

# **Foreigner Directed Speech:**

**Its role in Cultural Transmission of Language  
& the resulting effects on Language Typology**

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## **Abstract**

Language is shaped by the cognitive biases of its learners (Christiansen & Chater, 2008). Correlations in recent work (Lupyan & Dale 2010) have found that languages with larger speaker populations are more likely to use lexical strategies than morphological ones. These correlations have been hypothesised by several recent works to be due to the different biases of adult and child language learners. The experimental work which has been done looking at the differences between adult and child learners however is often contradictory or vague. This dissertation will demonstrate that other factors are at work which explain the correlations found by Lupyan & Dale (2010). These include the role of accommodation to second language speakers. The current work uses a novel experimental paradigm using an artificial language within a communication task. It is demonstrated that lexical strategies are adopted by participants who are told that their interlocutor has been taught a slightly different dialect to the one which they were taught, but only if the first speaker in an interaction initially uses a lexical strategy. It is concluded that foreigner directed speech needs to be considered as a factor which affects the amount of lexical strategies used within a language with a large proportion of second language speakers.

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## **1. Introduction**

In the past much of linguistics has been constrained by a framework which concentrates on the universal properties of language (Chomsky, 1981). Much recent work has ventured to instead view language as a more functional entity which is malleable and affected by communicative and social pressures. These opposing perspectives have created different views and ideas about the origin and evolution of language. These are largely divided by the importance given to the biological evolution of structures which give rise to language in the brain, against the effect of cultural evolution as the primary driving force behind the structure of language (Dunn et al. 2011).

All natural human languages lie on a typological continuum between being highly agglutinative or highly isolating. That is either being highly dependant on either morphological strategies or lexical strategies respectively. In most cases the same grammatical function can be served by either a morphological or lexical strategy within natural language, posing the question of why both strategies are available, and why different languages adopt different ratios of these strategies. Such questions are also of evolutionary relevance, since having two functionally identical systems is somewhat maladaptive given that one system would be sufficient.

Wray & Grace (2007) propose that the structure of a language is dependent of the social structure of the population who speak it. Demographic features which have been found to correlate with linguistic structure include language population size, how isolated a language is, geographical spread of language and the ratio of second language (L2) speakers to first language (L1) speakers (Lupyan & Dale, 2010). It is proposed that all of these features contribute to a language being either within an 'esoteric' niche or within an 'exoteric' niche (Wray & Grace, 2007, Lupyan & Dale, 2010). The linguistic structures which were found to correlate with these demographic features were all measures of morphologically complexity, showing that the cultural dynamics of a language affect where a language lies on the continuum of morphological complexity. However, the large network of social factors which possibly contribute to the correlations found by Lupyan & Dale (2010) is hard to

dissect. Work is needed to discover the causative relationships between social and linguistic features. This dissertation aims to review the work that has been done to try and disentangle these complex relationships as well as adding to the work with a novel experiment.

This paper will first introduce concepts relevant to the argumentation and experiment presented within this study. These include demographic features of languages (section 2.1), lexical and morphological strategies used in language (section 2.2) and audience design effects (2.3). The dissertation will then cover relevant past research which incorporates these concepts. This work will include a brief review of literature covering historical trends in morphological features (3.1) and also literature exploring the role of language acquisition in the evolution of language (3.2). Past experimental work will then be covered (section 4) before a new novel experimental paradigm will be introduced which aims to look at how accommodation to second language speakers contributes towards language typology (section 5). The results and conclusions of this experiment will also be presented with explanation of how the results contribute to the body of work covered within the dissertation (section 6).

## **2. Relevant Concepts**

### **2.1 Demographic Features of Languages**

#### **2.1.1 Esoteric and Exoteric Niches**

The majority of the world's languages are spoken by only a very small number of people. Lupyan & Dale (2010) outline this point by demonstrating that the median number of speakers for the languages found on the Ethnologue (Gordon, 2005) is 7,000 speakers whereas the mean number of speakers is the much larger figure of 828,000. Languages can be demographically characterised by how many speakers they have and the size of a speaker population is one of the many defining factors which categorises a language as being in either an exoteric or esoteric niche.

The terms esoteric and exoteric were first used in relation to language by Thurston (1987). In recent years it has been adopted into the field of evolutionary linguistics

and language typology by Wray & Grace (2007). Esoteric literally means ‘within an inner circle’. Languages in an esoteric niche are spoken in a small population. The populations who speak esoteric languages are often isolated. Lupyán & Dale (2010) define esoteric languages as languages with a small population, a small geographical spread and a small number of language neighbours. Languages in an exoteric niche are the opposite and spoken in large populations with a large geographical spread and a large number of language neighbours.

### **2.1.2 Correlations between Language Demography and Structure**

The world’s languages exhibit incredible diversity. A large portion of this diversity may be down to random drift in the cultural transmission of language. However, cultural factors beyond drift are also at work in affecting the differences in linguistic structure seen throughout the world. Many attempts have been made to establish links between the structure of society and the structure of language. Features which have been found to have an effect on the structure of a language have even included physical features of the environment including plant-coverage and amount of mountainous terrain which were found to correlate with the amount of sonority in a language (Ember & Ember, 2007).

The body of work dealing with connections between language demography and structure have largely dealt with phonological features of languages. Robust findings include Hay & Bauer (2007) who found that population size and phoneme inventory size correlated. Some work, which is reviewed below, is starting to emerge which looks at morphological and syntactic features.

#### **2.1.2.1 Statistical Studies**

Lupyán and Dale (2010) apply a statistical analysis to test the idea that demographic features affect the morphosyntactic features of the world’s languages. The paper investigates three variables which contribute to a language being in an exoteric or exoteric niche (population size, language contact, geographical area of language).

These were found to correlate positively with the use of morphological strategies such as size and complexity of case systems.

The three variables used as predictor variables by Lupyan & Dale (2010) are not independent of each other. It is easy to understand why this independence is present as a larger population will increase the geographical area which will increase the number of language neighbours. Lupyan & Dale (2010) do not propose that the correlations found are the factors which directly cause linguistic structure. The authors instead propose that these factors contribute to a 'linguistic niche' in which certain cultural dynamics work to create an environment in which different linguistic structures will emerge.

A statistical approach looking at links between demographic and linguistic structure is also taken by Bentz & Christiansen (2010). The most popular word-order among the world's languages is SOV (subject object verb). If however one looks at the number of speakers rather than number of languages who adopt each word-order then SVO is the most popular with more than double the speakers of SOV languages. This trend shows that languages with larger populations are more likely to have SVO word order. These findings complement Lupyan & Dale's (2010) nicely as SVO languages are much less likely to have a structural case-system (Bentz & Christiansen, 2010).

## **2.2 Lexical and Morphological Strategies**

Morphological strategies are those which convey information through the use of inflectional morphology. Lexical strategies are those which use devices other than inflectional morphology such as word order and lexical constructions. Most functional devices in language can be expressed with either morphological or lexical strategies and these can include number, tense, aspect, negation and case among many others. Whether a language used either the morphological or lexical strategies for these functional items was what was found to correlate with demographic features by Lupyan & Dale (2010).

Due to morphological and lexical strategies being functionally analogous there are contrasting views within the linguistic community as to whether a distinction between syntax and morphology is necessary. Several linguists have tried to argue that there is only one level of grammatical patterning (Selkirk 1982, Lieber 1992). However, as Carstairs-McCarthy (2010) points out there are analytic devices which have no application outside of morphology such as impoverishment, fission and fusion. A distinction between highly agglutinative languages and isolating languages also exists (section 2.2.1) and this relies on a distinction between morphology and syntax. This dual level structural system in language causes a problem for the evolutionary linguist due to its maladaptive nature as it is hard to imagine how a system with only one level of grammatical processing would not be adequate.

There are already some theories as to why there are different strategies to encode the same ideas within language. Carstairs-McCarthy (2010) makes a proposal about why a distinct level of structure would have evolved from a presyntactic 'protolanguage' of the type proposed by Bickerton (1990). He proposes that morphology is a result of effects of allomorphy in frequently co-occurring lexical items within this protolanguage competing with the pressures of synonymy avoidance. This theory assumes that morphology is merely a 'fossil' of pre-syntactic language.

The correlations found by Lupyan & Dale (2010) show that social factors can affect the extent to which lexical or morphological strategies are used within a language. These correlations need to be taken into account when trying to make sense of the presence of both syntax and morphology. The social factors explored within this dissertation could pose some possible solutions to explain why these dual levels of patterning exist or explain why they have persisted within language. If the evidence suggests that morphological and lexical strategies fulfil the needs of different social niches then it can be argued selection for these strategies works on the level of cultural evolution. If both morphological and lexical strategies exist to meet the demands of shifting social dynamics then this would explain why both need to be available to the human brain.

### **2.2.1 Agglutinative and Isolating Languages**

Agglutinative languages are those which use inflectional morphology extensively rather than use lexical strategies. These morphologically complex languages are hypothesised to be over-specified in terms of the amount of information they encode. Generally, if a language has a way to encode something morphologically, for example remoteness being marked on a verb, then this will have to be obligatorily specified (Lupyan & Dale, 2010). Isolating languages are languages which use more lexical strategies. If a language uses a lexical strategy to encode some functional item then this will most likely be optional. This over-specificity in agglutinative languages means that utterances in these languages are more likely to be context independent. This trend creates a problem for some suggestions by Wray & Grace (2007) who propose that languages spoken by smaller populations (esoteric languages) will have languages which are less context independent as the small groups which speak these languages will know each other and their environment so well that their language will not need to encode as much information. The correlations found by Lupyan & Dale (2010) found that esoteric languages are in fact more likely to be agglutinative and therefore more likely to be over-specified. The differences seen in these languages cannot therefore be driven by the extent to which these languages can rely on context.

Why complexity beyond communicative needs might emerge is an evolutionarily relevant problem in linguistics (Gil, 2009). Obligatory morphemes which express things such as remoteness are a prime example of complexity beyond what is communicatively necessary as this information will not always be useful, so why should it be obligatory? Many of the world's languages manage just fine without it. Evolutionary Psychologists (Griskevicius et al. 2006, Miller 2000) have argued that over-specification in language is the result of sexual selection. More complex linguistic constructions may show cognitive fitness which will attract mates. Sexual selection serves as another possible explanation for the differences in the prevalence of morphological strategies in some language populations if one was to argue that smaller populations have a greater prevalence of sexual selection. In fact, it is the case that small population size means that sexual selection has less of an effect as there are fewer mates for individuals to choose from and random drift is more likely to determine the fate of new linguistic strategies/genes (Whitlock, 2000). This shows

that these trends in complexity are probably not the result of sexual selection. Also, argumentation that linguistic complexity is the result of sexual selection also requires the assumption that different genes are at the root of different linguistic complexity in different populations. However, a baby taken from any population in the world will be able to learn any language of any population suggesting that linguistic genes are universal. It is possible that selection for complexity is however occurring on the level of cultural evolution.

### **2.2.2 Regular and Irregular Strategies**

The correlations presented by Lupyan & Dale (2010) represent complexity as being the amount of morphological strategies taken as opposed to lexical ones. This distinction creates clear-cut binary data which other measures of complexity would not be able to achieve and allows the data be used in a statistical analysis. However, when presented as evidence which supports the ideas of Wray & Grace (2007) this distinction between morphological and lexical strategies becomes a problem. Wray & Grace (2007) do not refer to lexical and morphological strategies but instead to regular and transparent strategies in opposition to irregular and idiosyncratic strategies. This disparity has raised some confusion within the literature and so I aim here to quickly clarify the relationships between these terms.

Morphological strategies are used synonymously with irregularity within the literature as morphology often gives rise to irregularity. Morphology creates a larger opportunity for phonological compression as, by definition, an affix needs to be phonologically bound to a stem in order to be considered an affix rather than a separate lexical item. This morphologicalisation creates a greater probability of sound change in affixes which will obfuscate the mapping between the original form and meaning and will give rise, over time, to a much more irregular and idiosyncratic system (Lupyan & Dale, 2010). Jackendoff (1999) also supports the hypothesis that morphological strategies are more likely to create irregularity, though with much less justification, simply stating that “inflection lends itself to a great deal of idiosyncratic irregularity; phrasal syntax much less so” (p. 278).

## **2.3. Audience Design Effects**

Audience design (Bell, 1984) is the theory that an individual's speech-style will change by way of accommodating to their interlocutor.

### **2.3.1 Child Directed Speech**

Child directed speech is probably the most thoroughly studied of all audience design effects. It is the speech patterns used by adults when talking to babies or toddlers. Child-directed speech is often thought to be useful in facilitating the acquisition of language in children. Its syntactic simplicity and its sing-song prosody allow for the bootstrapping of syntax and the conveyance of linguistic phonological information through hyperarticulation (Uther et al. 2007).

### **2.3.2 Foreigner Directed Speech**

Foreigner directed speech (FDS) is used when a native speaker addresses an L2 learner. It is a morphologically much simpler and much more regularised version of the language it is born from (Ferguson, 1971, 1975). Ideas of foreigner directed speech can be dated back to Goodman (1964) who states that "the Europeans deliberately and systematically simplified and distorted their language to facilitate communication with the non-Europeans" (p. 124).

It is much less studied than child directed speech. The few studies which have been done have drawn parallels with child directed speech which suggests that foreigner directed speech may also serve the primary purpose of facilitating learning in those it is aimed at (L2 learners) as well as facilitating communication. Uther et al. (2007) compared the linguistic features of child-directed speech to the same features in speech directed towards L2 learners of English. The study found that both child-directed speech and foreigner directed speech had hyperarticulation of vowels showing that features which facilitate the acquisition of language are shared between these registers. These features also include syntax. Long (1981) showed that adult native English speakers use different syntactic and morphological structures when speaking to L2 speakers than when speaking to other native speakers. Long (1981)

concludes that since the analysis was done on a relatively small corpus, a much larger analysis needs to be done comparing native-speaker to native-speaker with native-speaker to non-native speaker discourse. This research has so far been largely neglected.

### **3. Relevant Research**

#### **3.1 Historical Trends in Morphological Features**

Christiansen & Chater (2008) propose that the shape of today's languages is the result of transmission of language from one generation to another. This transmission means that features in a language must be learnable in order to be successful. The human brain has biases with regards to which features are more learnable than others and these small cognitive biases will therefore have an impact on the shape of the language. It is possible to observe the processes of small cognitive biases affecting language transmission by observing the historical trends of language. This has been done by several studies, not only in observing trends such as grammaticalisation to explain the prevalence of morphology in the world's languages (Heine & Kuteva, 2009), but also in the opposite of grammaticalisation as explored by the likes of Bentz & Christiansen (2010) who found trends in the loss of case systems in romance languages.

These trends are relevant to the current study as the result of grammaticalisation is highly agglutinative languages. Theories exploring the causes of grammaticalisation are therefore also theories as to what makes a language an agglutinative one.

##### **3.1.1 Grammaticalisation**

Grammaticalisation is the trend of less functional morphemes or words becoming more functional. Grammaticalisation is often seen to be the result of processes driven by items being frequently used together, as Bybee's (2002) linear fusion hypothesis states, those "items used together, are fused together". Traugott's (1982) unidirectional hypothesis states that grammaticalisation is the natural direction for language change. Whilst some counterexamples to grammaticalisation exist these are

largely outnumbered by the number of examples which conform to the principle (Haspelmath 1999).

An example of grammaticalisation is postpositions in Hungarian becoming syntactically indistinguishable from case-markers (Asbury 2005, Kiss 2005). What distinguishes postpositions and case-markers from one another is that postpositions are presented orthographically as separate words, they do not undergo vowel harmony and derivational suffixes can attach to them but not to case-markers.

In Hungarian the distinction between postpositions and case-markers is a blurry one. Asbury (2005) has hypothesised that some postpositions are becoming case-markers. However, ongoing change is not an easy thing to prove when presented only with synchronic data but as many as ten case-markers in modern Hungarian are known to have once been postpositions (Spencer 2008). This historical shift is thought to be the result of the weak prosodic status of both postpositions and case markers (Kiss 2002, Kabak 2006). Postpositions also meet the conditions that allow the linear fusion hypothesis to occur in that there is no determiner that intervenes between the postposition and the noun (Kabak 2006). Kabak (2006) also hypothesises that it is the postpositions which follow nouns not featuring case-markers which have a greater chance of turning into case-markers themselves. This theory is supported by the fact that all case-markers that are known to have once been postpositions once assigned no overt case suffix to the noun they modified. Almost all of the literature on the trends seen in Hungarian focuses on there being structural reasons for this historical shift. A lot of these structural mechanisms hint at a unidirectional trend in language. There is no theoretical equivalent to the linear fusion hypothesis (Bybee, 2002) which describes the opposite trend to grammaticalisation.

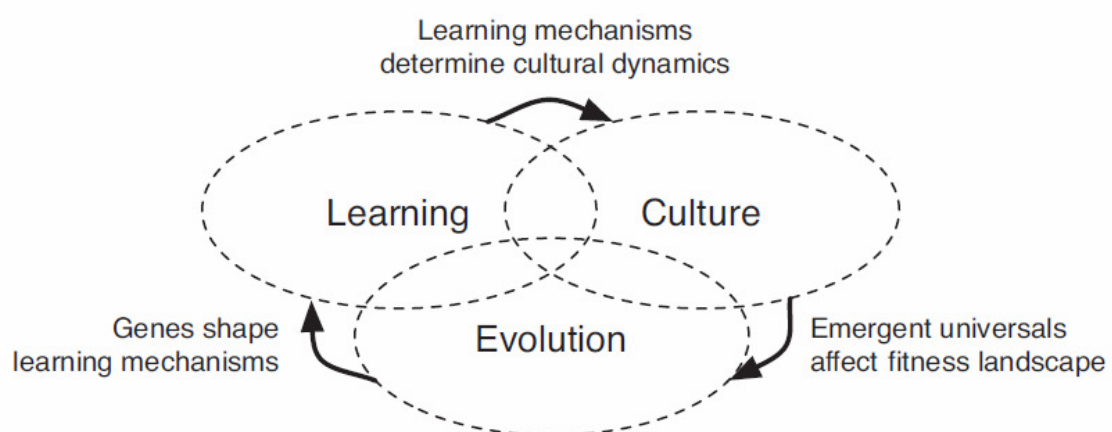
### **3.1.2 Degrammaticalisation**

There is a lot of dispute as to what extent language change is the result of universal principles such as grammaticalisation and to what extent they are due to the social factors such as language contact (Heine & Kuteva 2003).

Bentz & Christiansen (2010) present a very salient example of language change in the opposite direction of grammaticalisation. Romance languages which are derived from Latin lose the flexible word order present of Latin (with a dominant OV structure) to the more common SVO word order found in modern romance languages. This change in word-order is also correlated with the loss of the case-system of Latin as word-order is a functional substitute for structural case-markers. Bentz & Christiansen (2010) argue that this degrammaticalisation has occurred because the cultural dynamics of these languages have changed. How cultural dynamics can affect language change will be addressed in the next section but the example of romance languages at least shows that unidirectional theories of grammaticalisation which rely on things such as structural co-occurrence of lexical items must be at least partially subject to outside factors.

### 3.2 The Role of Language Acquisition in the Evolution of Language

Language acquisition plays a key role in the study of the evolution of language. The imperfect learning of languages is what allows for selection of features which survive to the next generation. A language has to be learnable in order to be transmitted. Constraints on acquisition will therefore have an affect on what parts of a language which get passed on to the next generation.



**Figure 1. From Kirby et al. (2007)**

Figure 1 shows the position which learning has in the ongoing evolution of language. It shows the learning process of language or other cultural mechanisms feeding into

the dynamics of that culture. It is these cultural or linguistic dynamics which invariably have an effect on an individual's fitness which in turn will affect the genes and cultural/linguistic features which get selected.

Goldin-Meadow (2003) observed that cross-linguistically all children follow the same general pace and patterns when acquiring language. They all generally acquire lexical categories and grammatical complexity in the same order. However, after children have got past a certain age and out of the "critical period" for acquiring language they find it much more difficult to acquire language (Newport et al. 2001). It is after this critical period that different language learning strategies are adopted. Adults do not follow the same language learning patterns and find it difficult to adapt to the differences between the world's languages while children do not.

Some have proposed that the difference in adult and child learning is down to the different types of memory available to adults and children (Paradis, 2004). Human memory is made up of two different types of memory, declarative memory and procedural memory. Declarative memory is memory which can consciously be recalled and procedural memory is more unconscious and related to skills and repeated actions (Ullman, 2004). Children are more proficient in procedural memory and adults, declarative memory.

Differences in the way adults and children learn language may have an impact on language typology as language changes depending on the cognitive abilities of those who speak that language (Christiansen & Chater, 2008). Therefore language change will be dependant on the number of adult second language learners a language has against the number of native child learners. This is a hypothesis used to explain some of the correlations seen between demographic and typological features of languages (Wray & Grace, 2007, Lupyan & Dale, 2010, Bentz & Christiansen, 2010).

### **3.2.1 The Effects of L2 Learners on Language Typology**

Trudgill (2001) proposes that languages which have had more contact with other languages will be more learnable by adult learners. Languages with a large amount of

language contact, such as creoles, are therefore subject to being shaped by L2 learners or, as Trudgill (2001) so eloquently puts it, "complexity disappears as a result of the lousy language-learning abilities of the human adult" (p.372).

Lupyan & Dale (2010) use their 'linguistic niche hypothesis' to propose that the propensity for languages within an exoteric niche to use lexical strategies can be accounted for due to a large number of adult second language speakers within these language populations. Languages with larger speaker populations and more language neighbours (two of Lupyan & Dale's (2010) predictor variables) will have a large number of L2 speakers. The authors claim that L2 learners, who are most often adults, have learning biases which predispose them to regularise the language they are learning where complex morphological paradigms exist (Klein & Perdue, 1997).

Bentz & Christiansen (2010) also hypothesise that the historical trends they found between Latin and modern romance languages are the result of the constraints in the acquisition abilities of L2 learners. The growth of Latin to become Europe's *Lingua Franca* caused Latin to grow from an esoteric language to become an exoteric one and, as a result, subject to a large volume of L2 speakers. Comprehension in L2 learners can be achieved by parsing only part of an utterance. Production can only be achieved by having the proficiency to code an entire utterance. They argue that the gap between the comprehension and production capabilities of L2 learners will cause a bottleneck which will create regularity.

Bentz & Christiansen (2010) also claim that languages which are not SVO will be harder for L2 learners to parse. Subject-verb agreement will not appear on concatenated items causing a bigger strain on memory. Word-order, and SVO in particular, will be 'selected' over structural case markers where memory constraints exist.

Differences seen in the acquisition of morphological or lexical strategies in adults and children could be down to the differences in declarative and procedural memory mentioned earlier. There are known connections between these different memory types and the use of different grammatical strategies. Procedural memory is thought to

be better at learning more opaque morphological and irregular inflections as it is good at learning individual forms. Declarative memory is much better at rule based inflections and lexical strategies (Hartstone & Ullman, 2005).

### **3.2.1.1 Audience Design Effects and Language Acquisition**

Long (1981) showed that it is paramount that we consider foreigner direct speech (FDS) which considering second language acquisition. The telegraphic language production by children and L2 adult learners may be down to the telegraphic input from current adult speakers of that language. This idea can be seen in the literature from as early as Ferguson (1964) who suggested that simplicity of child directed speech accounts for the development seen in a child's linguistic development. This simplicity includes such features as omitting the copular, prepositions, articles and inflectional endings. In a later paper, Ferguson (1971) argues that the grammatical simplification seen in FDS could contribute to the universal features seen in pidgins and creoles as a result of this FDS in their development in situations of language contact.

Given the link between FDS and the facilitation of acquisition in L2 learners then within a population with a large number of L2 learners, FDS should have an effect on the structure of that language. If FDS is presented as input to L2 learners then the language spoken by those L2 learners will mirror the features of FDS. Given that FDS is generally thought to be morphologically much simpler then FDS is a good explanation as to why languages in exoteric niches, with large L2 populations, are morphologically much simpler.

Wray & Grace (2007) mention FDS as a possible contributing factor to communication within exoteric niches. They state that "engagement by adult learners with the language will lead to unconscious and/or conscious strategies on the parts of both learner and native speaker to effect the regularisation of irregularities... [this will] serve the needs of non-native to native, or non-native to non-native, communication." (p.557)

### **3.2.1.2 Problems and Future Work**

Assumptions made in some of the studies reviewed here rely on there being a correlation between size of population and number of L2 learners. This is a well founded assumption given that the larger the population is the more attractive that language should be to learn as a second language. Larger language populations will also cover a larger geographical area which will increase the number of language neighbours that language has and therefore increase the amount of language contact. However, a number of counter-examples exist to this general trend. These include Japanese which has a large population of speakers but a very small percentage of these are L2 speakers (Lupyan & Dale, 2010). Whilst counter-examples are few and far between it is still worth taking note of these and analysing them independently to see if they fit with theories which rely on L2 learners being the driving force behind language typology. Whether these counter-examples are linguistically more similar to languages within esoteric or exoteric niches could tell us a lot about the causative effects between population size and language typology. This analysis would be interesting for future work but is outside of the purview of this dissertation.

Statistical and historical studies also suffer from demographic data on most languages not being well documented until recently. There are also events and anomalies which will affect the data and make it hard to disentangle. These include colonisations, occupations and invasions. Smaller scales studies need to be done in the form of experimental work.

## **4. Experimental Work**

Wray & Grace (2007) originated a lot of the ideas which relate adult learning to current trends seen in language typology. Whilst their proposals are largely theoretical, they did provide some evidence for their claims. This section will provide a review of the evidence put forward by Wray & Grace (2007) as well as covering other relevant studies and what these can tell us about the differences between child and adult learning. Some iterated learning experiments will also be reviewed as these provide evidence more relevant to the evolution of language.

## **4.1 Case Study**

The learning biases of children are covered in Wray & Grace (2007). Whilst the authors claim that adult learning abilities are important in shaping the languages used by populations with large numbers of L2 learners (exoteric languages) so too are the learning abilities of children important in shaping languages spoken by mostly native L1 speakers (esoteric languages). Children's ability to uphold morphological complexity is therefore as important as adult learner's tendency to regularise it if attributing typological trends of a language to the learning biases of those who speak it.

Wray & Grace (2007) specifically look at a case-study of some children who were 'native' speakers of Esperanto (Bergen, 2001). Esperanto is an artificial language which is completely regular and doesn't have any unpredictable variability. Bergen (2001) found that the language that the children produced displayed a loss of the accusative case and also displayed attrition in the tense system. Wray & Grace (2007) suggest that this explains patterns of irregularity seen in esoteric communities as children are so blind to the obvious regularity of Esperanto. However, it may not be as straightforward as they suggest. Based on the correlations found by Lupyan & Dale (2010) and Bentz & Christiansen (2010) there is strong evidence to indicate that esoteric conditions are going to display more morphological strategies in their languages which is the opposite to the biases the child learners of Esperanto are displaying. The children are rejecting morphological strategies in favour of attrition and word order. The findings of Bergen (2001) also indicate that children are not likely to uphold morphologically complex systems if they are not even upholding a relatively simple one. The results found by Bergen (2001) show trends inconsistent with the hypotheses born from the historical and statistical data which claim to support Wray & Grace's (2007) ideas. This disparity casts some doubt on either Wray & Grace's (2007) arguments or the validity of Bergen's (2001) case-study.

One problem which may exist with Bergen's (2001) study and Wray & Grace's (2007) interpretation of it is that the children may have had an inconsistent input. Although Bergen (2001) tested the adults giving the input to see if they were aware of how the accusative should be used, this is not evidence to suggest that they constantly

used it in the correct manner when producing the input that the children received. The trends found in this study are also inconsistent with findings from experiments such as Singleton & Newport (2004) and Hudson Kam & Newport (2005) who suggest that children play an important role in creole formation by regularising inconsistent grammatical patterns. This experimental evidence will be explored in the next section.

Bergen (2001) is the only evidence Wray & Grace (2007) present of children increasing the complexity of a language. This lack of evidence greatly weakens their hypothesis that language change in the direction of complexity should be the result of child learners.

## **4.2 Artificial Language Learning Experiments**

Artificial language learning experiments were first devised by Esper in 1925. They consist of a created, artificial mini-language which participants are trained on and then tested on. Artificial languages are most often used by linguists to investigate things such as statistical learning abilities and other problems of acquisition (Gomez & Gerken, 2000). They have been used in the past to examine the learning abilities of both human participants and non-human primates (Fitch & Hauser, 2004). They can be used to test how individual groups acquire and use language and also how language acquisition can affect things such as the transmission of language through the use of iterated learning experiments. They can also be useful in studying language contact situations and the emergence of creoles.

Artificial language learning experiments are useful in testing theoretical assertions such as those proposed by Wray & Grace (2007), as one can examine learning biases in an isolated context. Experiments in the lab also allow for manipulation of factors which affect these learning biases.

### **4.2.1 Differences between Adult and Child Learning**

Artificial language learning experiments which look at the differences between adult and child learning abilities are obviously relevant to the debate of whether L2 learners affect language typology.

There is some evidence to suggest that adult learners preserve irregularities and idiosyncrasies, while children are more likely to regularise. Studies which have addressed these problems include Hudson Kam & Newport (2005). This study attempted to address questions relating to creole formation by exposing both adults and children to two artificial languages, specifically focusing on the role of regularisation. Regularisation is defined here as consistent production of a grammatical feature when inconsistent input was given. The initial language used in the experiment contained inconsistent presence of determiners which is a linguistic feature present in pidgins and the early stages of creole formation. It was found that when adults are exposed to inconsistent input, they tend to reproduce these inconsistencies in their output; children on the other hand tend to regularise the language through generating patterns that are different from the initial input and consistently omitted or produced determiners.

Hudson Kam & Newport (2009) show in a different study that child learners of an artificial language will regularise unpredictable irregularity and adult learners will regularise unpredictable variability but only if that variability exists above a certain level of scatter and complexity. These results show the opposite to what would confirm the hypotheses of Wray & Grace (2007) which would indicate that child learners should uphold irregularity and adults should regularise. However, these results are not necessarily evidence against an explanation for the correlations found by Lupyan & Dale (2010) based on L2 learners as the features used in Lupyan & Dale's statistical analysis were morphological and lexical strategies rather than the regularity in the use of grammatical features of a single level of patterning.

The connection between regular and irregular strategies, and lexical and morphological strategies is a well founded one as discussed in section 2.2.2. However, argumentation can get quite muddy when considering experimental evidence where subjects have been tested using a distinction between a regular versus an irregular strategy rather than a lexical versus morphological one. This disparity creates the question of whether the experimental evidence presented here, which does not overtly address lexical and morphological strategies rather than regular and irregular inflection patterns, should be relevant to the issues raised in this dissertation. The

experiment presented in the present study implements morphological and lexical strategies in an attempt to make the results more relevant in explaining the typological trends seen in Lupyan & Dale (2010).

#### **4.2.2 Cultural transmission Experiments**

Techniques used in artificial language learning experiments as well as iterated learning experiments can be useful in looking at the cultural transmission of language.

Iterated learning experiments using diffusion chains were first carried out by Bartlett in 1932. These experiments use a Chinese whispers style paradigm. An individual learns some cultural behaviour which they then demonstrate to another individual to learn who then demonstrates it to another individual and the whole process is repeated over and over. This process can be used to model processes in the cultural transmission of language. Kirby, Cornish & Smith (2008) used a small artificial language within an iterated learning paradigm. The language is taught to a participant who is then tested on it and their output is taught to the next participant. Kirby, Cornish & Smith (2008) found that an initial completely random language, when put through a diffusion chain, and under pressures of expressivity, will become structured.

The language which emerges in Kirby, Cornish & Smith (2008) exhibits structure on a single morphological level. This single level of grammatical patterning is probably the result of single words expressing whole propositions within the starting language. There was also little time for the language to adopt lexical strategies within the ten generations each chain was given. The use of these iterated learning experiments to look into issues of cognitive biases towards morphological or lexical strategies would be worthwhile and illuminating. By iterating two languages, one purely agglutinative and the other purely isolating, one can observe to what extent each of these languages is either subject to grammaticalisation or degrammaticalisation. This process will reveal whether biases towards synthetic or analytic outcomes are stronger with regards to learnability alone. The iterated learning paradigm then allows for manipulation of variables which might affect the structure in the final language. By altering the task in which participants take part in, several cultural constraints can be

explored. These ideas would certainly make exciting future work but is outside of the purview of this dissertation.

Smith & Wonnacott (2010) use the iterated learning model with an artificial language which initially had unpredictable use of plural markers. The experiment showed that despite there being a tendency for individual adult learners to maintain the level of unpredicted variability, as was seen in Hudson Kam & Newport (2005), when put into a diffusion chain the unpredictable variability regularised. Smith & Wonnacott (2010) suggest that this result can explain the regularisation of languages over time. While this result fits nicely with theories about adult second language learners making language more regular it does not explain why exoteric languages should be so different from esoteric ones as children are just as liable to regularise as adults, if not more so, as seen in the experiments by Hudson Kam & Newport (2005, 2009). This disparity means that it is worthwhile looking for other factors which have caused or contributed to the correlations found by Lupyan & Dale (2010) such as the high level of foreigner directed speech.

### **4.2.3 Interaction Studies**

As well as simple language learning and cultural transmission experiments artificial language learning experiments can be useful in studies looking at interaction. Roberts (2010) built an experimental paradigm which used an artificial language within an interaction task to look at the emergence of linguistic diversity. The experiment was set up as a game where participants were put into teams who played rounds where they were trading resources either with a team member or with a competitor. All participants were initially taught the same artificial language and participants' identity was hidden so that initially nobody knew if they were interacting with a team member or a competitor. Participants were awarded points based on how balanced their stock of resources was at the end of each round. Conditions were graded with regards to the ratios of how many interactions were with team members or competitors. The experiment showed that if teams are given enough interaction with their team members they were able to use linguistic cues to be able to identify each other. In the most competitive conditions linguistic diversity between teams emerged. Linguistic

markers are very difficult to acquire and maintain and, as Roberts (2010) points out, are therefore perfect social markers as they are salient and despite their high cost are reasonably flexible in order to deal with a shifting group dynamic. This experiment has shown that highly competitive situations with a high interaction frequency can create language diversity where none existed before within short time scales.

Not only are Roberts' (2010) results interesting in their own right they also show that audience design effects are relevant in the emergence of linguistic features and that these can be manipulated within an experimental paradigm.

## **5. A New Experimental Paradigm**

The sections covered so far have touched upon many subjects and whilst some of these are obviously related to each other the connections between others may be slightly obfuscated by the word count of the argument. This section will briefly try to draw everything together before adding to the body of work reviewed with the introduction of a new experimental paradigm.

The purpose of this dissertation is to explore possible social factors present within exoteric populations and how these might produce the correlations found by Lupyan & Dale (2010). Lexical and morphological strategies are the linguistic features which Lupyan & Dale (2010) find correlate with demographic features. Whilst some research has been done in exploring whether the learning biases of L2 learners could affect the level of morphological complexity within exoteric languages there is quite a few problems with the evidence which supports these claims. This evidence has been reviewed throughout this dissertation. As a result of these problems it is proposed that audience design effects, and foreigner direct speech (FDS) specifically, provide an explanation for the propensity for exoteric languages to use more lexical strategies.

An experiment is presented presently which explores the role of FDS in the use of either morphological or lexical strategies. The experiment aims to address the hypothesis that within a communication task, when interacting with a perceived foreigner, an interlocutor will adopt lexical strategies over morphological ones.

If FDS can be seen to have an effect on language typology then theories, which have been reviewed above, which do not incorporate social factors such as FDS will need to be revised. This experiment will therefore also contribute to the body of work on trends of grammaticalisation and the origins of morphology.

## **5.1 Pilot Experiment**

The aim of the experiment was to establish whether participants' perception of their interlocutor would have an effect on their use of language. Perception of one's interlocutor was hypothesised to have an effect because if participants perceived their interlocutor as speaking a slightly different dialect then they would adopt features used in foreigner directed speech.

Participants were taught an artificial language which had synonymous morphological and lexical strategies. All participants were taught the same language. However, participants were told different stories in different conditions about the dialect their partners spoke. Participants were either told that their partner had been taught the same language as themselves or a slightly different dialect.

There were some reservations in the design of this experiment about whether telling participants they speak a slightly different dialect would be enough to induce foreigner directed speech. Participants would still be aware that they'd have some common language. However, using different strategies between dialects is not inconceivable, for example a person from Scotland or the North-East of England exchanging 'dinna' to the lexicalised and more transparent 'do not' when speaking to someone from the South of England. This example shows a transparent lexical strategy used where a more opaque morphological ones exist in a regional dialect.

A pilot experiment was conducted in order to ensure that being told that their partner spoke a slightly different dialect would be enough to instigate foreigner directed speech. The number of participants in this pilot experiment is quite small as the experiment was abandoned quite early as there was a strong bias towards using morphological strategies and very little evidence that different conditions were

generating different results. The pilot experiment will be presented here first before the main experiment. All methodological changes which were made to the pilot experiment in order to rectify the problems which were encountered will be outlined in the method section of the main experiment.

## **5.1.1 Method**

### **5.1.1.1 Participants**

In the pilot experiment 16 adult participants were run in 2 conditions. 4 pairs were used in each condition. Most were postgraduate students from the University of Edinburgh. They were paid £4.50 for the 45 minutes it took to complete the experiment.

### **5.1.1.2 Conditions**

The manipulation within this experiment was what participants were told about the language their partner had been taught. In both conditions participants are taught exactly the same language. The participants were told that they were taking part in a dialect experiment. This experiment was described to participants as being to investigate how effectively two people who have been taught different dialects can communicate.

#### **5.1.1.2.1 Esoteric**

In the esoteric condition participants were told that they were in the control condition and were going to be taught exactly the same tribal language as their partner. Within this condition both participants were asked to wear the same tribal hat during the communication task in order to reinforce the knowledge that they had been taught the same language. This condition was intended to replicate situations in the real world in which speakers encounter those who they consider to be insiders and was used as a control condition to get a baseline of how often participants used lexical strategies.

### **5.1.1.2.2 Exoteric**

In the exoteric condition participants are told that they are in the experimental condition where the other participant has been taught a dialect from a different tribe, although they were in fact taught exactly the same language. To reinforce this perceived difference they are given two different tribal hats to wear during the communication task. This manipulation was intended to replicate situations in the real world in which speakers encounter those who they consider to be outsiders as their partners were presented as being from a different 'tribe'. Within this condition it was expected that participants would use more lexical strategies as these are expected in foreigner directed speech.

Participants were told that they were taught the same language after the experiment was complete in order to rectify the minor deception.

### **5.1.1.3 Procedure**

The experiment was done in two parts. The first part was the training and the second part was a communication task.

#### **5.1.1.3.1 Training**

Participants were trained on a small artificial language consisting of nouns and a small number of function words and affixes. Participants were trained individually in separate computer cubicles using the programme E-prime.

##### **5.1.1.3.1.1 Description of the language**

The language was designed to provide descriptions for a set of pictures which would be used in both the training and the communication task (figure 2). There were two ways to describe every image used, one used a lexical strategy and the other used a morphological strategy. Functional items which can be expressed using either morphological or lexical strategies in natural language were used. Case-markers and postpositions were included as these are perhaps the most salient example of where the same grammatical function can be served by either a morphological strategy or a

lexical strategy. These were used in the in the analysis of both Lupyan & Dale (2010) and Benzon & Christiansen (2010) as grammatical features which have been found to correlate with demographic features. Negative particles were also included in the language as a functional item which can be either morphological or lexical.

### 5.1.1.3.1.1 Vocabulary

*Nouns.* There were 6 nouns in the language. 2 were two syllable nouns referring to animals [liki (CAT), nimu (DOG)]. The other 4 nouns were 1 syllable nouns referring to locations [mat (GARDEN), nat (KITCHEN), gat (LIVING ROOM), tat (DINING ROOM)]. All locational nouns had an /a/ vowel.

*Inessive Case.* There were 2 ways to express the inessive case. The first way was to use a case-marker which was a suffix which attached to the locational noun [-al (IN)]. This suffix had –VC syllable structure and had an /a/ vowel. This vowel was the same as the vowel used in all of the locational nouns. This uniformity in vowels was done on purpose to serve as an implicit vowel harmony to make the affix seem more integrated with the stem. As mentioned earlier in section 3.1.1 the way that case-markers are distinguished from postpositions in Hungarian is that case-markers undergo vowel harmony. This implicit vowel harmony served to make participants less likely to parse these affixes as lexical items. This vowel harmony was kept to the use of only one vowel as to not make the morphological strategies more complex to learn than the lexical strategies. The second way to express the inessive case was to use a postposition [kik (IN)]. Both strategies could be used with any noun and were present 50% of the time in training.

*Negation.* There was also 2 ways to express negatives, one using a morphological strategy and the other using a lexical strategy. The first was to use a suffix which attached to the case-marker [-as (NOT)]. This suffix also had –VC syllable structure and had an /a/ vowel so that, again, an implicit vowel harmony was present making it more integrated as a suffix. The second way was to use a negative particle which was a separate lexical item [nim (NOT)].

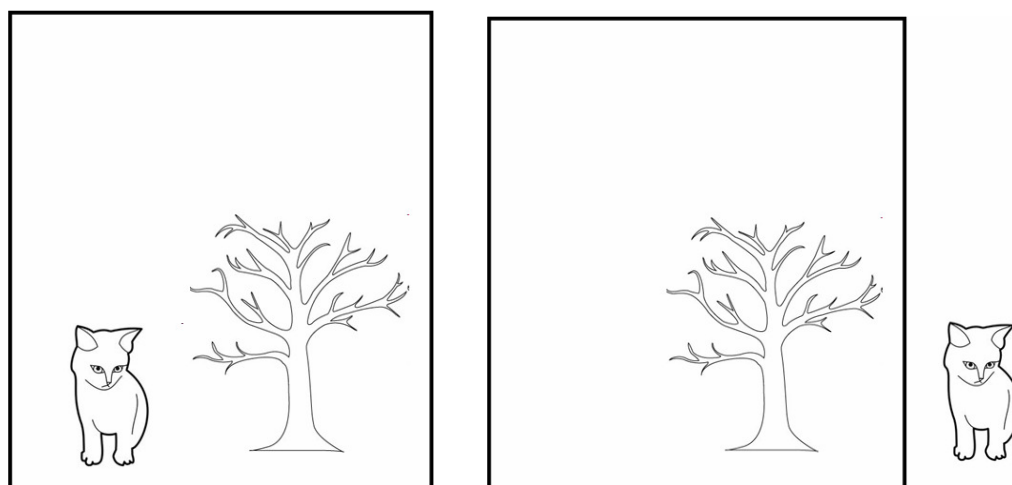
### 5.1.1.3.1.1.2 Grammar

Descriptions were structured in one of two ways:

Noun Noun Postposition Neg [liki mat kik nim (THE CAT NOT IN THE GARDEN)]

Noun Noun-Case(suf)-Neg(suf) [liki matalas (THE CAT NOT IN THE GARDEN)]

Two entirely synonymous constructions are extremely rare in natural languages (Givon, 1985) and not usual in the input for normal language acquisition (Wonnacot & Newport, 2005). However, inconsistent input is typical of learning environments with a large amount of language contact and be comparable to language learning in exoteric conditions. One might expect learners to be biased towards lexical strategies because of the similarities to language learning in an exoteric context. To counteract this bias, morphological strategies have been made as easy as possible to learn in comparison to the lexical strategies.



**Figure 2. 'liki matal' - the cat in the garden (left) and 'liki matalas' - the cat not in the garden (right)**

### 5.1.1.3.1.2 Structure of Training

Training consisted of presentation of the language along with mini tests which punctuated the training. These tests were to make sure participants were paying attention, to enforce their learning and to make sure participants had fully learnt the language before going into the communication task. Participants were first given

explicit training on vocabulary items. A single isolated presentation of each lexical item was presented with the English translation and the picture which would be used throughout the experiment as the referent for that word. Instruction on the use of function words and grammatical rules then followed. This instruction was explicit descriptions of the word order and what each element referred to both in relation to the pictures used. The English translation was also given. This was followed by a number of training blocks and tests which were broken up as follows:

1. Training Block 1
2. Testing Block 1
3. Training Block 2
4. Testing Block 2

Both blocks of training consisted of scenes similar to those shown in figure 2. These were presented along with audio and written descriptions in the artificial language. Sentences used in training were all recorded as entire utterances and stored in Waveform Audio File Format. All possible combinations were recorded by me in order to make the utterances as natural as possible. Every effort was made to make pronunciation of the vocabulary items constant across descriptions. These audio stimuli were played throughout the training along with images of the scenes they described. The participants were asked to repeat back the spoken descriptions after they had heard them throughout the training. This spoken training was important as the final experiment consisted of a spoken communication task. These descriptions either used the morphological strategy or the lexical strategy. Morphological strategies were presented 50% of the time, lexical strategies were presented 50% of the time. Within both blocks of training all possible scenes were presented twice, once with the lexical description and once with the morphological description. 32 trials were in each block of training. These were presented in random order. E-Prime was responsible for randomising stimuli in the tests throughout the training.

Testing block 1 had two tests. The first test was a grammaticality judgement task. Participants were presented with a scene and had to choose between two written descriptions, one was correct, and had been seen before, and the other was incorrect.

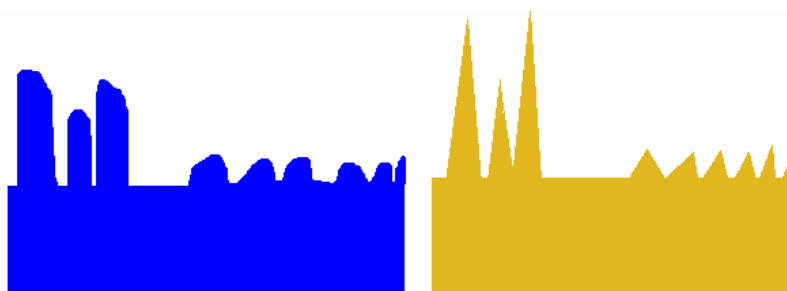
Descriptions were incorrect for a number of reasons including use of the wrong noun, affix, function word or word order. There were 16 trials in this test which were presented in random order. Feedback was given by the computer after each token. The second test was a comprehension test. In this test participants were presented with a spoken description of a scene and asked to choose between two pictures, one of which the utterance had described. Again, there were 16 trials in this test which were randomised and feedback was given by the computer after each token.

Testing block 2 had three tests in it, a grammaticality judgement task and a comprehension test, as described above, and also a production test. In this last test participants were presented with a scene and had to describe it using a spoken utterance. Feedback was given by the experimenter who was present for the production test only. Participants were tested apart from each other in their separate cubicles.

Participants' proficiency in these tests was near ceiling level with a mean 97% correct across all participants in all tests. This high score shows that the language was very easy to learn within the time limit.

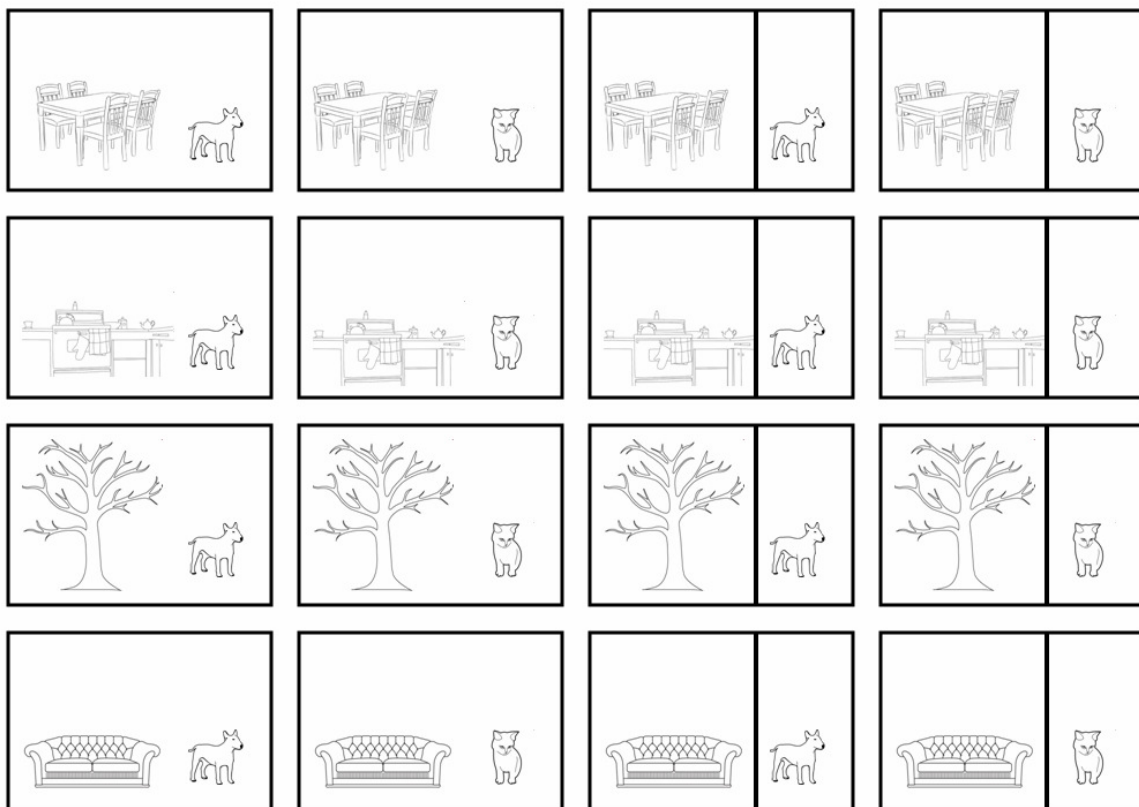
### **5.1.1.3.2 The Communication Task**

The main part of the experiment consisted of a spoken communication task. Participants were seated across the table from one-another. Both participants were given their own set of pictures on an A4 piece of paper (figure 4). Both participants were also given paper hats. These hats were the same in the esoteric condition and different in the exoteric condition. Hats were either blue with curvy appendages or yellow with spiky appendages (figure 3).



**Figure 3. Hats**

The task involved one participant being presented with an image which only they could see. The experimenter pointed to a sheet which was hidden from the other participant. The participant had to communicate the image to their partner using the artificial language. Their partner then had to choose a picture from their set of images. Participants were then told if the picture chosen matched or did not match the picture originally presented by the experimenter. The participants took it in turns to be the speaker. Images were presented in a different random order between pairs of participants. Every picture was presented twice in each communication game, giving a total of 32 tokens. Participants were recorded throughout this process to analyse their use of lexical or morphological strategies.



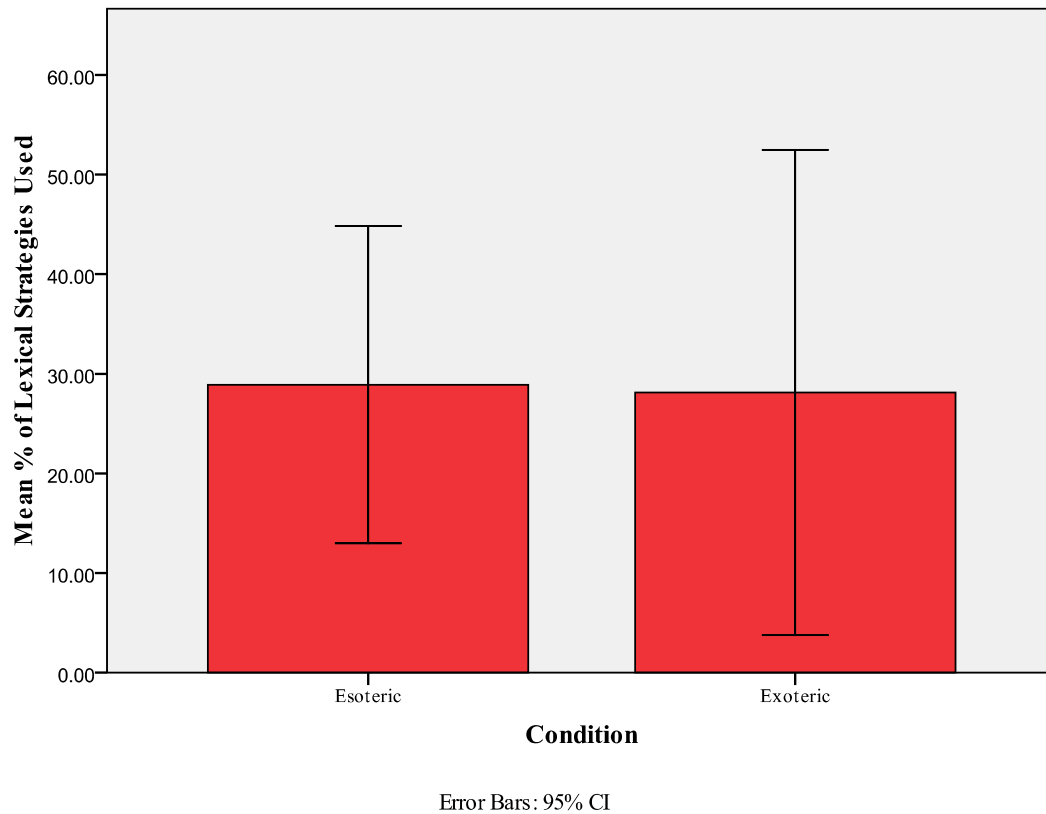
**Figure 4. Grid of possible scenes**

### 5.1.2 Results of Pilot

The sample size in the pilot experiment was so small ( $N=4$  in each condition) that no assumptions can be made with regards to normality and so non-parametric tests (Mann-Whitney) were used to compare conditions. The result of the pilot experiment

showed no significant difference between the percentage of lexical strategies used by participants in the esoteric condition ( $N=4$ ,  $m=28.9$ ) and participants in the exoteric condition ( $N=4$ ,  $m=28.1$ ),  $U= 6$ ,  $p = 0.56$ .

**Graph showing % of Lexical Strategies adopted during the communication task in each condition**



A one sample Wilcoxon was conducted on the percentages of lexical strategies used in both conditions in order to establish if a bias towards either morphological or lexical strategies existed. The test showed a statistically reliable difference between the mean number of lexical strategies used ( $M = 28.5$ ,  $s = 11.98$ ) and the 50% assumed by the two-tailed null hypothesis that there would be no bias towards either strategy,  $Z = -2.53$ ,  $p = 0.012$ . The strategy which was preferred was morphological which had a frequency of 71% across all data.

Despite the lack of effect of condition there are other factors at work which might affect the use of morphological or lexical strategies. It is also relevant to look at factors such as starting strategy (the strategy used at the beginning of the communication game by the first participant to speak). Starting strategy is relevant in

the exoteric condition as participants are told that they have been taught slightly different dialects and they may be liable to adopt the strategy used initially as they know that this will be understood. Within the esoteric condition (N=4, M=28.9) the starting strategy of pairs within the communication task was not a significant indicator of the overall mean strategy used (U=0, p=0.16). In the exoteric condition the starting strategy of pairs within the communication task was also not a significant indicator of the overall mean strategy used (U=1.5, p=1).

### **5.1.3 Conclusions of Pilot**

There was no difference found between the two conditions in the pilot experiment. This result indicates that no conscious or unconscious choice of strategy is being affected by whether participants perceive each other as outsiders or not. However, such a strong bias towards morphological strategies in both conditions means that any difference between the two conditions is going to be less significant than if there were no initial bias towards any strategy.

Such a strong bias towards morphological strategies was an unexpected one as second language learners were expected to be biased towards using lexical strategies which is why the design of the experiment was such that morphological strategies were made easier. It is concluded that the methods used to make the morphological strategies easier went too far and ultimately ended up skewing the data.

Starting strategies were also shown to have no effect on the overall use of strategies within an interaction. However, there was only 1 instance of lexical starting strategy in both conditions and so if there is an effect of starting strategy a bigger N value within the main experiment should be able to uncover an effect.

## **5.2. Main Experiment**

Due to the biases seen towards morphological strategies in the pilot experiment steps were made to make morphological and lexical strategies just as learnable as one another. The other main difference from the pilot was the number of participants used.

## 5.2.1. Method

### 5.2.1.1. Participants

40 adult participants were used, making 10 pairs in each condition. Most were undergraduate and postgraduate students from the University of Edinburgh. They were paid £4.50 for the 45 minutes it took to complete the experiment.

### 5.2.1.2 Description of the language

The semantic content of the language used in the main experiment was exactly the same as in the pilot as the scenes used within the experiment were the same. This language differed from the one used in the pilot as vowel harmony was introduced, which involved both front and back vowels, to make the morphological strategies harder to learn and also less transparent. This also made participants less likely to interpret affixes as separate lexical items.

#### 5.2.1.2.1 Vocabulary

*Nouns.* There were 6 nouns in the language. These had the same referents as the nouns in the language in the pilot. The same nouns were used which referred to the animals [liki (CAT), nimu (DOG)]. Two of the four locational nouns used in the pilot were changed to enable vowel harmony. All the nouns used in the pilot couldn't be used as all vowels in the initial nouns were the same. A contrast had to be present in order for suffixes to be used with either back or front vowels to make the vowel harmony both representative of natural language but also create a more opaque mapping between the suffix and its meaning. This opaque mapping would mean that it would be both harder to learn and participants were less likely to parse it as a lexical item. All locational nouns were kept to one syllable and were as follows [mot (GARDEN), nat (KITCHEN), gat (LIVING ROOM), tot (DINING ROOM)].

*Inessive Case.* As in the pilot there were 2 ways to express the inessive case. The first way was to use a case-marker which was a suffix which attached to the locational noun, this suffix took two forms, [-al -/ **a** (IN)] or [-ol -/ **o** (IN)] depending on whether the noun the suffix is attaching to were back vowels or front vowels.

Therefore, the vowel used in the suffix was the same as the vowel used in the noun. Participants were not assumed to know the difference between back and front vowels. The lexical strategy used to express inessive case, as in the pilot, was to use a postposition [kik (IN)]. Both strategies could be used with any noun and were presented 50% of the time in training.

*Negation.* There were also 2 ways to express negatives. The first was to use a suffix which attached to the case-marker. As with the case-markers, this morphological negative particle underwent explicit vowel harmony, the suffix took two forms, [-as - /a/ (NOT)] or [-ol - /o/ (NOT)] depending on whether the noun and case-marker the suffix is attaching to were back vowels or front vowels. The second way was the same as in the pilot and used the negative particle [nim (NOT)] which was a separate lexical item.

#### **5.2.1.2.2 Grammar**

As in the pilot, the language had two construction types which could be used to express any of the pictures used in the communication task and were synonymous with each other.

Noun Noun Postposition Neg [liki mot kik nim (THE CAT NOT IN THE GARDEN)]

Noun Noun-Case(suf)-Neg(suf) [liki motolos (THE CAT NOT IN THE GARDEN)]

#### **5.2.1.3 Structure of Training**

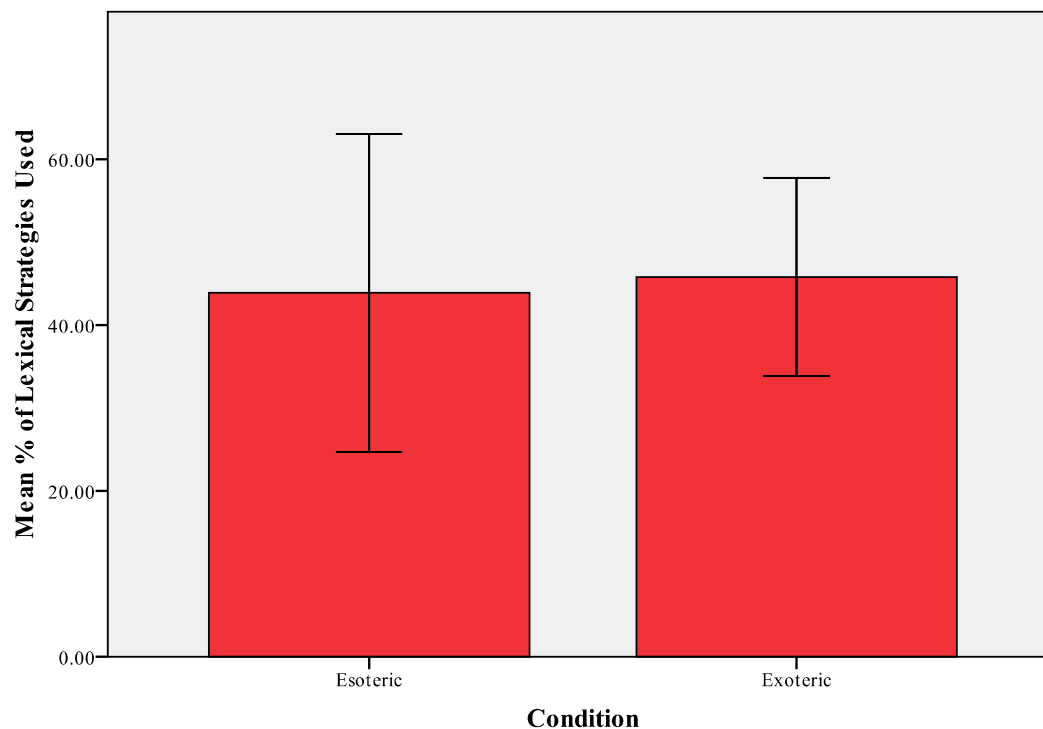
All three tests were kept the same except that they were changed to also test correct use of vowel harmony as well as use of the wrong noun, affix, function word or word order.

Participants' proficiency in the tests was near ceiling level as in the pilot with a mean 98% correct across all participants in all tests. This high score shows that the language was very easy to learn within the time limit even given that it had been made more complex with the introduction of vowel harmony.

## 5.2.2 Results

Data in both conditions was normally distributed (esoteric,  $D(10)=0.21$ ,  $p = 0.2$ , exoteric,  $D(10)=0.21$ ,  $p = 0.2$ ), because of this parametric tests (t-tests) could be used. The result of the main experiment showed no significant difference between the percentage of lexical strategies used by participants in the esoteric condition ( $M=43.9$ ,  $SE=8.47$ ) and participants in the exoteric condition ( $M=45.8$ ,  $SE=5.28$ ),  $t(18)=-0.19$ ,  $p=0.85$ . The null hypothesis, that telling participants that their interlocutor spoke a slightly different dialect did not have an effect on the type of strategy used, could therefore not be rejected.

**Graph Showing the % of Lexical Strategies adopted during the communication task in each condition.**

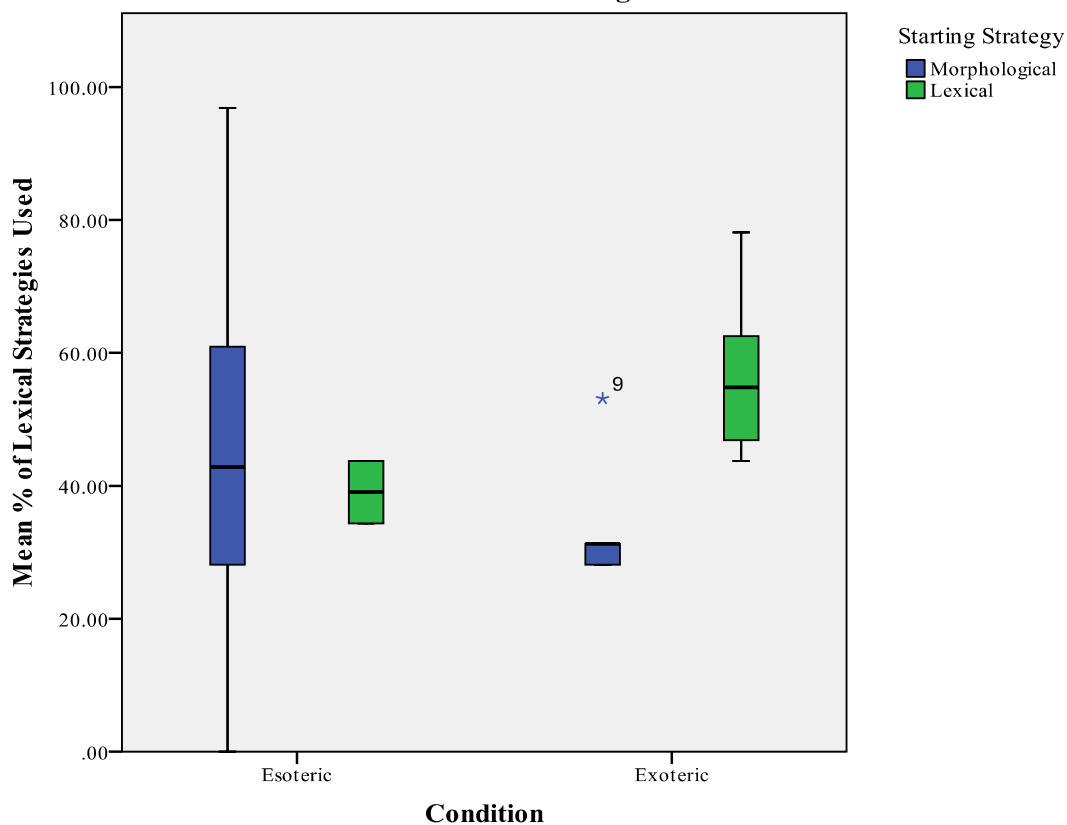


Error Bars: 95% CI

A one sample t-test was conducted on the percentages of lexical strategies used in both conditions. A  $t$ -test showed no significant difference between the mean number of lexical strategies used ( $M = 44.84$ ,  $s = 21.75$ ) and the 50% assumed by the two-tailed null hypothesis that there would be no bias towards either strategy,  $t(19)=-1.06$ ,  $p = 0.302$ . This result indicates that the bias problems in the pilot experiment have been resolved. There was however still a slight skew towards morphological strategies which had a frequency of 55% across all data.

Within the exoteric condition the distribution of mean strategies used by pairs with a morphological starting strategy were significantly not-normal ( $D(5)=0.42$ ,  $p = 0.005$ ), because of this a non-parametric test (Mann-Whitney) was used within both conditions to enable comparison of correlations seen between the starting strategies and overall mean strategy used. Within the esoteric condition ( $N=10$ ,  $M=43.9$ ) the starting strategy of pairs within the communication task was not a significant indicator of the overall mean strategy used ( $U=6.5$ ,  $p = 0.694$ ). In the exoteric condition, however, the starting strategy of pairs within the communication task was a significant indicator of the overall mean strategy used ( $U=2$ ,  $p = 0.027$ ).

**Graph Showing the effect of Starting Strategy on the % of Lexical Strategies used in a communication game**



Taking only the pairs which had a lexical starting strategy, there was a significant difference between the conditions under the hypothesis that lexical strategies will be adopted more in the exoteric condition given that the first person to speak adopts this strategy. Those pairs in the esoteric condition who started with a lexical strategy ( $N=2$ ,  $M=39.1$ ) had a significantly lower number of lexical strategies used in the

communication task than pairs in the exoteric condition who started with a lexical strategy (N=5, M=37.2),  $U=0.5$ ,  $p = 0.048$ .

Taking only the pairs which had a morphological starting strategy there was not a significant difference between conditions. Those pairs in the esoteric condition who started with a morphological strategy (N=8, M=45.09) had no significant difference from those who started with morphological strategies in the communication task in the exoteric condition (N=5, M=34.38),  $U=14$ ,  $p = 0.218$ .

## **6 Discussion and Conclusion**

This research looked at whether adult participants' perception of one another would affect their use of language. This study investigated specifically how foreigner directed speech affects the use of either morphological or lexical strategies and how use of these strategies could contribute to knowledge on trends seen between number of L2 learners in a population and the typological features of the language spoken by that population. The results show that there is no effect of condition with regards to how many lexical and morphological strategies are used. However, on closer inspection there is a difference between the conditions when the strategy used by first interlocutor to speak in each pair is taken into account. If a lexical strategy is adopted initially by the first interlocutor to speak in an interaction then, within the exoteric condition, where participants are told they speak slightly different dialects of the same language, that pair are significantly more likely to adopt a higher percentage of lexical strategies within the whole communication task. This finding was only observed with lexical strategies. If the first speaker in an interaction used a morphological strategy then the starting strategy had no effect on the overall use of strategies in the communication game. When participants were told that they were taught exactly the same language as their interlocutor (esoteric), there was no effect of starting strategy on overall strategies used.

Since there are some significant effects of condition then the use of a perceived difference in dialects, as opposed to languages, was enough to change participants'

speech. If one was to perceive their interlocutor's language as being completely different then presumably an even stronger effect would be seen.

The results of this experiment can contribute to a number of bodies of work, these include the experimental work on syntactic accommodation effects, experimental work done on foreigner director speech and also contribute to our knowledge of the effects L2 learners can have on the typology of a language as a result of FDS.

### **6.1 Syntactic Accommodation Effects**

Work has been done on syntactic accommodation or structural priming from as early as Bock in 1986. Work on syntactic accommodation has been done in the past using artificial priming experiments where participants' processing of a structure is facilitated by exposure to that structure (Pickering and Ferreira, 2008) but has been the subject to experiments which use more natural conversational techniques to investigate syntactic priming (Branigan et al., 1999) as well as studies using corpora to look at patterns in people's speech (Healey et al. 2010).

The literature shows differing opinions to quite what extent structural priming exists in natural conversation. Some, such as Pickering & Garrod (2004, 2006), suggest that structural priming is an automatic mechanism which is used to facilitate all dialogue. Branigan et al. (2000) presents evidence to support that structural priming is automatic by using a communication task. Participants were found to co-ordinate to each other's syntactic structure in dialogue. Healey et al. (2010) contradict this claim with evidence from their corpus analysis which found that people's levels of structural matching in conversations were no difference from chance.

The results produced in the current study show that participants behaved no differently from chance with regards to paying attention to the starting strategy within an interaction if they thought that the other person spoke the same dialect as them. However, there were effects present when participants were told that their interlocutor had been taught a slightly different dialect. This shows that structural priming is an important thing to consider when considering native to non-native or non-native to

non-native interactions. Explicit information as to who their interlocutor is affects whether participants accommodate to the structures used. This finding indicates that this accommodation, or structural priming, is not a result of some automatic mechanism used when speaking to just anyone as suggested by Pickering & Garrod (2004, 2006).

## **6.2 Morphological Bias**

Another surprising result from this study was the bias seen towards morphological strategies in all conditions. This bias was most extremely seen in the pilot study but even after vowel harmony had been introduced there was still a small bias towards morphological strategies as they were used 55% of the time over 640 tokens collected in the experiment. The morphological biases were surprising as all of the participants in the experiment were adult L2 learners as they were all learning a new language and were all above the age of any estimated critical period for native language learning. Adults are thought to struggle more with complex morphological paradigms than lexical alternatives (Klein & Perdue, 1997). This difficulty with complex morphology is emphasised by papers such as Lupyán & Dale (2010) who claim it is the learning biases of adults that shape the typology of languages in exoteric niches. The bias towards morphological strategies seen in this study casts some doubt on the assumption that L2 learners prefer lexical strategies. This morphological bias also presents some justification for seeking out further explanations for what is causing the high levels of lexical strategies used in populations with high percentages of L2 learners.

## **6.3 Linking Foreigner Directed Speech with Language Typology**

Before now historical and statistical analysis of languages have shown some important correlations between features of languages and the social dynamics of the populations who speak them. However, these methods are far from perfect with regards to picking apart patterns of causation. These methods run into difficulty when considering that until recently demographic data on languages would be incomplete and also subject to complication from wars, invasions, colonisations and occupations.

Experimental work and case studies are required and some relevant examples have been reviewed throughout this dissertation. However, some of the experimental work is contradictory to the statistical trends seen.

Other work which is relevant to understanding why some languages are more agglutinative than others includes work on grammaticalisation. Bybee (2002) suggests that purely linguistic factors account for grammaticalisation. However, the linear fusion hypothesis as well as other unidirectional theories (Traugott, 1982) need to be revised if social factors and cultural evolution can have an effect as to what extent lexical or morphological strategies are used. While it may be the case that the co-occurrence of lexical items may contribute to grammaticalisation the correlations between social factors and linguistic features need to be considered when accounting for what causes grammaticalisation. One would also imagine if grammaticalisation was unidirectional then the diversity displayed in the world's languages would be vastly lower as more languages would tend towards the agglutinative end of the spectrum. Great diversity does exist however and the work presented within this dissertation show theories of grammaticalisation which do not account for social factors are incomplete.

Other social factors which have hypothesised to have an effect on the typology of a language include how well a community know each other and their environment as this will affect how context dependent the language needs to be (Wray & Grace 2007). However, Lupyan & Dale (2010) show that smaller populations are actually more likely to have morphologically complex languages which are more over-specified and context independent. This decreases the validity of the argument that linguistic features born from demographic features will be the result of a need for context dependence.

Sexual selection has also been proposed as a possible explanation for linguistic complexity. The only way this could explain the correlations seen in Lupyan & Dale (2010) is if smaller populations had a greater prevalence of sexual selection as these are the ones which display higher levels of morphological complexity and over-specificity. In fact, small population size means less sexual selection as there are

fewer mates for individuals to choose from and random drift is more likely to determine the fate of new linguistic strategies/genes (Whitlock, 2000).

The problems shown for the explanations explored here mean that we need a more robust explanation for morphological complexity. The present study aims to present an alternative hypothesis to explain these trends and empirically test it.

Participants only adopted their partner's strategies in the exoteric condition when the starting strategy was a lexical one. The fact that this structural priming does not occur with morphological strategies within the experiment would suggest that foreigner-directed speech isn't only about structural priming but a combination of that and lexical strategies which facilitate learning. This result presents evidence for the hypothesis that foreigner directed speech may perpetuate the use of lexical strategies within a community by way of structural priming. This hypothesis would help to make sense of some of the correlations seen by Lupyan & Dale (2010) as FDS will have the biggest effect within populations with a high percentage of L2 learners. This hypothesis does not suggest why populations with esoteric conditions use more morphological strategies however. It may be the case that an effect of L2 speakers alone may produce the correlations observed by Lupyan & Dale (2010), but it may also be the case that the learning biases of children are implicated. Further experimental evidence needs to be carried out with regards to the biases of child learners. The experiments presented within this dissertation all focus on whether children maintain irregularity as opposed to looking at preferences of morphological or lexical strategies. Further study needs to be done which focuses on the learning biases that children have between lexical or morphological strategies and what can affect these biases. These experiments could use a similar paradigm to that used by Hudson Kam & Newport (2005) but instead of inconsistent input of the presence of a determiner, use instead inconsistent use of either morphological or lexical strategies similar to those used in the current study.

Social factors can affect the extent to which lexical or morphological strategies are used within a language. This fact may need to be taken into account when trying to make sense of the presence of both syntax and morphology. It was mentioned earlier

that having two levels of grammatical patterning with the same function are considered maladaptive. The social factors explored within this dissertation could pose some possible solutions to explain why these dual levels of patterning exist or explain why they have persisted within language. Evidence is presented within this dissertation that morphological and lexical strategies fulfil the needs of different social niches and so the selection for these strategies works on the level of cultural evolution which means that both need to be available to humans on a biological level because of shifting social dynamics.

#### **6.4 Cultural Evolution**

This study finds links between social factors and linguistic structures. Other work covered in this dissertation also finds these connections (Lupyan & Dale 2010, Benz & Christiansen, 2010, Ember & Ember, 2007). All of this evidence brings into question quite to what extent the structure of language is shaped by the human brain and how much of it is subject to exterior factors. Theories which concentrate on social factors present an opposition not only to theories of human language which concentrate solely on language universals being a direct reflection of an innate language capacity (Chomsky, 1981), but also to theories which argue that the structure of language is the product of cognitive biases in the brain (Christiansen & Chater, 2008). Dunn et al. (2011) find that the features of languages are best predicted by their lineages rather than features which are meant to co-occur given a hypothesis of their being such a thing as cognitive parameters. Their study demonstrates that lineage-specific cultural evolution is the primary factor behind the structure of languages rather than cultural evolution driven by universal cognitive biases. Given the statistical correlations between demographic features and linguistic features, and the lack of correlation between linguistic features which were thought to emerge together given specific cognitive biases, it is interesting to consider whether social factors have more of an effect on the cultural evolution process than biological cognitive parameters. This line of argumentation presents a strong conclusion that social factors need to be considered in order to understand the structure of the world's languages.

Other cultural factors, which aim to explain the link between demographic and linguistic structure, have also been proposed in literature not covered in this dissertation. These include whether things such as literacy can affect the level and direction of language change (Tarmariz et al., 2010). Whilst the current study shows the importance of FDS when looking at possible features which could affect language typology, it is in no way suggested that FDS is not part of a rich tapestry of factors which make language the shape that it is.

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