# Demonstrative Shift and Proximal Markedness

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**Abstract**

Grammaticalization clines are a widely covered topic in the language change literature, but the birth of diachronic semantic experimental work and computational linguistic modeling for language change have expanded the tools available for understanding questions about the processes of extension and semantic bleaching. This paper makes use of these tools to attempt to answer the question of why it is the case that the distal demonstrative more frequently grammaticalizes toward functional items in languages with a bipartite deictic system.

## 1 Introduction

Grammaticalization is a widely used term in historical and diachronic linguistics with a variety of meanings (Demske, 2020; Fuchs Piñango, 2019; Balpinar, 2019; Welch, 2019; Ferrazzano, 2013; van Gelderen, 2010; Smith, 2011; Katz, 1993; Ng, 2002). This paper explores the synchronic effects of grammaticalization clines of demonstrative pronouns by probing the contrast between distal and proximal demonstratives in English. I propose that the proximal demonstrative is a marked deictic pronoun with locational requirements whereas the distal demonstrative is an unmarked deictic pronoun without locational constraints. The contrast in markedness of the proximal and distal demonstratives helps explain their semantic change patterns. Through experimental inquiry, I show that this contrast can be detected in their synchronic properties. A novel adaptation of evolutionary game theory models of semantic change into the demonstrative domain further supports the asymmetrical view of English demonstratives using the synchronic semantics of the demonstratives as an avenue for inquiry into the semantic change of these lexemes.

This paper focuses on the interplay between the grammaticalization of the demonstratives and impact of the semantic change trajectory of the lexemes

on their synchronic patterns. There are two main construals of the concept of grammaticalization: as a reduction or as an extension (Traugott, 2010). The concept of 'semantic bleaching' is an extension of grammaticalization as a process of losing meaning, or losing restrictions, such that the lexical element itself has a less complex phonological, morphological, and semantic form (Seuren, 2013). To view grammaticalization from the opposite lens, a word grammaticalizes as it adds contexts to its acceptable uses or adopts meanings in a higher level in the clausal hierarchy (Schlacher, 2020; Hill, 2011). This is the idea of extension, where the possible syntactic environments and possible concepts of objects referred to by the morph lose restrictions and expand in number. Although the grammaticalization process is viewed as time-series datapoints for a lexical item's semantics chronologically, each point along the process has bearing on a synchronic use of the item. This paper makes this implication explicit through experimental and formal semantic lenses.

Wichmann et al. (2010) described grammaticalization as a process such that "over time, certain high frequency items are subject to a gradual loss of semantic weight, a process of 'bleaching' through habituation, and acquire a grammatical or pragmatic role." So while an item is losing its restrictions it is gaining more roles in the language, as we will explore for distal demonstratives within synchronic English within this paper. Heine (1996) conceptualized the process as adding a more abstract and grammatical meaning to a linguistic expression, rather than losing its meaning.

Furthermore, there are four mechanisms within the processes involved in language change as posited by Heine: desemanticization, extension, decategorization, and erosion. These can be clustered within the two camps of grammaticalization theory. Desemanticization and erosion are reconfigurations of semantic bleaching, such that an element is deemed as losing its meaning on some level or another. Extension and decategorization may both fall under the umbrella of syntactic and semantic extension, since losing a category and extending to more contexts—both syntactic and semantic—expand the possible uses and contexts of a word (Heine, 2003: 578-580).

As Lehmann (1995) observes, morphological and phonological reduction often occur parallel to semantic reduction. All these changes and shifts occur, however, because of increased frequency of a lexical item (Bybee, 2006). As an item increases in use across a language, it is more accessible to the process of grammaticalization. This process likewise has myriad schematic representations in the literature.

Most commonly, grammaticalization is seen as a pathway from one stage to another along a unidirectional, step-wise progression. Although this view is widely accepted, it does not completely encompass the path of change for a lexical item. Perhaps a grammaticalization chain, rather than a pathway, is the proper mode of understanding this process (Craig, 1991; Heine et al., 1991). A chain allows for overlapping structures and grammatical categories to co-occur, since a lexical item can be inherently ambiguous in certain uses. There is both a diachronic and synchronic dimension to the grammaticalization chain such that

at a given moment it represents synchronic uses in a population and the uses of that item up to that point. I will probe this synchronic moment in the English language demonstratives' grammaticalization cline throughout this paper with a strong bearing in the historical linguistic literature of demonstrative shift. This literature informs the analysis of demonstratives I have adopted, since the synchronic use of demonstrative still maintains remnants of is semantic history, as can be seen in section 2.

## 1.1 Background of Demonstrative Shift

One of the most well-studied grammaticalization patterns, at least in the field of Indo-European historical linguistics, is that of the demonstrative pronoun to the definite article. Although this process is evident in languages outside of the Indo-European family as well, its conception as a typological chain began within this language family. Wackernagel (1928) was the first to mention demonstratives evolving to definite articles. Greenberg (1978) expanded upon this idea and formed a process within the definiteness space that consists of four clear stages:

**Table 1** Greenberg Stages of Definites

| | |
|---|---|
| **Stage 0** | Demonstrative with deictic force |
| **Stage I** | Loses deicticity and transition to definite article |
| **Stage II** | Loss of definiteness and evolution to a non-generic article |
| **Stage III** | Nominal marker compulsory with any NP |

Source: Greenberg (1978)

To better understand this cline of grammaticalization as proposed by Greenberg, Ferrazzano (2013) created a table of stages.

**Table 2**

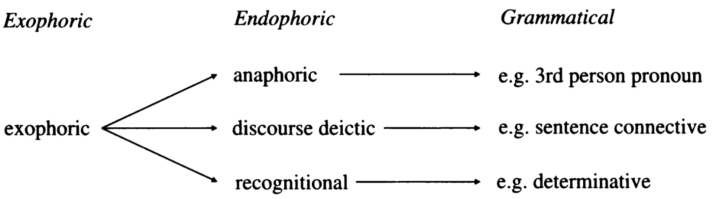
| | **Stage 0** | **Stage I** | **Stage II** | **Stage III** |
|---|---|---|---|---|
| **Properties** | The demonstrative (Greenberg does not discuss the specific attributes). | Article is compulsory, when referent is 'identifiable.' | Article has the combined function of definite and indefinite article. | Productive contrast between articulated and non-articulated forms has largely disappeared. If articulated form dominates, we get either a gender marker or a general noun marker. |
| **Languages that exhibit this type of determiner** | English *this/ that,* Italian *questo/quello* | Many European languages; Italian *il* and variants, French *le/la/les*, English *the,* German def. art. *der* | Common in African languages. Maasai *ol* [masc.], *en-* [fem] | Niger-Congo languages, Nilo-Saharan, *k-* |

Source: Ferrazzano (2013)

This process seems neat enough through Greenberg's stages, but it falls into a couple of conceptual traps that are difficult to disentangle. First, the stages are ordinal and discrete without any overlapping available in the system such that a lexical item may be at multiple stages at a given moment in time. This is with the constraint that a language does not include the same lexeme twice in the grammar: one 'that' for Stage 0 and one 'that' for Stage 1, for example. Second, the process does not account for the multiple steps that are between stage 0 and stage 1. Third, there is no consideration for why a language with multiple demonstrative pronouns grammaticalizes one of these elements and not another.

To account for the issue of the second point, namely that there are multiple processes for the demonstrative grammaticalization that are left out of this schema, Diessel (1999) proposed a more robust pathway for the demonstrative:

**Figure 1**




Source: Diessel (1999)

English uses *'that'* as an exophoric pronoun, an anaphoric pronoun referring to an NP, a discourse deictic referring to a proposition, an adnominal, a resumptive anaphor, a complementizer, and as a third person pronoun. As such, it represents multiple clines and multiple positions along Diessel's schematic of grammaticalization.

Most importantly from this cline, Diessel shows that there is more than one possible grammaticalization process for the demonstrative. The union of each cline is that the functional changes of the item along the pathway causes the item to no longer be deictically contrastive and is no longer used to focus attention to the outside world (Diessel, 1999: 118). The syntactic changes along with the semantic bleaching means that their occurrence is restricted to a particular context. The morphological changes also freeze the element as no longer inflectable, and frequently only one of the demonstratives moves along this cline.

In the transition from exophoric to endophoric, there are three possible landing points along the cline: anaphoric, discourse deictic, and recognitial. Anaphoric pronouns are those that corefer with an NP (a), discourse deictic pronouns refer to propositions (b), and recognitial pronouns indicate that the hearer can identify the referent based on specific shared knowledge (c).

(1)

(a) One thing I noticed about the movies was that the colors were very strange.... **these** colors...

(b) then he goes off, ... and that's the end of **that** story, but then... it goes back to the farmer

(c) **those** wooden things that you hit with a ball.
Source: Himmelmann (1996)

The syntactic priming for the demonstrative is the most effective determiner for which of the clines a lexical element may move along. This still does not reflect the fact that the same lexical element in a language may move on more than one cline at a time and be at multiple positions along the cline at a synchronic moment in the language, as shown by the English data above.

Since the syntactic context of the demonstrative determines the grammaticalization cline of the demonstrative, it is then only possible for a demonstrative to grammaticalize toward a definite article in the contexts where the demonstrative and a definite determiner can occur, either independently or together. As soon as the determiner can be considered a definite article, it can assume to exist as such Schlachter (2020). Along this line of inquiry, I will focus on the third and bottom of the clines presented by Diessel: the exophoric demonstrative to the definite article. Examples throughout the diachrony of French are as follow:

**Table 3**

| Language | Prefixed Num/Gender | Definite Article | Proximity Marker |
|---|---|---|---|
| Classical Latin | - | - | hic, iste, ille |
| Vulgar Latin | - | ille | ecce iste, ecce ille |
| Old French | - | le | cest, cel |
| Modern French | le | ce | ce... ci, ce... là |

Source: Harris (1978)

Classical Latin had three forms of the demonstrative: the proximal, the medial, and the distal. The distal demonstrative *ille* is in contrast to the other demonstratives in its locational reference to the deictic center.

(2)

| *non* | *dicam* | *illinc* | *hoc* | *signum* | *ablatum* | *esse* | *et* |
|---|---|---|---|---|---|---|---|
| not | say.FUT.1SG | from.there | DEM.PROX | statue | take | PERF.PASS | or |
| *illud* | | | | | | | |
| DEM.DIST | | | | | | | |

'I do not say that this statue or that statue has been taken away from there.'
Source: Cicero Verr. 2, 1, 20, § 53.

Vulgar French uses the distal demonstrative in the sense of a definite article as a marker of uniqueness and familiarity. A particular passage in the Vetus Latina Bible points to the demonstrative loss of force.

(3)

| *Est* | *tamen* | *ille* | *daemon* | *sodalis* | *peccati* |
|---|---|---|---|---|---|
| be.3RD.SG | nevertheless | dem.dist | demon | companion.NOM | sin.GEN |

'Nevertheless the devil is a companion of sin.'
Source: VA 7.3

Old French, following phonological reduction, has the same lexeme as a definite article.

(4)

| *prent* | *li* | *pedre* | *de* | *ses* | *meillours* | *serjanz* |
|---|---|---|---|---|---|---|
| take.PRST.3SG | the.NOM.SG | father.NOM | of | his | best | servants |

'then the father takes (some) of his best servants'
*Vie de saint Alexis*, 23 [circa 1050]

In Modern French, the definite article is even more qidely required for nominals than in just the familiar or unique sense, as depicted in the table above and the following example.

(5)

| *L'eau* | *est* | *essentielle* | *à* | *la* | *vie.* |
|---|---|---|---|---|---|
| the.water | be.3RD.SG | essential | to | the | life |

'Water is essential to life'

Although the cline from exophor to definite article is the most studied of the given clines, a large gap still exists in the literature for complete understanding. There has not yet been a full analysis of why it is the case that in languages with a proximal and a distal demonstrative available it is the distal that grammaticalizes most frequently.

I will continue with an overview of the current state of our understanding of the demonstrative pronoun, both from a descriptive semantic sense and a logical form sense. I will be sure to highlight for each conception of the demonstrative when the definition accounts for the diachronic evolution of the pronoun. I will then proceed to introduce an experimental account of the synchronic status of the demonstrative pronoun in English, through which I will motivate a definition of the demonstrative that factors in the tendency of the distal demonstrative to grammaticalize in bipartite deictic systems. Using this new definition, I will implement an Evolutionary Game Theory model of language change. More accurate probabilistic models of language change are gained through the adoption of synchronic definitions of elements motivated by their diachrony.

# 2 Treatment of Locational Marking

Diessel (2013) conducted a typological survey of 234 languages for their various treatments of demonstratives across a variety of parameters and environments. Demonstratives are generally encoded as having a bearing on the external world in the context of the discourse, and most languages have at least a two-way demonstrative system such that the locations of the demonstratives contrast with each other. Of the languages included in the survey, 1.99% had no distance contrast, 54.3% had a two-way contrast, 37.6% had a three-way contrast, 3.41% had a four-way contrast, and 1.7% had at least a five-way contrast.

In a purely descriptive definition of the demonstrative, Bisle-Müller (1991:80) defined the demonstrative as "the delimitation from other possible references." He

claims that "it is decisive that other possible referents exist in the common knowledge and that the designated referent can be clearly differentiated from those other ones by the hearer considering the common knowledge with the speaker, and the hearer can regard this difference as relevant." In considering this definition and the facts of the world's languages collected by Diessel, we would expect there to be at least sufficient treatment of the demonstrative in its logical form definition to include a contrastive element and a locational specification.

I will spend some time analyzing various treatments of the demonstrative in the literature, with special emphasis on the treatment of the locational element. The disparate approaches to the locational specification will inform the basis for our experimentation. Since it is the distal demonstrative that most frequently grammaticalizes toward a functional item, we ask why it is the case that the demonstrative definition presented across the literature rarely, if ever, takes this into account when defining the demonstratives—especially the proximal and distal in contrast to each other. The formal semantic ideas of the synchronic definition of demonstrative pronouns have not been formulated in their current state to capture diachronic change as well as their synchronic idiosyncracies. It is not the purpose of the formal semantic literature to do so. The approach that this paper follows examines the diachronic patterns of demonstrative pronouns to determine which synchronic proposal best captures the data.

## 2.1 The "Linguistic Point"

Epstein (1993:129) describes the demonstrative as a linguistic point, since it both identifies a referent in the immediate vicinity of the interlocutors and it focuses attention. It is important to note the mutual attention of the speaker and the hearer in this definition and the mention of a locational element. Diessel likewise emphasizes the shared attention of the interlocutors, but also posits that the demonstrative's first goal is to "indicate the location of a referent relative to a deictic center" (2006:469). The deictic center is the speaker's position, from which the proximal and distal distinction is drawn.

Toward a logical representation of the demonstrative, more attention is paid on the contrast of proximal and distal to each other at some levels.

## 2.2 A Unique Satisfier

Elbourne (2008) defines demonstratives as requiring one unique satisfier, thus a constrained domain is the crucial determinant of a felicitous demonstrative. In the equations (6) and (7), $w$ is the possible world, $a$ is the originator or agent of the speech act, $t$ is the time at which the speech act occurs, and $h$ is a variable assignment. The determiner takes as an argument an indexed individual, a relation, and a property of the value of the NP. It maps these to an individual concept as the value of the whole DP. This is the smallest function that takes a situation $s$ and maps it to the individual $z$. Demonstratives under this scheme are combinations of definite descriptions and pronouns.

The proximal and distal features in the demonstratives are determined based on the index of the referent. As such, the index is an argument so that the distal and proximal features in the definition are read as "$x$ is distal/proximal to $a$ at $t$ in $w$".

(6) $[[that]]^{w,h,a,t} = \lambda x.\lambda f_{\langle e,sest\rangle}.\lambda g_{\langle se,st\rangle}.\lambda s.\iota z(f(x)(\lambda s'.z)(s) = 1$
$\&(\lambda s'.z)(s) = 1 \& distal(x,w,a,t))$

(7) $[[this]]^{w,h,a,t} = \lambda x.\lambda f_{\langle e,sest\rangle}.\lambda g_{\langle se,st\rangle}.\lambda s.\iota z(f(x)(\lambda s'.z)(s) = 1$
$\& g(\lambda s'.z)(s) = 1 \& proximal(x,w,a,t))$

(8) $[[the]]^{w,h,a,t} = \lambda f_{\langle se,st\rangle}.\lambda s.\iota x f(\lambda s'.x)(s) = 1$

Source: Elbourne (2008: 27)

I have additionally included his definition of the definite article here. The definition of the definite article is a subset of the definitions of the proximal and distal demonstratives represented as such. What is not apparent is the definition of "proximal" and "distal" in a comprehensive delineation of the locational domain of the discourse in these definitions.

## 2.3 A Specific Index

Patel-Grosz & Grosz (2017) give a definition of the demonstrative in contrast with the personal pronoun definition–another of the possible grammaticalization paths of the demonstrative. They show that the difference between the two is the requirement for a specific index for the demonstratum such that the referent appears at that index. Although this is not a claim of a diachronic representation of either element, it again highlights the intersection of various elements along the cline of grammaticalization. In equations (9) and (10), $PER$ is the personal pronoun and $DEM$ is the general demonstrative pronoun. The variable $s_r$ abbreviates $g(s_r)$ such that $s_r$ is a restrictor situation and $x$ is the individual in that situation with the property $NP_n$ and an index argument.

(9) $[[PER]]^g = \iota x[[[NP_n]]^g(x)(s_r)]$

(10) $[[DEM]]^g = \iota x[[[NP_n]]^g(x)(s_r) \& x = g(1)]$

Source: Patel-Grosz & Grosz (2017)

There is a tie to the physical context of the discourse, which aligns with both Diessel and Epstein's understanding of the demonstrative as a mutual attention of the speaker and hearer to an object in the discourse context.

## 2.4 Restrictive Parameters

Another representation of demonstrative pronouns comes from Ahn (2018), in which a single element within the definition can account for many different restrictive parameters in the demonstrative at a time: deixis, relative clauses, anaphoric indices, and more. The degradation of that element $R$ is presumably what would spur

language change, though Ahn does not herself engage in the diachrony of the demonstrative. Equation (11) includes variables for the property of an NP $P$ and for $R$ as defined above, which takes the place of an index argument, and returns the "maximal entity that meets all of the properties combined" (2019:180).

(11) $[[bi - sup]] = \lambda P.\lambda R.\iota x.\forall y[P(y) \wedge R(y) \leftrightarrow y \sqsubseteq x]$

Source: Ahn (2018)

## 2.5 Weak vs. Strong Articles

Schwarz (2009) presents the weak and strong articles in relation to each other. Schwarz highlights the overlapping characteristics of strong definites and the English term *that*, but does not directly define the demonstrative pronoun. Instead, he presents the "semantically more complex, strong article" as being expressed by a more complex form, while the "semantically simpler, weak article is expressed by a reduced form" (2009: 264). The form of the strong article is made up of the form of the weak article combined with an anaphoric index argument. In equation (13), the $s_r$ variable defines the situation, $P$ is the property of the referent, $x$ is the referent, and $y$ is the dynamic binding mechanism for covarying interpretations of the index argument. Although there is no definition for the demonstrative independent from the strong definite article's potential uses in demonstrative environments, Schwarz does provide a basis for representing semantically more complex terms with more complex forms and for encompassing multiple derivative definitions of an item within its own form.

(12) $[[the_{weak}]] = \lambda s_r.\lambda P.\iota x.P(s)(s_r)$

(13) $[[the_{strong}]] = \lambda s_r.\lambda P.\lambda y.P(x)(s_r)\&x = y$

Schwarz (2009)

## 2.6 Contrasted Markedness

The representation of the demonstrative that is most suited to motivate diachronic change as understood in this paper comes from Wolter (2006), in which the definitions of the distal and the proximal are contrastive in markedness and contain the definition of the definite article within them. The conclusions drawn from her paper are compelling in their implications for a synchronic understanding of the demonstrative that takes into account the diachrony of the lexical form. I will present her definitions in (14), (15), and (16). I will then extrapolate upon the motivation for their conception.

(14) $[[that_n]] = \lambda P.P(s_n)$is a singleton set and $s_n$ is non-default.
If defined, denotes $\iota P(x)(s_n)$

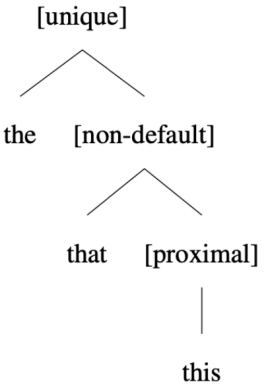
(15) $[[this_n]] = \lambda P.P(s_n)$ is a singleton set and $s_n$ is non-default and $\iota.P(x)(s_n)$ is proximal to the speaker. If defined, denotes $\iota P(x)(s_n)$

(16) $[[the_n]] = \lambda P.P(s_n)$ is a singleton set. If defined, denotes $\iota P(x)(s_n)$

Wolter (2006)

To better schematize the relationship of these lexical items with each other, Wolter also represented them in a hierarchy of defaultness:

**Figure 2**




Source: Wolter (2006)

The intuition that follows from Wolter's definition of the demonstratives is along these lines: the proximal demonstrative is more marked than the distal demonstrative, since it has an extra restriction that requires the referent to have a locational feature that is proximal to the deictic center. Since the proximal has more restrictions, it cannot refer to as many objects in the discourse context. As the distal demonstrative can be used in more contexts, its frequency of use is greater than the proximal demonstrative. With increased frequency, a lexical item is more likely to grammaticalize toward a functional item and extend into new functional meanings.

It is this reasoning that leads me to propose an experimental diagnostic for the current state of a language along the grammaticalization cline for the demonstrative pronouns. In this approach to studying synchronic and diachronic semantics in harmony with each other, our understanding of demonstratives can deepen in both their semantic change and their formal semantic definitions. Through grammaticality judgments of synchronic uses of the demonstrative, we attempt to show the diachronic implications of synchronic definitions of the demonstrative pronoun. We aim to innovate the formal semantic definitions of these lexical items to provide insight into their varying diachronic behaviors.

# 3 Synchronic Experimentation of Diachronic Trends

The approach of using experimental methods to answer questions of language change phenomena was pioneered by Zhang, Piñango, and Deo (2018) in their analysis of the location-possession domain. They studied the path from spatial locative to posessive relations as a cognitive pathway for synchronic meaning variation, which gives rise to diachronic semantic change. In running an experiment to prompt participants to expand their use of the locational to also encompass some possessive meanings, they determined that the context of an utterance facilitates the meaning change over time.

This paradigm spurred the experimental approaches presented below as using synchronic experimental evidence to motivate diachronic semantic understanding.

## 3.1 Methods

To test the hypothesis that the proximal demonstrative is more marked than the distal demonstrative such that it requires an extra feature or proximalness to be satisfied by the referent's location, we designed a simple experiment to elicit grammaticality judgments from participants. In a Qualtrics survey, we set up 36 questions across two surveys so that each survey had 18 questions total. We recruited participants through Prolific Academic filtered as native English speakers for the survey through Prolific's internal parameter settings. 70 participants were split across the two surveys such that each survey had 35 participants for each question for counterbalancing purposes. In sum, each question had 35 data points the experiment included 36 questions total.

The questions within the survey each consisted of a short video prompt and a slider bar for a naturalness rating. The videos each were four seconds long, in which an individual was positioned on one end of a rectangular table and four objects of identical nominal category were positioned on each corner of the table. A total of six types of objects were used: mugs, bowls, glasses, pens, shoes, books. In each video, the individual said a short sentence of the form:

(17) I prefer $\textsc{dem}_1$ NP to $\textsc{dem}_1$ NP.

(18) I prefer $\textsc{dem}_1$ NP to $\textsc{dem}_2$ NP.

As the individual uttered the demonstrative, they pointed to a location and an item either near or far from them on the table space. This resulted in videos of every commutation of proximal or distal demonstrative and near or far locational reference. To better represent these commutations, the following graphic illustrates the locations and the demonstratives used:

(19) I prefer this mug to this mug → *Proximal*

(20) I prefer this mug to this mug → *Distal*

(21) I prefer that mug to that mug → *Proximal*

(22) I prefer that mug to that mug → *Distal*

As a catch trial, we included sentences with one occurrence each of the two demonstratives. Participants who rated the contexts of *this* as a distal and *that* as a proximal with a more natural rating that the contexts with *this* as a proximal and *that* as a distal were not included in the analysis.

(23) I prefer this mug to that mug → *Proximal*, *Distal*

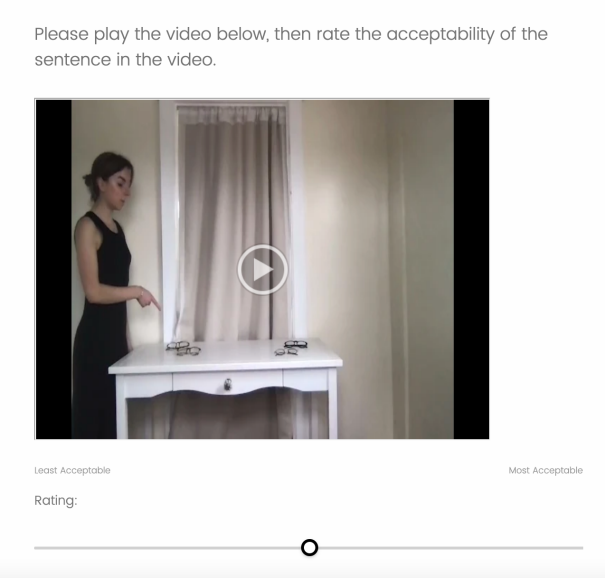
(24) I prefer this mug to that mug → *Distal*, *Proximal*

To test participants' attention and filter for quality responses, we removed the responses of any participant who completed the survey in less than 4 minutes. This metric was determined based on the minimum amount of time to watch each video prompt, slide the slider bar, and click through to the next video.

The participants were prompted to watch the video in the question and rate on the slider bar the naturalness of the sentence from 'Less Natural' to 'Very Natural.' The slider bar always originated at the 50% level in the middle at the initiation of the question.

Due to pandemic restrictions, the videos were recorded at the home of the speaker in the videos. As such, some control for location and distance of the speaker and referents in relation to each other had to be relaxed for spatial and resource purposes.

**Figure 3**



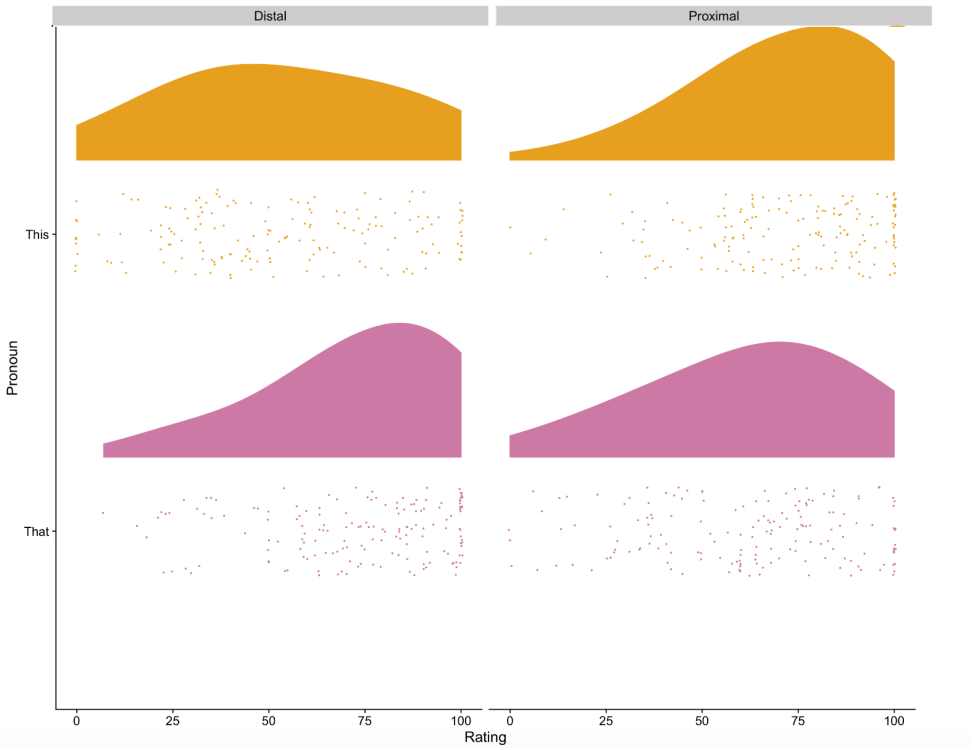

The hypothesis predicted that the naturalness rating for the 'mismatch' locations (distal demonstrative in the near location; proximal demonstrative in the far location) would be emblematic of the contrast of markedness in the demonstratives. The hypothesis would hold if the naturalness score for the distal mismatch were greater than the naturalness score for the proximal mismatch.

## 3.2 Results

The results from the survey supported our hypothesis that the distal demonstrative *that* is more natural in proximal contexts in exophoric reference than *this* in distal contexts. Since increased frequency of use and weakened restrictions on exophoricity lead to increased accessibility for grammaticalization toward functional items, the distal exophoric demonstrative in English has empirical support as the most likely candidate for grammaticalization.

The figure below illustrates the differences in naturalness ratings for the English demonstratives across matching and mismatching contexts. The data is a collation of all responses from the two surveys, with 8 individuals' responses filtered for failing to pass the attention metrics.

**Figure 4**




The mean rating for the contexts were:

**Table 4**

| | | |
|---|---|---|
| **this** | **distal**: 53.158 | **proximal**: 71.703 |
| **that** | **distal**: 73.394 | **proximal**: 61.879 |

We analyzed the data using a mixed effects linear regression to predict the naturalness rating as a function of parameters for pronoun, location, and the interaction between pronoun and location. The coefficients were as follow:

**Table 5**

| | **Estimate** | **Standard Error** | **t value** | **p-value** |
|---|---|---|---|---|
| **Intercept** | 73.394 | 1.9773 | 7.128 | $< 2e^{-16}$ |
| **Pronoun This** | -20.236 | 2.796 | -7.239 | $1.27e^{-12}$ |
| **Location Near** | -11.515 | 2.796 | -4.119 | $4.29e^{-5}$ |
| **Pronoun This: Location Near** | 30.061 | 3.954 | 7.603 | $1.0e^{-13}$ |

Each of the coefficients were statistically significant and the data supports the hypothesis that exophoric distal demonstratives are less marked for locational restrictions than proximal demonstratives, since their use is rated as significantly more natural in more contexts than their contrastive proximal counterparts. These findings support a new understanding of the demonstratives in relation to each other and their grammaticalization clines.

## 3.3 Discussion

Rather than contrastive to each other, demonstratives lay on a scale of informativeness (Levinson 2000:79), such that the semantically less specific form, or in this case the distal demonstrative, implies the converse of the stronger form. So rather than the proximal being nearer and the distal being farther in relation to the deictic center, the distal encodes 'not here' and the proximal implies that the object of reference is 'here'. Another crucial point in Enfield's analysis is that demonstratives can include semantic content that specifies "where something is without specifying how far away it is" (Enfield, 2003:87). Thus the distal is an elsewhere demonstrative such that it is used whenever the referent does not fill all the restrictions for reference by the proximal. While the demonstratives were strongly favored in their location 'matching' contexts, there is still a contrast between the distal and the proximal demonstratives in relation to each other such that the availability of the proximal in the proximal and distal in the distal locations precludes the use of the other.

Instead of using this technique of naturalness rating in different contexts purely as a consideration of the accessibility of one demonstrative to another in a given time, it may also be used to determine the relative position of a language along the diachronic grammaticalization cline at a synchronic moment. The English demonstratives are not strictly tied to their locational specification such that their use spans multiple positions along the cline.

The experimental data both supports the hypothesis that the proximal is the more marked demonstrative and supports the conceptualization of the grammaticalization clines as chains within which a language's demonstratives may inhabit many locations on the cline at a synchronic moment.

# 4 Proposal Demonstrative Semantics

We can implement the experimental conclusion in our conceptualization of the definition of the demonstratives. As seen earlier in this paper, the semantic representations

of the demonstrative pronouns currently proposed in the semantic literature do not account for the basis as to why the distal demonstrative grammaticalizes more readily than the proximal demonstrative in bipartite systems. The essence of the deictic exophoric demonstrative is its tie to a locational element indexing the referent in the physical context.

As supported by the data, the proximal demonstrative is more marked than that of the distal demonstrative, since it requires an extra restriction of proximity in the context to fulfill its semantic complexity. As the demonstrative pronoun grammaticalizes further toward a functional item, it undergoes semantic bleaching such that the restrictions gradually become less integral to the semantic form of the lexical item. The first step from an exophoric to an anaphoric demonstrative, for instance, requires the loosening of the restriction on deixis, such that the requirement of a pointing action accompanying the utterance is no longer necessary. The locational element so strongly required by deixis is then able to be fulfilled not only by a physical reference to a location, but also by a location in the discourse or a location of an index for a pronoun, as in ASL Sampson (2021). This extension of location gives rise to the anaphoric uses of the demonstrative, as presented in sentences 1, 2, and 3 earlier in this paper.

The requirement of proximity for the proximal demonstrative is no longer strictly a physical location requirement, but may also be fulfilled by proximity to the utterance in the interlocutor's discourse. The final step along the grammaticalization cline toward the definite article is the loss of a restriction on location, and rather only the restriction of a unique referent. For the proximal demonstrative to take this final step, it would require a loosening of the restriction on proximity and on locational reference in general. The distal demonstrative only requires a loosening of locational restriction, since it is underspecified for its restriction on location in relation to the proximal demonstrative. Thus the distal demonstrative grammaticalizes most accessibly and economically to a definite article. The encoding of the speaker positional information for the proximal demonstrative gives the distal demonstrative its distant from speaker meaning through implicature while it maintains its identity as unmarked for location.

It is important to note that this theory of proximal markedness and process of semantic bleaching supersedes any choices with regard to the definition of definite article. Rather, this forms a larger theoretical discussion as to the relative markedness of the proximal demonstrative compared to the distal demonstrative. This frame of thought is applicable to any definition of the definite article the reader may deem suitable.

# 5 Proximal Markedness in Practice

The new formulations of the logical forms for the demonstratives allow for many possible applications for modeling language change along the grammaticalization clines through probabilistic and evolutionary models. Since there is clear experimental motivation for these definitions of the synchronic demonstratives based on their diachronic evolution, it is both possible and beneficial to model the language change with this framework in mind. Using the Evolutionary Game Theory model, first used in Deo (2015), we can implement our new understanding to show the evolution of language through mutual strategies of interlocutors across time. This model has been

used predominantly to model verbal domain change, but it models grammaticalization clines particularly well as it combines probabilistic mathematics and biological evolutionary models.

## 5.1 Empirical Motivations for Evolutionary Game Theory

In accordance with Wolter's (2016) hierarchy of markedness in the demonstrative to article shift, the grammaticalization of the demonstrative patterns with that of the progressive to imperfective shift. Deo (2015) models the shift of the marked progressive aspect as compared to the unmarked imperfective aspect in an implementation of Game Theory she calls the "Imperfective Game."

The main use of the progressive aspect is in the "phenomenal" or *event-in-progress* instances, where the aspect refers to a snapshot in time with the implicature that this is not a permanent state of affairs. In contrast, the imperfective aspect has at least three distinct readings:

(27)

(a) the progressive or *event-in-progress* reading;

(b) the habitual or generic *characterizing* reading; and

(c) the *continuous* reading with lexically stative predicates.

Source: Deo (2015)

It is uncommon to have complete blocking of the event-in-progress use of the imperfective because of the availability of the progressive morphology. Rather it is more common to have a period of free variation between the progressive and the imperfective forms. In Middle English, before the *be+V-ing* construction as a progressive construction, the English Simple Present encompassed all of the above possible readings of the imperfective. Shakespeare uses this free variation:

(28) What do you read, my lord?

Source: Hamlet II.2.191

(29) O, I die, Horatio.

Source: Hamlet V.2.345

In Turkish, the progressive ending *-(I)yor* has begun to appear with a wider range of meanings as it expands into the domain of the imperfective Aorist endings *-ir*, but the Aorist is not expanding into the progressive endings. Examples (1) and (2) show the distribution of the progressive as a situation and the imperfective as a characterizing reading.

(30) *saat ikide çalış-**iyor-du**-m*
At two.o'clock work-PROG-PST-1SG

At two o'clock, I *was working.*

(31) *genellikle iki saat çaliş-**ir-du**-m*
Usually for two.hours work-IMPF-PST-1SG

I *would* usually *work* for two hours.
Source: Göksel & Kerslake 2005, in Balpinar 2019

The tendency for the progressive to more recently take on formerly imperfective meanings is exemplified in (3) and (4).

(32) *sen Ömer'i benden daha iyi tan-**iyor-du**-n*
you Omer me better than know-PROG-PST-2SG

You *knew* (lit. were knowing) Ömer better than me.

(33) *O zamanlarda Mehmet çok sigara iç-**iyor-du***
At that time Mehmet lot cigarrette

At that time, Mehmet *used to smoke* (lit. was smoking) a lot.
Source: Göksel & Kerslake 2005, in Balpinar 2019

This typology of diachronic shift from the progressive to the imperfective aspect means that there is a state of flux in any synchronic moment of a language such that the polar ends of the progressive and imperfective will not be represented by the morphology on a one-to-one basis, but will reflect the shifting diachrony of the movement along the grammaticalization cline (Bybee, Perkins & Pagliuca, 1994).

## 5.2 The Evolutionary Game Theory Model

In Deo's use of the model, the verbal morphological state of a language at stage 0 has only the imperfective to refer to both phenomenal and structural cases. A variety of expressions may be employed to differentiate between phenomenal and structural contexts before a favorite expression proliferates and becomes categorical as the marker of phenomenal contexts. As this expression increases in use, it then generalizes to become the new marker of general imperfective. Deo calls these stages zero-PROG in which only the imperfective morphology occurs, emergent-PROG in which the progressive is restricted in its use for event-in-progress situations, categorical-PROG in which there begin to be some overlaps in the use of the progressive and imperfective markings, and generalized-PROG in which the progressive morphology has taken over from the imperfective as the more frequent marking for any of the categories of the imperfective's former uses.

This grammaticalization cline patterns similarly with that of the distal demonstrative pronoun taking on meanings and eventually taking over from anaphoric personal pronouns as it extends its semantics into anaphoricity from pure exophoricity.

## 5.3 The Model for Demonstratives

In the context of demonstrative pronouns and their shift towards definite articles, the contexts in parallel to phenomenal and structural are exophoric and anaphoric uses. The "basic" use of the demonstrative pronoun at stage 0 would be the demonstrative use while another lexical item would be used in the anaphoric sense at the time. Over

time, the lexical item used as demonstrative would generalize to become an emergent anaphor while retaining use as an exophor. It then would become a categorical anaphor such that the lexical item would be used with the previously used anaphoric lexical item to refer to items in the physical context and the discourse context. Finally, the exophoric lexical item would lose its tie to exophoricity and become the new, sole anaphoric item. I will label these, then, zero-ANAPHOR, emergent-ANAPHOR, categorical-ANAPHOR, and generalized-ANAPHOR respectively.

The distal exophor, as shown in the previous sections of this paper, is the most likely candidate for this grammaticalization path toward anaphor in languages with a binary system of demonstrative pronouns. As such, the two linguistic strategies for a speaker is either the use of the distal demonstrative or the use of the anaphoric pronoun used at stage 0.

The first stage is that in which the demonstrative pronoun is restricted to use in a purely exophoric sense and is not available for use in the anaphoric sense, as exemplified in (34). German has purely exophoric uses of *dem* as an adnominal to situate the discourse in a physical context in relation to the referent. The same lexical form also can serve as a definite article, which has become its main use in German (35).

(34) *Mit* ***dem*** *Kerl* *will* *ich* *nichts* *mehr*
with DEM.DAT.SG guy.DAT.SG want.1SG.PRES.ACT 1SG.PRO nothing more
*zu* *tun* *haben.*
to do.INF have.INF.

I don't want anything more to do with **that** guy.
Source: Schwarz (2013)

(35) *Ich* *habe* ***dem*** *Bub* *das*
1SG.PRO have.1SG.PRES.ACT DEF.ART.DAT.SG boy.DAT.SG DEF.ART.ACC.SG
*Spielzeug* *gegeben.*
toy.ACC.SG give.PERF.PART.

I gave the toy to **the** boy.
Source: Schwarz (2013)

English likewise has synchronically diverse uses of the same lexeme *that*: as a deictic (a), anaphoric (b), recognitial (c), or establishing (d) adnominal determiner.

(36)

(a) Hand me **that** hammer.

(b) John bought a book and a magazine. **That** book was expensive.

(c) Did you buy **that** car? (that you were telling me about)

(d) Did you hear **that** story about the students on the news?

Source: Schwarz (2013)

Thus multiple states of a lexeme's semantic extension are present both diachronically and synchronically in a language. The diachronic states available for our current

study of the demonstrative pronoun are modeled on the four-part distinction specified for the progressive to imperfective shift introduced earlier in this section.

These four states are strategies of communication such that the zero-ANAPHOR and the generalized-ANAPHOR rely on the context of the discourse to disambiguate reference, whether that be physical or linguistic context. The emergent-ANAPHOR and categorical-ANAPHOR stages are effective at disambiguating through use of a lexical item whether a referent can be identified through type of context. When implementing an Evolutionary Game Theory model, the strategies are selected as a Speaker-Hearer consensus for maximum mutual understanding such that we can predict which strategies proliferate.

To begin an EGT model, we must consider both a speaker and a hearer. The speaker is in one of two states $\{exo, ana\}$, such that they aim to refer to an object in the physical context or the linguistic context. A speaker is in the state of *exo* iff they intend to refer to an object in the physical context. They are in the state of *ana* if they intend to refer to an object in the linguistic context. To convey this state, the speaker may use $\{dist, per\}$ to communicate this state to the hearer. The hearer chooses a referent based on the speaker's form conveyed as either in the physical or linguistic context.

A speaker's strategy is a function from states to forms: $[\{exo, ana\} \rightarrow \{dist, per\}]$. A hearer's strategy is a function from forms to states: $[\{dist, per\} \rightarrow \{exo, ana\}]$. In accordance with Deo (2015), the utility function for the speaker and hearer is defined below. Given a speaker strategy $S$, a hearer strategy $H$, a state $t$, the success of a communication is given as follows by the $\delta$-function.

(37)

$$\delta_t(S, H) = \begin{cases} 1 & \text{if } H(S(t)) = t \\ 0 & \text{otherwise} \end{cases}$$

Source: Jäger (2007)

The associated cost of a given strategy combines 'formal economy as well as successful communication' (Deo 2015: 29). To determine the utility function, $n$ is the number of expressions employed to communicate state $S$ and $k$ is a parameter that determines how the speaker values clarity over signal cost. A low $k$ means high value placed on communicate disambiguation, while a high $k$ means more value placed on signal cost. I adopted Deo's strategy of setting the $k$ value to 0.1. $n$ is the number of strategies in which the speaker is in the given state. The utility function is as follows:

(38)

$$U_s(t, S, H) = \delta_t(S, H) - k \times n(S)$$

Source: Deo (2016)

The probability of being in a certain state should be driven by external factors that do not depend on the speaker or hearer, so the average utility is the sum of the utility of the strategy in each state weighted by the probability of each state. To take contexts into consideration for disambiguation, van Rooij (2004a) enriches the game theoretic approach to resolve ambiguous linguistic forms by means of a context. A context is a distribution of probabilities over states such that a $C_{exo}$ has P(exo) = 0.9 and P(ana) = 0.1, while $C_{ana}$ has P(exo) = 0.1 and P(ana) = 0.9. These are roughly adapted as a quantitification of the space defined as near in a

given scenario compared to ones considered not near the speaker. This may change depending on the given language's consideration of a near context. The knowledge of probability of contexts is common ground, but only the speaker knows at a given moment what context they themselves are in. The strategies, then, are as follow:

**Table 6**

| | $C_{exo}$ | | $C_{ana}$ | |
|---|---|---|---|---|
| | **exo** | **ana** | **exo** | **ana** |
| $S_{cd}$ | dist | per | per | per |
| $S_{pcd}$ | dist | dist | per | per |
| $S_{em}$ | dist | dist | dist | per |
| $S_{cd'}$ | dist | dist | dist | dist |

$S_{cd}$ is a context dependent strategy, where the speaker uses the same form to convey both physical referents and discourse referents. $S_{pcd}$ is a partially context dependent strategy such that the speaker uses only the necessarily exophoric distal, and never the anaphoric use, in the context of $C_{exo}$. $S_{em}$ is an explicit marking strategy to convey the contexts linguistically, but keeps the same context dependence of the previous state such that all $C_{exo}$ states use the distal. $S_{cd'}$ is identical to $S_{cd}$ but uses solely the distal demonstrative instead of any other pronominal form that may be relevant for the referent.

**Table 7**

| | $C_{exo}$ | | $C_{ana}$ | |
|---|---|---|---|---|
| | **dist** | **per** | **dist** | **per** |
| $H_{cd}$ | exo | exo | ana | ana |
| $H_{pcd}$ | exo | exo | exo | ana |
| $H_{em}$ | exo | ana | exo | ana |

Since populations play the role of speaker and hearer equal amounts of the time, the game must be symmetric such that the utility is the average of a pair of speaker and hearer strategies since an individual can be both speaker and hearer. Based on the diachronic trajectory of the distal demonstrative, the four states of zero-ANAPHORIC, emergent-ANAPHORIC, generalized-ANAPHORIC, and categorical-ANAPHORIC correspond to $\langle S_{cd}, H_{cd}\rangle$, $\langle S_{pcd}, H_{pcd}\rangle$, $\langle S_{em}, H_{em}\rangle$, and $\langle S_{cd'}, H_{cd}\rangle$ respectively. The proliferation of a certain set of strategies depends on the 'replicator mutator' equation:

(41)

$$x_i' = \sum_{j=1}^{n} Q_{ji} \frac{x_j f_j}{\phi}$$

Adapted from Deo (2015)

The output of the equation is $x_i'$. This the frequency of strategy $i$ based on the payoff for $i$. The payoff is the "probability that the individual's strategy is adopted by another player". This value comes from the average utility matrix of each strategy combination possibility, which comes from the utility function defined above. The other consideration for the strategy's frequency is the average population fitness $\phi$ before that moment in time, or the overall population's willingness to adopt any strategy. This value is the weighted average of the payoffs of the strategies at the current time-step. The frequencies begin with only the contextually dependent hearer and speaker strategy as frequent with a value of 1 and every other strategy with a value of 0. As the time-steps progress the frequencies change based on the payoffs of strategies. The mutation probabilities, $Q_{ij}$, are adapted from the experimental data. The Q values are as follow:

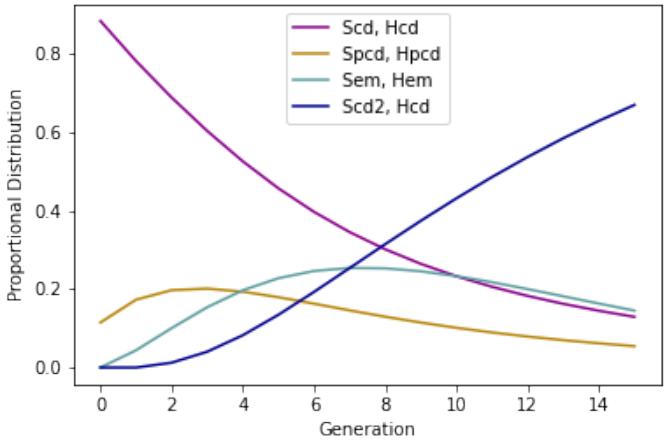
**Table 8**

| | $S_{cd}, H_{cd}$ | $S_{pcd}, H_{pcd}$ | $S_{em}, H_{em}$ | $S_{cd'}, H_{cd'}$ |
|---|---|---|---|---|
| $S_{cd}, H_{cd}$ | 0.885 | 0.115 | 0.0 | 0.0 |
| $S_{pcd}, H_{pcd}$ | 0.0 | 0.619 | 0.381 | 0.0 |
| $S_{em}, H_{em}$ | 0.0 | 0.0 | 0.734 | 0.266 |
| $S_{cd'}, H_{cd'}$ | 0.0 | 0.0 | 0.0 | 1.0 |

Each value $Q_{ji}$ represents the probability that the strategy $j$ will mutate into the strategy $i$. Each row has two values, one for the current state and one for the next state along the strategy clines. This reflects the unidirectionality of grammaticalization clines and the inability to skip from one step to a nonconsecutive strategy. A row sums to 1.0. The first row is a relatively arbitrary decision for the value for how 'sticky' the original use of the demonstrative pronoun is for use in exophoric contexts to refer to only physical entities. I chose a value of 0.885 for the probability that the strategy will maintain, but this can be anything with a similar output with the only variation in the amount of time the grammaticalization process occurs. The other values are taken directly from the mean naturalness ratings, or acceptability individuals rate each strategy, from the above experiment. The final row represents the complete adoption of the final step of the grammaticalization process as we have considered it, since there is no next step modelled.

In modeling this Evolutionary Game Theoretic model, we were able to simulate the proliferation of the distal demonstrative into anaphoric contexts where the speaker knows they are in an anaphoric context and conveys the distal demonstrative:

**Figure 5**




In this grapical representation of the continued adoption of new strategies, the y axis represents the proportional distribution of a population adopting a certain mutual strategy. The x axis is labeled generation as adopted from Deo (2016) as an abstract view of time series for a language change. It does not map identically to generations of people, but represents a more abstract idea of generations of a language as it evolves over time in meta-generations linked to human generations.

This model is convincing in portraying the discourse as a series of strategies for referencing objects in the context. It shows the overall trend of speakers and hearers choosing coordinated strategies of communication to meet at a mutual understanding of a referent in a context and a state. The implementation of the Evolutionary Game Theory model highlights the diachronic tendency for the grammaticalization pathway as different strategies rise and fall over time before the final outcome persists.

## 5.4 Model Success for Demonstratives

The Evolutionary Game Theory model extends exceptionally well to the study of demonstratives in their grammaticalization pathways. The model's use of the replicator mutator dynamic, as well as the interaction between speaker intention and hearer interpretation closely mimic the Rational Speech Act model Goodman and Frank (2016). This probabilistic interpretation of conversational dynamics in which the most likely semantic candidate for join speaker and hearer mutual intelligibility is chosen as the winning conversational output for meaning is parallel in methodology with the EGT model. The purpose of the EGT model is the continual mutual understanding of the speaker and hearer with the added element adopted from evolutionary biology of the fitness of an utterance. This fitness determines the likelihood that other speakers will adopt the utterance they hear in a certain context the next time they communicate a similar proposition.

The demonstrative pronoun definitions we have proposed in this paper naturally encode a sense of fitness for replication in myriad contexts because of the markedness asymmetry between the two demonstratives. Since the distal demonstrative is less marked than the proximal demonstrative for a locational encoding feature, the distal

is more fit for replication in contexts beyond deictic and distal reference. Speakers can better anticipate a mutual understanding of a certain reference with the distal demonstrative in more locations than the proximal demonstrative because of the success of their previous conversations with the distal used in many contexts. This is replicated so that the distal semantically changes its meaning over time to encompass more elements on Diessel's cline of demonstratives than the proximal demonstrative does. The model shows peaks of frequency for other demonstratives in their increased usage over time, since there is not a complete breakdown of mutual understanding with use of the proximal in less locationally constrained contexts, but the replicator mututator dynamic of these uses is degraded compared to that of the distal demonstrative used in more contexts. The Evolutionary Game Theory model works well to mimic the changes in proportional distribution of various demonstrative pronouns in comparison to each other.

# 6 Conclusion

The grammaticalization clines of demonstratives to functional items are well-documented in the literature, but there has remained a gap in complete comprehension of the process as to why it is the case that distal demonstratives more readily grammaticalize towards copulas, pronouns, definite articles, and complementizers in bipartite exophoric systems. This paper is an attempt to bridge the gap in semantic literature between grammaticalization typologies and synchronic understanding of demonstratives. Through our experimental testing of the synchronic extension of demonstratives as a gateway into its diachrony, we formulated a new definition of the proximal and distal demonstratives such that the proximal demonstrative is more marked than its distal counterpart. With an extra feature restriction for the proximal demonstrative, the less marked demonstrative–in this case the distal–ought to grammaticalize toward a functional item more easily. The experimental format also served as a diagnostic for a language's synchronic positioning along the grammaticalization cline.

The experimentally supported definition of the demonstrative developed in this work has expansive implications on potential models for grammaticalization. The Evolutionary Game Theory's approach to language change, previously focused on the verbal domain in the literature, can help model the proliferation of the distal demonstrative as an anaphor as well as an exophor. It serves as an important model of the interlocutors' reasoning about meaning in synchronic language use, which can prime and motivate diachronic pathways for change. Since semantic bleaching and extension of lexemes into new contextual uses are made available by reanalyses, the strategies that interlocutors take in the synchronic form of a language are crucial in understanding the extensions possible.

It would be beneficial to expand this line of inquiry regarding grammaticalization of demonstratives into languages with tripartite or more systems to test the markedness of the medial demonstrative, which tends to grammaticalize most frequently in those languages. Additionally, the computational methods implemented here would aid in any study of grammaticalization clines as a modeling and prediction technique. Work in computational approaches to demonstrative pronouns and semantic change are less prolific than those in the VP domain. Future work in developing this literature would be welcome.

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