported in Ingham (1994).

Table 2 shows the number of participants in the final analysis. Participants are shown divided into three dialect groups based on the location of their upbringing and Ingham's (1994) classification of Najdi dialect areas. My participants came from three dialect areas identified by Ingham: Central Najdi, Northern Najdi, and Mixed Northern-Central. Central Najdi speakers are the most represented population ($n = 18$), with participants coming mainly from Riyadh and surrounding areas. Mixed Northern-Central speakers ($n = 8$) came from Qasiim. The Northern Najdi speakers ($n = 2$) came from Hail. An additional participant did not provide any location information. Riyadh is the most populous area of the Najd today, so the dialect spoken there is well represented.

	Male	Female	Not Provided	Total
Central Najdi	4	13	1	18
Mixed Northern-Central	2	6	0	8
Northern Najdi	2	0	0	2
Unknown	0	1	0	1
Total	8	20	1	29

Table 2: Number of Participants in Experiment 1 by Sub-Dialect and Gender.

3.2 Methods

In this experiment, participants were shown pictures of scenes online via Qualtrics, and they were asked to select a sentence that best described the picture, as shown in the example in **Figure 1**. There were 16 scenes constructed from four animals (dog, cat, camel, and goat) and four non-distributive actions (gather, cluster, share, and meet). The nouns used were all broken plurals, meaning they are formed with non-concatenative morphology. Non-distributive actions

⁷ The Najd is a region of central Saudi Arabia, and approximately one-third of the Saudi population lives in the region, mainly in Riyadh. The area has historically been home to a mix of sedentary populations and nomadic Bedouins. Because of the migratory nature of the Bedouins, the dialect of the region extends up into Jordan.

were chosen for this experiment to ensure that there was not an effect of event structure in this experiment. Participants selected from three forms of the same sentence which only differed in the gender/number morpheme found on the verb: feminine singular, feminine plural, and masculine plural, as exemplified by (8) which were given with the images from **Figure 1**.

- (8) a. al-kilaab iḍtamaʕ-uu fii al-mutanazzah.
 DEF-dog.M.PL gather-M.PL in DEF-park
 ‘The dogs gathered in the park.’
- b. al-kilaab iḍtamaʕ-at fii al-mutanazzah.
 DEF-dog.M.PL gather-F.SG in DEF-park
 ‘The dogs gathered in the park.’
- c. al-kilaab iḍtamaʕ-na fii al-mutanazzah.
 DEF-dog.M.PL gather-F.PL in DEF-park
 ‘The dogs gathered in the park.’

	
<p>تُظهر هذه الصورة:</p>	<p>تُظهر هذه الصورة:</p>
<p>الكلاب اجتمعوا في المتنزه.</p>	<p>الكلاب اجتمعوا في المتنزه.</p>
<p>الكلاب اجتمعن في المتنزه.</p>	<p>الكلاب اجتمعن في المتنزه.</p>
<p>الكلاب اجتمعت في المتنزه.</p>	<p>الكلاب اجتمعت في المتنزه.</p>

Figure 1: Examples of questions from Experiment 1. These examples show a group of dogs gathering in a park, and participants are asked to select between three sentences which differ in the inflection (masculine plural; feminine singular; and feminine plural) on *iḍtamaʕa* ‘gather’

The sentences were presented using standard Arabic orthography, which could bias speakers to think in terms of MSA; however, only the feminine singular form is expected if speakers truly switch into MSA. Initially, the experiment was designed without the feminine plural to more closely match Kramer & Winchester (2017); however, during a preliminary trial of this experiment, I was informed that there were environments in which participants preferred the feminine plural. Therefore, I added this form to have a more complete picture of the agreement system.

The participants always saw a picture which matched the sentences in the question. Every animal was shown performing every action for 16 scenes, and each picture had two actor conditions which determined the number of animals in the picture (5 actors or 25 actors). Therefore, there were 32 total pictures. The motivation for the actor conditions comes from Kramer & Winchester (2017), who propose that a herd/clump head is triggering DAgr. If we believe that this head marks the nominal argument as a cumulative ensemble in the mental representation, we can follow Treisman (2006) suggesting that ensembles are created at higher numbers. The exact numbers were selected based on Fassi Fehri's (2018) claims about unicity features on the noun. Since he argues that unicity changes at ten, 5 was selected as below that threshold, and 25 was selected as clearly above it.

Participants were divided into two lists, with 17 participants in List A and 12 participants in List B. Both lists were shown all of the scenes ($n = 16$), but each list had only one of the actor conditions for each scene. Within each list, items were presented in a pseudo-random order. After the main experiment, participants were asked to complete a demographic survey.

3.3 Results

I analyzed this data using a logistic mixed-effect regression model (Quené & van den Bergh 2008); however, since this is not binomial data, I had to create two models to interpret the data using a hierarchical comparison. The first model predicted the gender of the verb (masculine vs. feminine) with fixed effects of number of actors, nominal gender, and their interaction. **Figure 2** shows the data analyzed in this model. The model further included random intercepts for both participants and noun and a random slope for condition on participant.⁸ The maximal random effect structure was attempted, but due to the lack of convergence, random slopes and intercepts were removed from the model by removing the lowest variance (Barr et al. 2013). Both categorical variables (number of actors and nominal gender) were dummy coded. The intercept reflects the reference levels of the number of actors, 25, and the nominal gender, feminine. Significance for

⁸ The random intercept for the noun allows the model to vary slightly depending on the animal used in the picture. This random intercept allows for participants to treat the nouns differently when selecting the verbal form. The animals shown did affect the selection of verb form but mainly in that the gender of the noun referring to the animal affects the selection of verbal gender.

simple effects and interactions were then calculated through log-likelihood comparisons. **Table 3** provides a summary of the final model's outcome.

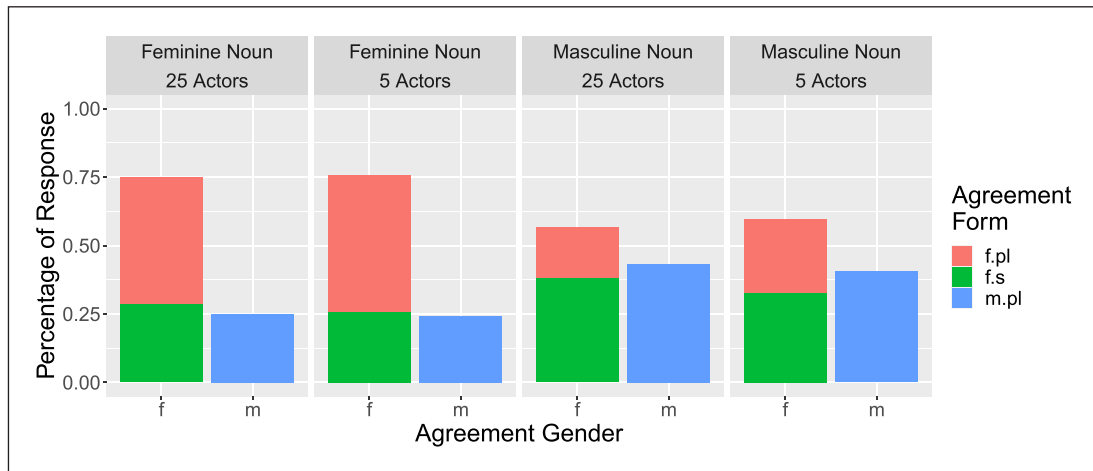


Figure 2: The percentage of responses for both nominal genders and experimental conditions separated by gender

	Estimate	z-value	p	$\chi^2(df)$	p
Intercept	-2.037	-3.049	0.002	—	—
Number of Actors	-0.323	-0.659	n.s.	0.793 (1)	n.s.
Nominal Gender	1.478	2.338	0.019	3.8542 (1)	0.049
# of Actors x Nom. Gender	0.030	0.053	n.s.	0.003 (1)	n.s.

Table 3: The output of the model predicting gender of the gender/number morpheme with results from the significant log-likelihood comparisons.

The model found a significant simple effect of nominal gender, suggesting that participants chose the verbal gender based on the gender of the noun. A significant simple effect of intercept suggests that speakers chose feminine forms more than masculine forms; however, this is unsurprising as there are two feminine options as opposed to one masculine option. The number of actors was not found to be significant in this model.

The second model only looked at the data for which participants selected a feminine form (i.e., when participants selected feminine singular or feminine plural forms). **Figure 3** shows the data analyzed in this model. It predicted the grammatical number of the verb (singular vs. plural) with fixed effects of number of actors, nominal gender, and their interaction. The model further included random intercepts for both participants and verbs and a random slope for nominal gender on participant. The maximal random effect structure was attempted, but due to the lack

of convergence, random slopes and intercepts were removed from the model by removing the lowest variance. Both categorical variables (number of actors and nominal gender) were dummy coded. The intercept reflects the reference levels of the number of actors, 25, and the nominal gender, feminine. Significance for simple effects and interactions were then calculated through log-likelihood comparisons. **Table 4** provides a summary of the final model's outcome.

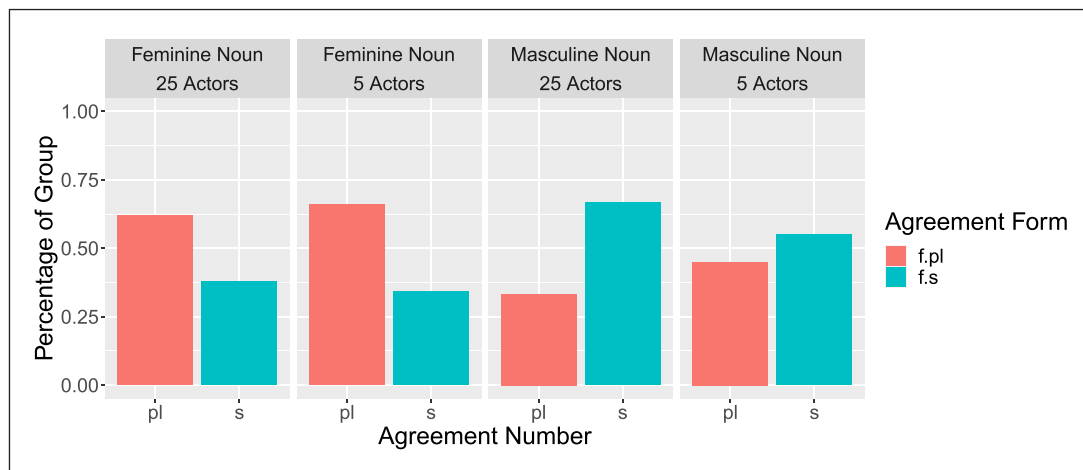


Figure 3: The percentage of feminine responses for both nominal genders and experimental conditions separated by grammatical number.

	Estimate	z-value	p	$\chi^2(df)$	p
Intercept	-0.502	-1.107	n.s.	—	—
Number of Actors	-0.306	-0.755	n.s.	3.734 (1)	n.s. 0.053
Nominal Gender	2.535	3.790	< 0.001	18.826 (1)	< 0.001
# of Actors x Nom. Gender	-0.802	-1.194	n.s.	1.456 (1)	n.s.

Table 4: The output of the model predicting number of the gender/number morpheme within the feminine responses with results from the significant log-likelihood comparisons.

The second model found a significant simple effect of nominal gender, suggesting that when participants selected a feminine verb form, they selected verb number based on the gender of the noun, with masculine nouns being more likely to take a feminine singular verb. This model did not have a significant intercept, suggesting that participants were not more likely to select the singular or plural form for feminine nouns. The number of actors was still not found to be significant in this model.

3.4 Discussion

In this experiment, participants selected the gender of the verb based on nominal gender. Participants were relatively more likely to pick the verb conjugated for masculine plural when presented with a masculine noun. Breaking apart the feminine verb forms into singular and plural, masculine nouns also drove participants to select feminine singular verbs over feminine plural ones.

Remember that Kramer & Winchester propose that their herd/clump head exists between the noun and the verb preventing agreement between the two. Crucially, the authors propose this positioning because “it is well-established that the highest-gender feature determines the gender feature of the whole *nP*” (2017, pg. 49). If this were the case, we would expect that the features of the noun (nominal number and nominal gender) would have no effect on the selection of the verbal number. Instead, the number condition would predict the verbal number. Again, this was not found; in fact, I find that nominal gender is accessed by speakers when selecting agreement. This finding raises the question of why nominal gender is affecting verbal number. I take this to be evidence that feminine plural agreement is dispreferred for masculine nouns. This awareness of nominal gender is a problem for Kramer & Winchester’s head because this head intercepts nominal features and blocks the gender feature of the noun.⁹

These results suggest that nominal gender is central to speakers’ selections of verb form. However, these results do not suggest a cause for the DAgr. In the following experiment, I approach the question of individuation in verbs from an aspectual direction. In experiment 2, I ask if the number of events being discussed can predict DAgr.

4 Event Structure Affects Deflected Agreement

Remember that there are two possibilities for the cause of DAgr. One of the possibilities is that DAgr originates on the noun and is agreement. If the non-individuative features described by both Kramer & Winchester (2017) and Fassi Fehri (2018) are the same and DAgr is subject-verb agreement as described, then we would expect that DAgr would emerge in the presence of this feature. Experiment 1 did not find this. If the semantics associated with DAgr do not originate on the noun, a question remains about where it originates. Following Krifka (1989) and Borer (2005), aspectual information can affect the representation of groups. Therefore, verbal information may be providing the semantic material. In this experiment, I explore the domain of events in order to see if the semantic information encoded by DAgr relates to aspectual information on the verb.

⁹ This finding also poses problems for Dali & Mathieu (2020). Under their approach, the gender features on these broken plural nouns should only be female, but masculine nouns do seem to be treated differently.

4.1 Participants

Twenty-five Najdi Arabic-speaking participants were recruited for an online experiment through personal connections and advertisements on social networking sites, such as Reddit, Twitter, and WhatsApp. All participants were prescreened to ensure that they were Najdi speakers before beginning the experiment. All of the participants came from Saudi Arabia; however, in the demographic survey, participants provided more information on the speakers' location. Participants came from across the Najd, and using this information, we can place participants into groups based on the sub-dialects reported in Ingham (1994). No participant who participated in Experiment 1 also participated in Experiment 2.

Table 5 shows the number of participants in the final analysis. Participants are shown divided into three dialect groups based on the location of their upbringing and Ingham's (1994) subdialect groups. As in Experiment 1, participants came from three of the four dialect areas identified by Ingham: Central Najdi, Northern Najdi, and Mixed Northern-Central. Central Najdi speakers are the most represented population ($n = 14$), with participants coming mainly from Riyadh and surrounding areas. Mixed Northern-Central speakers ($n = 8$) came from Qasiim. The Northern Najdi speaker ($n = 1$) came from Hail. Two participants did not provide any location information. As with Experiment 1, given the population distribution in the Najd, the prevalence of Central Najdi speakers is expected.

	Male	Female	Not Provided	Total
Central Najdi	3	9	2	14
Mixed Northern-Central	2	5	1	8
Northern Najdi	1	0	0	1
Unknown	0	1	1	2
Total	6	15	4	25

Table 5: Number of Participants in Experiment 2 by Sub-Dialect and Gender.

4.2 Methods

In Experiment 2, participants were again shown pictures of scenes and were asked to select a sentence that best described the picture; see the example in **Figure 4**. There were 16 scenes constructed from four animals (dog, cat, camel, and goat) and four distributive actions (walk, eat, beg, and chase). The nouns used were all broken plurals. Distributive verbs were chosen for this experiment so that I could control the event structure in this experiment. As in Experiment 1, participants selected from three forms of the same sentence which only differed in the gender/number morpheme found on the verb: feminine singular, feminine plural, and masculine plural. The subject noun was always in the plural form.



Figure 4 Example of a question from Experiment 2. The example on the left shows a group of five dogs walking, while the example on the right shows five images of a single dog walking. Participants are asked to select between three sentences which differ in the inflection (masculine plural, feminine singular, and feminine plural) on *saara*, ‘go’

In Experiment 2, scenes were again made using each of the animals and each of the actions, yielding 16 scenes. However, in this experiment, the number of actors was held constant at five. Instead, pictures varied in how the event was depicted. Either participants saw a single picture with five of the same type of animal doing the action (single event), or they saw five separate pictures each with the same animal doing the action (multiple events). Therefore, there were 32 total stimuli. The five separate pictures were intended to represent spatiotemporal separation. The participants always saw a picture matching the sentences they were presented in the question.

Participants were divided into two lists, with 12 participants in List A and 13 participants in List B. Both lists were shown all of the scenes ($n = 16$), but each list only saw one of the event conditions for each scene. Within each list, items were presented in a pseudo-random order. After the main experiment, participants were asked to complete a demographic survey.

4.3 Results

I analyzed the data from Experiment 2 using a logistic mixed-effect regression model (Quené & van den Bergh 2008), using the same hierarchical comparison used in Experiment 1. The first

model predicted the gender of the verb (masculine vs. feminine) with fixed effects of number of events, nominal gender, and their interaction. **Figure 5** shows the data analyzed in this model. The model further included random intercepts for both participants and noun and a random slope for nominal gender on participant. The maximal random effect structure was attempted, but due to the lack of convergence, random slopes and intercepts were removed from the model by removing the lowest variance (Barr et al. 2013). Both categorical variables (number of events and nominal gender) were dummy coded. The intercept reflects the reference levels of the number of events, multiple, and the nominal gender, feminine. Significance for simple effects and interactions were then calculated through log-likelihood comparisons. **Table 6** provides a summary of the final model's outcome.

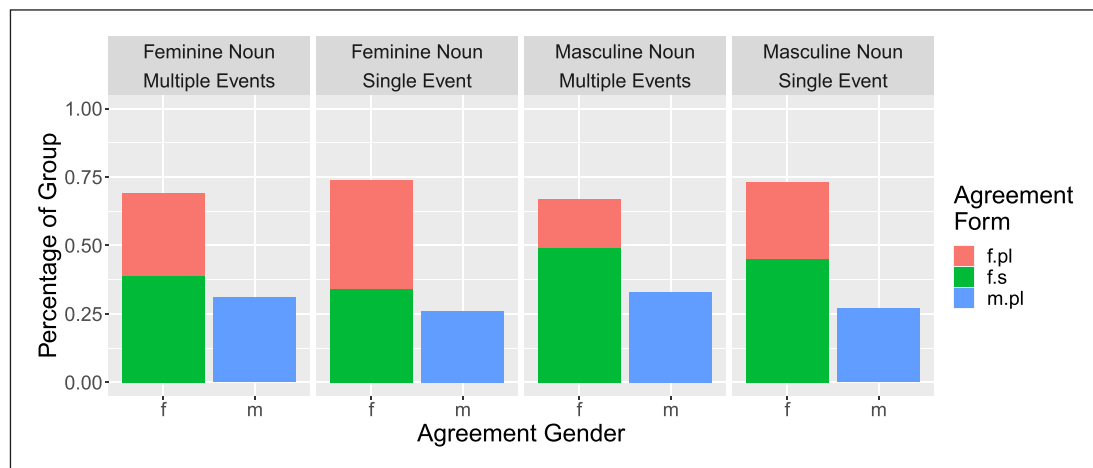


Figure 5: The percentage of responses for both nominal genders and experimental conditions separated by gender.

	Estimate	z-value	p	$\chi^2(df)$	p
Intercept	-1.438	-2.122	0.034	—	—
Number of Events	-0.395	-1.015	n.s.	2.310 (1)	n.s.
Nominal Gender	0.240	0.323	n.s.	0.093 (1)	n.s.
# of Events x Nom. Gender	-0.048	-0.089	n.s.	0.008 (1)	n.s.

Table 6: The output of the model predicting gender of the gender/number morpheme with results from the significant log-likelihood comparisons.

The model found no significant simple effects. A significant simple effect of intercept suggests that speakers chose feminine forms more than masculine forms; however, this is unsurprising as there are two feminine options as opposed to one masculine option. The number of events was not found to be significant in this model.

As with Experiment 1, the second model only looked at responses in which participants selected a sentence with a feminine form. **Figure 6** shows the data analyzed in this model. It predicted the grammatical number of the verb (singular vs. plural) with fixed effects of number of events, nominal gender, and their interaction. The model further included random intercepts for participants. **Table 7** provides a summary of the final model's outcome.

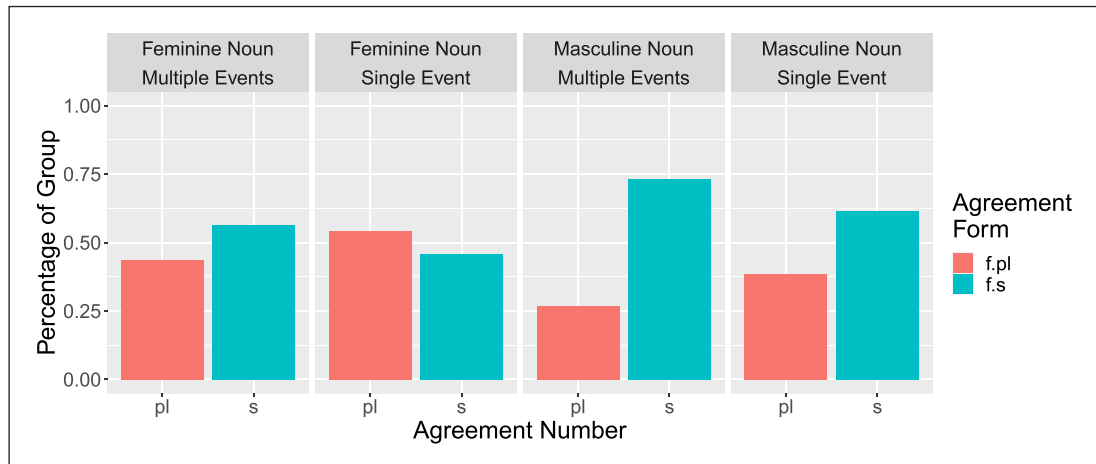


Figure 6: The percentage of feminine responses for both nominal genders and experimental conditions separated by grammatical number

	Estimate	z-value	p	$\chi^2(df)$	p
Intercept	0.7746	1.531	n.s.	—	—
Number of Events	-0.731	-1.753	n.s.	6.214 (1)	0.013
Nominal Gender	1.091	2.460	0.014	12.035 (1)	<0.001
# of Event x Nom. Gender	-0.061	-0.102	n.s.	0.010 (1)	n.s.

Table 7: The output of the model predicting number of the gender/number morpheme within the feminine responses with results from the significant log-likelihood comparisons.

The second model found a significant simple effect of nominal gender, suggesting that when participants selected a feminine form, they selected number on the verb based on the gender of the noun, with masculine nouns being more likely to take a feminine singular verb. A significant simple effect of the number of events was also found, by which participants used the feminine singular more in the multiple event condition than in the singular event condition. This model did not have a significant intercept, suggesting that for feminine nouns, participants were not more likely to select the singular or plural form of the verb.

4.4 Discussion

In Experiment 2, the results suggest that there is no significant predictor of the gender of the verb. This finding is in direct contrast with the findings of Experiment 1. However, Experiment 2 replicated Experiment 1's effect of nominal gender on verb form. Participants are still more likely to select a feminine singular verb when shown masculine nouns, suggesting that this nominal gender effect on verbal number is reliable. Speakers do not want to use a feminine plural verb with a masculine noun. Given the response options that were available, it makes sense that, when looking solely at the responses with feminine verbs, masculine nouns would be used with the feminine singular form because there was not a symmetric masculine singular form. Feminine plural verbs in Najdi require a feminine noun, while feminine singular verbs do not have a similar constraint.¹⁰

Importantly, despite the effect of nominal gender on the selection of number within feminine verbs, the model found an additional effect of the number of events the participants saw. When participants saw a single depiction of an event, they were more likely to select a feminine plural verb. Taken with the last analysis, this preference suggests that DAgr is not a shift in gender features as required by Kramer & Winchester (2017) but rather a shift in number features. Here, we find that the semantic facts of event structure predict the grammatical number of the verb.

One problem with the design of this experiment is that the multiple event condition contained five of the same image repeated. It has been pointed out that this condition could be construed as five images of the same event. If participants did have this interpretation of the images, then their selection of the feminine singular could be seen as them selecting a singular form for a singular entity. However, two factors of the design also need to be considered here. First, participants were given sentences with plural subjects. While this cannot prevent participants from interpreting the image as a single event with a single actor, it ideally primed them to create a representation with multiple actors. Secondly, the nouns used to create the sentences were balanced for nominal gender. While plural agreement is complicated in Arabic, singular agreement is more straightforward, and plural agreement is never licit. If this interpretation were common, we would expect a great majority of participants to select the feminine singular verb with feminine nouns, which was not seen. A similar approach cannot be taken with the masculine nouns since the masculine singular verb was not provided.

One question raised in this experiment's results is why verbal gender is no longer predictable. Experiment 1 was able to predict it, while Experiment 2 was not. In the following section, I discuss an analysis of subsets of Experiment 1 and 2's data which are directly comparable to determine if other factors are driving the loss of the effect of nominal gender.

¹⁰ Arabic dialects are complicated. For instance, some dialects retain all possible number and gender combinations, while others collapse the distinction in various ways. The presence of feminine plural agreement with masculine nouns is not well investigated here, nor is it an expected agreement choice; however, I think it is fascinating for future investigation.

5 Further Support that Deflected Agreement is Verbal

Experiments 1 and 2 were designed so that they could be directly compared. In particular, both experiments showed participants an image of five animals doing an action. However, the experiments used actions which differed in the lexical semantics of their corresponding verb. Experiment 1 used non-distributive actions (gather, cluster, share, and meet), while Experiment 2 used actions that allow for distributive interpretations (walk, eat, beg, and chase). Therefore, it is possible to create a data set which looks at the verbs' lexical semantics by including the five actor condition from Experiment 1 and the single event condition from Experiment 2. This analysis aims to determine if these semantic differences affect participants' selections of verb form.

5.1 Results

I analyzed this data set in the same way I analyzed the data from Experiments 1 and 2 using a logistic mixed-effect regression model and a hierarchical comparison. The first model predicted the gender of the verb (masculine vs. feminine) with fixed effects of lexical semantics (distributive vs. non-distributive), nominal gender, and their interaction. **Figure 7** shows the data analyzed in this model. The model further included random intercepts for participant and noun. The maximal random effect structure was attempted, but due to the lack of convergence, random slopes and intercepts were removed from the model by removing the lowest variance. Both categorical variables (lexical semantics and nominal gender) were dummy coded. The intercept reflects the reference levels of the lexical-semantic type, non-distributive, and the nominal gender, feminine. Significance for simple effects and interactions were then calculated through log-likelihood comparisons. **Table 8** provides a summary of the final model's outcome.

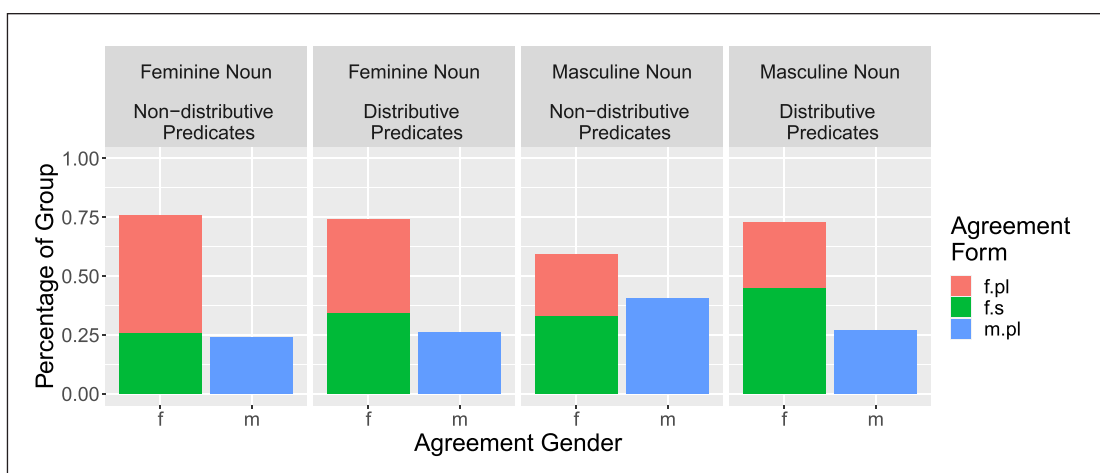


Figure 7: The percentage of responses for both nominal genders and distributivity conditions separated by gender.

	Estimate	z-value	p	$\chi^2(df)$	p
Intercept	-2.334	-2.695	0.007	—	—
Lexical Semantics	0.294	0.343	n.s.	—	—
Nominal Gender	1.479	1.553	n.s.	—	—
Lexical Semantics x Nom. Gender	-1.500	-2.431	0.015	6.146 (1)	0.013

Table 8: The output of the model predicting gender of the gender/number morpheme in the data set combining Experiments 1 and 2 with results from the significant log-likelihood comparisons.

The model found a significant interaction of lexical semantics and nominal gender, which suggests that nominal gender has a greater effect on participants' choices of verb form when a verb is non-distributive. In other words, participants care less about the gender of the noun when they are choosing the gender of a distributive verb. A significant simple effect of intercept suggests that speakers chose feminine forms more than masculine forms; again, this is unsurprising as there are two feminine options as opposed to one masculine option.

The second model only looked at the responses in which participants selected a sentence with a feminine verb form. It predicted the grammatical number of the verb (singular vs. plural) with fixed effects of lexical semantics, nominal gender, and their interaction. **Figure 8** shows the data analyzed in this model. The model further included random intercepts for participants and random slopes for nominal gender. The maximal random effect structure was attempted, but due to the lack of convergence, random slopes and intercepts were removed from the model by removing the lowest variance. Significance for simple effects and interactions were then calculated through log-likelihood comparisons. **Table 9** provides a summary of the final model's outcome.

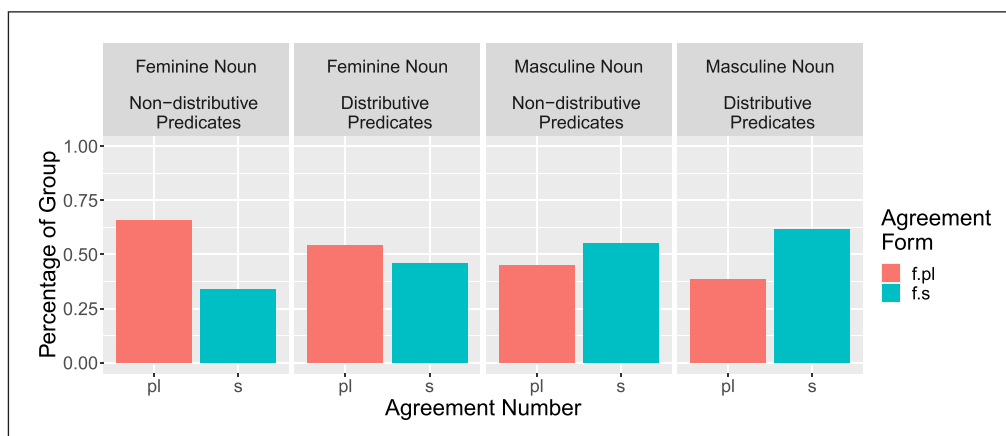


Figure 8: The percentage of feminine responses for both nominal genders and distributivity conditions separated by grammatical number.

	Estimate	z-value	p	$\chi^2(df)$	p
Intercept	-1.063	-1.795	n.s.	—	—
Lexical Semantics	1.047	1.226	n.s.	0.918 (1)	n.s.
Nominal Gender	1.491	2.777	0.005	8.636 (1)	0.003
Lexical Semantics x Nom. Gender	-0.598	-0.794	n.s.	0.640 (1)	n.s.

Table 9: The output of the model predicting number of the gender/number morpheme within the feminine responses in the data set combining Experiments 1 and 2 with results from the significant log-likelihood comparisons.

The second model found a significant simple effect of nominal gender, suggesting that when participants selected a feminine verb form, they selected number based on the gender of the noun, with masculine nouns being more likely to take feminine singular.

5.2 Discussion

The analysis of this data set supports my claims that the lexical semantics of the verb affects how speakers select the gender of verb forms. When selecting the gender and number of a non-distributive verb, participants pay more attention to nominal gender. However, when participants were given a distributive verb, the effect of nominal gender is neutralized. Psychological understandings of event representation can explain these effects.

I will draw heavily on the psychological idea of mental models. These models were initially proposed by Johnson-Laird (1983) and van Dijk & Kintsch (1983), who suggested that language serves to provide instructions on how to construct these representations. In other words, language allows two people to construct the same or, at least, similar mental representations of an event. In order to facilitate this transmission, people are required to store a lot of information about events, such as information pertaining to the time, space, and participants involved with an event (Altmann & Ekves 2019). I would argue that information about an event's distributivity would also be modeled because distributivity often involves either distance in space or distance in time.

In Experiment 2, I found that speakers vary the gender and number of the verb depending on how they construct an event based upon a pictorial representation of the event (see **Figure 4** for an example). When they saw multiple pictures of an event intended to represent spatiotemporal separation, speakers selected DAgr more often than when they saw an event presented as a single picture, for which they used SAgr. I would argue that this is evidence that speakers are tracking this information about their mental model and changing verbal morphology to be maximally informative. However, for the examples from Experiment 1 which used non-distributive verbs, speakers do not rely on DAgr to be maximally informative because the lexical semantics of the verb requires certain facts about these spatiotemporal properties.

To summarize, if we accept that speakers are cooperative and provide maximally informative information to help a collocutor reconstruct their mental representation, then the difference between distributive and non-distributive verbs can be understood as speakers needing to provide more information for distributive verbs which generally have more possible interpretations. The results of this analysis are consistent with this.

When we look at grammatical number within the feminine forms of verbs, there is no effect of the verbal lexical semantics. Instead, we still find the effect of gender that we have seen in the previous data sets.

6 General Discussion

Taken together, the results of Experiments 1 and 2 suggest several things about the drivers of agreement selection for Najdi Arabic speakers.¹¹ First, nominal gender clearly affects how speakers select verb forms. However, nominal gender only affects the selection in one way. Plural verbs are selected based on nominal gender. While it may seem uninformative to say that nominal gender drives the selection verbal gender as this is expected, this effect has not been discussed in other literature on DAgr.

This effect of nominal gender predicting the gender of verb forms suggests that the semantic differences that have been reported as a part of DAgr are not actually related to gender; instead, I argue that grammatical number carries this information. The data presented here found significant effects of the number of events predicting the number of the verb while nominal gender was only found to predict the gender of the verb. Thus, I argue that the literature has focused on the incorrect feature when discussing DAgr. The change of number conveys the semantic information, while the change of gender is simply a historical accident following Bettega (2019). If gender was originally an individuation distinction, as he claims, speakers may have retained this information. In dialects which retain feminine plural verb forms like Najdi (Ingham 1994), speakers can reanalyze the systems that they have access to, including at least their native variety and MSA.¹²

I believe that number is the feature that speakers center the reanalyzed meaning on. I do not reject that feminine features at some point played a role. My question is, do they still in

¹¹ A reader might wonder how related these experiments are to the work of Kramer & Winchester (2017). While Kramer & Winchester elicited judgments based on contexts in which DAgr occurs, these experiments are designed to explore what environments could trigger DAgr.

¹² Given that speakers have access to MSA, there is a question of how MSA influences their language use. In MSA, non-human plural nouns can only use DAgr and not SAgr. According to Al-Sharkawi (2014), the precursor to modern Arabic dialects lost the use of DAgr. Later, modern varieties borrowed DAgr from MSA. However, as we have seen, Najdi speakers' use of agreement morphology is complicated, since SAgr appears as well. Bettega & D'Anna (2022) argue that DAgr in modern varieties is retained from earlier stages of the language. By examining various dialects' use of verbal morphology, we have reasons to support both accounts (Rouillier 2023).

the synchronic grammars of Najdi speakers, or is this the remnant of a diachronic change? Regardless of the features of the plural noun, the use of the singular form suggests that the speaker is structuring the event as multiple sub-events. To return to the dogs going down the street, speakers would use singular agreement to mean, “The dogs walked down the street separately.”

Second, this data suggests that DAgr does not originate on the noun, as suggested by Kramer & Winchester (2017). Experiment 1 looked at this relationship directly, and it does not support this claim. In Experiment 1, the number of actors was shown to have little effect on the form of the verb selected. By contrast, Experiment 2 looked at the relationship between verbal properties and verb form and found that event structure was a significant predictor of the selection of verb form.

However, the analysis of data from Experiments 1 and 2 suggests that the story is more complicated than this. Take the English translations of two of the sentences used in Experiments 1 and 2 in (9).

- (9) a. The dogs gathered in the park.
b. The dogs went down the street.

When you read the sentence in (9a), you likely constructed an event such that there was a space, namely a park, and at some given time there was a group of dogs there. This sentence aided you in constructing that mental representation. Importantly, you know that there was only one location present and that all of the dogs gathered at a particular time. While there are habitual readings, these readings are not relevant to this discussion and are also available for distributive verbs. When you read the sentence in (9b), it is possible that you constructed a single event in which a group of dogs was all walking down the street. However, here, other interpretations exist. It is also possible that you constructed a representation in which you had dogs walking down the same street at different times or at the same time but in different locations. These three representations seem quite different to us when we imagine them, yet they can all be described using the sentence in (9b).

The possible representations of (9b) seem very different because the most salient properties of events tend to be the spatiotemporal ones (Radvansky & Zacks 2011). Clearly, (9b) is not the maximally informative sentence to describe these events. However, according to Grice’s (1975) cooperative principle, we would expect speakers to provide information that they deem relevant and appropriate to the discourse. In situations where the spatiotemporal information is not seen as relevant, the use of (9b) would be acceptable and perhaps even preferred to a longer sentence explaining the spatiotemporal minutiae. In English, verbs with distributive interpretations like *walk* require speakers to explain much more spatiotemporal information

about their event interpretation in order to properly help their collocutor reconstruct the same mental model.

This analysis found that nominal gender had a greater role in speakers' selections of verb forms when verbs that most naturally have a non-distributive interpretation in comparable conditions were used. In Experiment 1, the semantic properties of the non-distributive verbs entailed a single event interpretation. In these environments, participants were more likely to use plural verb forms and, in turn, to have these forms agree in gender with the subject. However, in Experiment 2, the semantics of the verbs are such that participants are able to construct different mental representations for the events when they are shown a single image. They are able to create either a single-event interpretation, like Experiment 1, or a multiple-event interpretation. This multiple-event interpretation yields the feminine singular verb form and, in turn, washes out the effect of nominal gender. Since DAgr is not caused by nominal features but by verbal ones, DAgr does not satisfy the definition of agreement.

A reader may wonder why DAgr looks like an agreement morpheme if it is an aspectual marker. I argue that this is an effect of semantic shift. While DAgr may have started as just an agreement marker, speakers can attribute new meanings to the marking over time. Hofherr & Pasquereau & O'Meara (2018) suggests that pluractionality and nominal number can overlap in marking, so it seems reasonable to suggest that speakers may have attached pluractionality to DAgr. Since speakers had both SAgr and DAgr at their disposal, they could then narrow the use of DAgr to be a marker of pluractionality only. Morphological forms can change and acquire meanings unique to them.

The goal of this study was to understand the relationship between nominal individuation and DAgr in Arabic. To this point, the discussion has described where DAgr is found, but it has yet to turn towards why it is found in these environments. I argue that DAgr is found in these environments due to general effects of cognition. In particular, I believe that the location of DAgr is constrained by the language user's mental or situational model, as proposed by Johnson-Laird (1983) and van Dijk & Kintsch (1983). Both of these proposals suggest that language is a set of instructions on how to construct a mental representation of an event (Zwaan & Radvansky 1998). A speaker should select forms in order to best capture their mental model of the world (Grice 1975).

These models capture spatiotemporal information on the event or information about actors. The information about the participants includes information on the conceptual number of the entities and the morphological representation of number (Humphreys & Bock 2005; Patson & Warren 2010). Research suggests that the number information is explicitly stated in the mental representation only when the number of entities falls within the subitization range (Beg & Čičko & Domijan 2021; Patson 2021). The subitization range is the range at which people are able

to both quickly and accurately tell the size of groups, and it is normally said to be capped at five (Beg & Čičko & Domijan 2021). Patson (2021) found evidence that mental representations contain the exact number of entities when the number is below the subitization range; however, when the number exceeds the subitization range, only a single representation is created.

Psychological understandings of event representation also rely on Johnson-Laird's (1983) mental models; however, events have more information stored about them. Altmann & Ekves (2019) discuss mental event models in terms of five dimensions: time, space, participants, causality, and intentionality. Particularly relevant here, Radvansky & Zacks (2011) makes the claim that events are most likely to be differentiated based on the spatiotemporal properties of that event. In other words, comprehenders are more likely to separate events if they occur physically or temporally distanced from each other. Patson & Warren (2015) found that sub-events affected participants' response times more for distributive verbs than for non-distributive verbs in a number interference task in which they asked participants how many words were on the screen. These findings support the semantic theory that nominal referents affect interpretations of event structure (Krifka 1989). Additionally, Patson & Warren's (2015) findings suggest that while comprehenders are most likely to build a single group event for a single event with a plural subject, they are still able to construct events in different ways given the correct context.

In relation to the study at hand, when presented with an event in Experiments 1 and 2, participants are able to create either a single representation of the event or multiple representations of it. While it is most natural to create a single representation of a non-distributive predicate, comprehenders can create multiple representations of them (i.e., two separate groups of dogs gathering concurrently) (Patson & Warren 2015). When a single event is constructed, comprehenders are able to access number and gender information of the noun, resulting in gendered plural agreement. However, if participants create multiple representations for the event, they begin switching to DAgr. As comprehenders represent more events, they eventually create an ensemble representation of the events. If we follow Beg & Čičko & Domijan (2021) and assume that number information stops being tracked in ensemble representations, then the nominal number would be inaccessible to the verb.

7 Conclusion

When changing the actual number of actors participating in an action, participants did not exhibit a shift from SAgr to DAgr. However, the results suggested that nominal gender did predict the gender of SAgr. Experiment 2 tried to extend the shift in a different direction. Instead of changing the actual number of actors, Experiment 2 varied the number of events shown to participants. The number of events was shown to predict the number of the verb, but nominal

gender was no longer able to predict the gender of the verb. An additional analysis was conducted comparing Experiments 1 and 2 to test whether factors of the verbal semantics affected the verbal morphology. This analysis found that non-distributive predicates were more likely to take SAgr than distributive predicates. This finding provides further support that verbal information is driving the selection of DAgr and SAgr.

If agreement is simply the matching of features found on one word with those found on another, then it is clear that deflected agreement as used by Najdi Arabic speakers does not easily fit this definition. I have argued that the selection of DAgr and SAgr is determined by aspects of lexical semantics. Given that this information is verbal, DAgr cannot be agreement because features are not being shared from one word to another. While SAgr is agreement, with nouns and verbs sharing matching features, DAgr should be understood as related but distinct. The data presented here suggest that if nouns have an effect on the selection of DAgr, it is very weak.

Data Availability

The experimental materials, data, and data analyses are available at https://osf.io/geywb/?view_only=0197162466a642bfa6f671411e7fde3a.

Ethics and consent

The work presented here was approved by the Ohio State University Institutional Review Board (#2021E0821). All participants provided consent to participate in this study.

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Competing interests

The author has no competing interests to declare.

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