

Creolization: Could Adults Really Have Done It All?

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1. Introduction

Creolization is the expansion of a simplified pidgin into a more complex language called a creole. Various theories have been proposed to explain this transition; most are attempts to explain who created the creole, adults or children, and refer to processes of first or second language acquisition. However, using traditional methods of investigation, this issue has been difficult to resolve. To augment the more traditional studies of creolization, we have developed an artificial language paradigm designed to model a pidgin learning situation. This paper describes our first experiment in this line of work and relates the findings to claims made regarding the possible involvement of adults in the creolization process. The results suggest that a theory relying on adults alone may not be sufficient to explain the phenomenon of creolization.

2. Background

The most well-known creole languages are those spoken on former plantation and slave colonies in the Caribbean. When first encountered by Europeans or North Americans, these languages often sound familiar, since their vocabularies are drawn primarily from European languages such as English and French.¹ If one listens more closely, however, the creole is not readily comprehensible. This is because creoles are not merely dialects of their superstrate languages, as is often assumed, but rather are separate languages with their own grammars. This mismatch between vocabulary and grammar is, in fact, what makes creole languages of interest: What is the source of the grammatical structure if not the lexifier?

Creole languages are often preceded by pidgins which have the same basic lexicons, but which are not structurally the same as the creoles (Hall, 1966, Romaine, 1988). Pidgins are contact languages, spoken within a group of people who do not share a common language (for example, the slaves, indentured labourers, overseers, and owners), but who need to communicate in a certain context (Todd, 1974). Understandably, then, pidgins have small vocabularies (typically limited to the context of use), and they have few, if any, grammatical devices such as inflectional morphology. Moreover, unlike full languages, they tend not to have redundancy (DeCamp, 1971).² If pidgins do have forms that could be considered inflection-like (e.g. *go* used to indicate future), they are used

inconsistently (Sankoff, 1994, Sankoff & Laberge, 1973). Thus, pidgins do not have the categorical rules used in full natural languages.

In contrast, creoles are more complex, regular, rule-governed languages, and theories of creolization must account for this. Current theories of creolization differ as to whether they hypothesize that adults or children are responsible for producing these changes in structure. This difference is due, in part, to differences in focus. Certain structural features are highly characteristic of creoles, showing up in many unrelated creoles, while other features show up only in a single creole (Romaine, 1988). Theories which focus on the cross-creole similarities tend to see children as the main agents of change, whereas theories which focus on features that occur in individual creoles often propose that adults are wholly responsible for the grammatical structure of the creole.

Bickerton's language bioprogram hypothesis (LBH) is an example of a theory focusing on inter-creole similarities (Bickerton, 1980, 1984). According to the LBH, children are the main agents of creolization. Bickerton claims that when children are exposed to inconsistent input during first language acquisition, they fail to learn from it. Instead, they access the innate language-specific knowledge contained in the bioprogram and impose these specifications on the pidgin, thereby creating a new language -- the creole. Those features shared by all creoles are those proposed to be specified in the bioprogram.

Lefebvre's relexification hypothesis is an example of a theory focusing on the contribution of adults to creolization.³ Lefebvre and her collaborators work on Haitian Creole, comparing it to Fongbe, a West African language that likely served as an important substrate to Haitian Creole (Singler, 1995). They have found numerous similarities between the two languages and on that basis have proposed that adults transferred structures from their own native languages into the language they were learning (Lefebvre, 1992, 1996, Lumsden, 1989).

3. The present study

To re-state, what theories of creolization must explain is as follows: *Creoles have consistent, obligatory grammatical structure, while pidgins do not.* The two theories mentioned above treat creolization as a unitary and holistic process, but this is not necessarily the case; the source of the *structures* may not be the same as the source of the *consistency* and *obligatoriness* (see also Kiparsky, 1971, for the same point in historical change). Thus, for instance, while there is some evidence that adults were responsible for introducing many structures found in Haitian Creole, this does not entail that adults were also responsible for the regularization, the other necessary part of the creolization process. Our experiment focused on the question of regularization, and was designed to investigate whether adults could be responsible for this part of the creolization process.

First, we were interested in seeing whether adults could learn from inconsistent linguistic input at all. Second, we wanted to know what they did with it as they learned it. That is, do adults learn what they hear, or do they

change the language in some way (e.g. by making it more regular)? One might imagine, however, that the answer to either of these questions is not simply a function of the presence of inconsistency, but rather that it might depend on the amount of inconsistency present in the input. Our experiment investigated this possibility as well. We used an artificial language paradigm to expose subjects to a language with certain pidgin-like characteristics, and exposed subjects in different conditions to differing amounts of inconsistency. We then examined what they had learned about the language using several dependent measures.

3.1 Method

Subjects. Our subjects were 20 native English speakers (11 men and 9 women) with a mean age of 24. All subjects were students at the University of Rochester. Subjects were randomly assigned to one of four different exposure conditions, with five subjects in each condition. All subjects were run and tested individually, and were paid for their participation.

Description of the language. The language is quite small, having only 51 words: 36 nouns, 7 intransitive verbs, 5 transitive verbs, 1 negative, and 2 determiners, 1 for each of 2 noun classes. The language was created in conjunction with a small world of objects, which restricted the number of possible sentences. Even with the semantic restrictions, however, there are over 13,200 possible sentences in the language. The basic word order is (Neg)V-S-O and the determiners follow the nouns within the NPs. This leads to four possible sentence types: intransitive, transitive, negative intransitive, and negative transitive. The nouns were divided into two classes on a completely arbitrary and random basis. (Twenty nouns are in class one, and the remaining 16 nouns are in class two). The only grammatical consequence of noun class membership is determiner selection, with each class taking a different determiner. As such, the two determiners function primarily as nominal agreement markers. The exact nature of the linguistic input received by a subject varied according to condition, and is described below.

Presentation. Subjects were exposed to the language by videotape. All presentation of the language was auditory. Subjects saw a scene or event on the video monitor and heard a sentence describing it. The sentences were spoken at a normal rate and sounded very natural and fluent. There was no explicit instruction of grammar or vocabulary; subjects were required to learn the language solely from exposure to the sentences. For example, the subject sees a plastic bowling ball hitting a bowling pin and she hears:

- (1) flimm rungmawt poe blergenfall poe
hit bowling-ball det bowling-pin det
'The bowling ball hits the bowling pin.'

There were 230 scenes and corresponding sentences in the exposure set (115 intransitives and 115 transitives). Each scene was presented three times over the course of six exposure sessions. Each session lasted 25-29 minutes. Subjects were given the opportunity to take a break in the middle of each session, but few did. Subjects were asked to repeat each sentence after hearing it; they were told that this was pronunciation practice which would be helpful since they would have to produce their own sentences at the end of the experiment. The entire experiment took seven sessions (the six exposure sessions and one test session). Subjects took seven to ten days to complete the experiment.

Experimental manipulation. Subjects in the four conditions were exposed to different levels of consistency in the input they received. For this experiment, consistency was defined as the occurrence versus non-occurrence of the determiners; subjects were exposed to a particular mixture of sentences with and without determiners. Subjects in the LOW input group heard nouns with determiners 45% of the time; 55% of the nouns occurred with no determiner. Subjects in the MID input group heard determiners 60% of the time, and subjects in the HIGH input group heard determiners 75% of the time. The subjects in the PERFECT input group served as controls and heard determiners 100% of the time. All other parts of the grammar were completely consistent in all input groups.

The occurrence percentages (45%, 60% and 75%) were true of nouns as a general word class, as well as for the various syntactic positions; the same of percentage of intransitive subjects, transitive subjects, and transitive objects each occurred with determiners. However, the percentages were not necessarily the same for each noun; individual nouns co-occurred with determiners within a certain range centered around the overall percentage. For instance, for the LOW input group the percentage of determiner occurrence for any particular noun varied between 33% and 55%. The particular sentences with missing determiners were randomly selected. Importantly, each presentation of a particular sentence had the potential to be different from the other two, meaning that there truly was no pattern of determiner omission available to be learned from the data.

Tests. Subjects were given five tests on two different days, four of which will be discussed in the present paper. The first was a vocabulary test administered after subjects watched the videotape in the fourth session. In this task, subjects were tested on their knowledge of 12 vocabulary items. Subjects were told that this test was designed to give them some idea of how they were doing up to this point - that it was for their own benefit. Subjects were asked to provide a name for each object as it appeared on a video monitor, and were given as much time as they wanted. All responses were videotaped, but (in accord with the instructions) the results were not used in our analyses.

A second vocabulary test was used to evaluate whether subjects had learned enough vocabulary to be tested on more complex aspects of the language. Subjects were tested on the same 12 items as in the first vocabulary test, but the order in which the items appeared was different.⁴ Presentation and recording

proceeded in exactly the same manner as in the first vocabulary test, except that it was administered with the other tests in the final (test) session.

The third test was a sentence completion task. This task was designed to evaluate if and how subjects' own productions would vary according to the inconsistency present in their input. Subjects saw a scene and heard the first word of the sentence. They were then asked to complete the sentence. For example, the subject sees a piece of cotton fall and hears the word *gern* (fall). She should then say *kowalta kaw* (cotton DET). Since the language is V-S-O, subjects were always given the verb and they themselves provided the NP(s) (the part of the grammar containing the inconsistency). There were 24 test sentences (12 transitive, 12 intransitive), resulting in 36 possible NPs and therefore 36 possible determiners. Subjects were first tested on the transitive sentences and then on the intransitives. The set of test sentences was designed so that 12 nouns each appeared once in each possible syntactic position (intransitive subject, transitive subject, and transitive object). The first use of individual nouns varied between subject and object positions in the transitive sentences; some nouns were first used as subjects and others as objects. Responses were videotaped and later transcribed for analysis.

The fourth test was a grammaticality judgment task that also examined subjects' knowledge of determiner usage. Subjects listened to 36 sentences and judged each of them on a four-point scale according to how much they liked or disliked the sentence. Subjects were instructed to respond that they really liked a sentence when it sounded like a sentence from the language that they had been learning, and to respond that they really disliked a sentence when it sounded completely unlike a sentence from the language. They were also told that if they thought a sentence was mostly, but not completely, like or unlike sentences from the language, they should use the middle of the scale.⁵ The 36 sentences consisted of three variations of 12 base sentences. One form of each sentence was correct, one had the determiner in the wrong location (preceding the noun), and one had no determiner at all. The sentences were randomly ordered, with the constraint that two versions of the same base sentence could not follow each other. The three variations of one base sentence can be seen in (2):

- (2) a. *gern ferluka poe* b. *gern poe ferluka* c. *gern ferluka*
 fall girl DET *fall DET girl* *fall girl*

Four of the 12 base sentences varied the determiner of the transitive subject, four varied the transitive object, and four were intransitive. Sentences were presented by audiotape recorder and responses were recorded by the experimenter.

3.2 Results

Vocabulary tests. As described, the results from the first vocabulary test were not tabulated. However, the results from the second test were examined and used as a criterion for further analysis. The mean score for all subjects was

81.25% correct. There was no significant difference between the scores of subjects in different conditions ($F_{(3,19)}=.882$, $p=.471$). Based on this measure, one subject who knew only one noun was not required to do the sentence completion task. However, he did complete all other tasks.

Sentence completion task. The results of this test were of primary interest, since we were investigating the effect of consistency of linguistic input on output. We computed a percentage of determiner production for each subject by dividing the number of correct determiners used by that subject by the number of possible times they could have used a determiner, and then multiplied by 100. (The number of possible usages was simply the number of correct nouns the subject produced in this task.) Figure 1 shows the mean percentage of correct determiner production by input condition. The dashed line shows the percentage of determiners present in the input, and the solid line shows the mean percentage of determiners produced by the subjects in each input condition. Note that as the percentage of determiners present in the input increases, so does the percentage of determiners used by subjects. This is a significant linear trend ($F_{(1,15)}=19.69$, $p<.001$).⁶

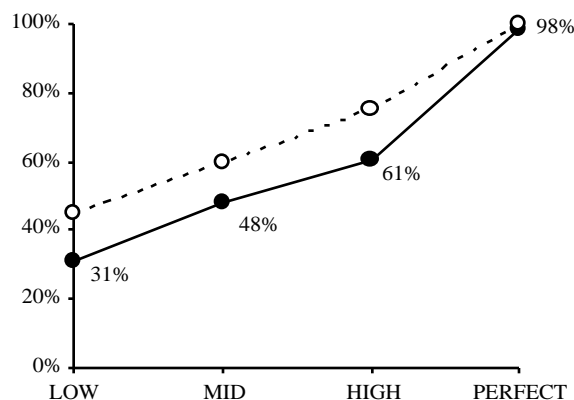


Figure 1: Mean percent determiner production by input condition

Figure 1 also shows that subjects do not use determiners exactly as often as they hear them. Instead, they undershoot their input by 12%-14%, indicating that adults are degrading the language a bit in the learning process. When examined in more detail, however, the data show a slightly different picture. Table 1 presents the individuals' scores, with four scores highlighted. Most subjects perform in accord with the group means, using determiners approximately as often as they had been present in their input. However, the highlighted scores represent subjects who show a different pattern of responses; these subjects produce determiners at the two extremes: either 100% or nearly 0% of the time. Importantly, all but one of these subjects produce the latter pattern. One subject in each of the LOW, MID, and HIGH input groups uses determiners less than 10% of the time. These subjects use only one to three determiners altogether, and where multiple determiners are used, the determiners always occur with the same noun. These subjects thus appear to have adopted a NO DET rule. One subject in the HIGH input group uses determiners 100% of the time, adopting a consistent DET rule.

| LOW | MID | HIGH | PERFECT |
|--------------|--------------|--------------|---------|
| 50% | 67.68% | 100% | 100% |
| 44.44% | 63.89% | 66.67% | 100% |
| 31.25% | 57.14% | 66.67% | 100% |
| 21.74% | 3.03% | 61.11% | 100% |
| 8.82% | -- | 9.09% | 91.67% |

Table 1: Individual subjects' percentage determiner production by input condition

If we remove for the moment the scores of these four subjects, and plot the means of the majority of subjects who do not appear to have devised a rule, we get the graph in Figure 2. (As in Figure 1, the dashed line represents the input, and the solid line represents production.) For these subjects, productions are very close to their input, much closer than Figure 1 would indicate. In short, subjects who do not devise rules (and these are the majority) do a very good job of reproducing the inconsistency of their input. A few subjects when exposed to inconsistent input drop virtually all determiners. Only one subject, exposed to the least inconsistent input, formed a regular determiner usage rule.

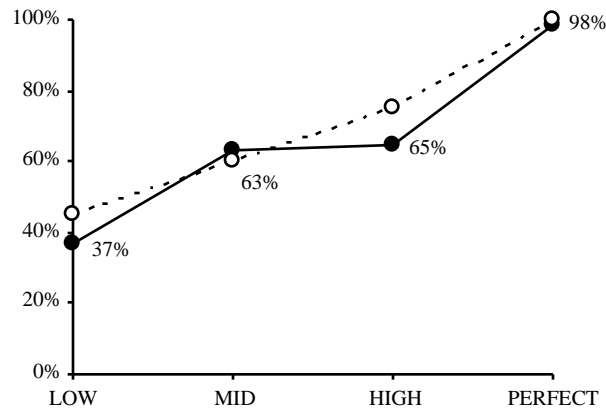


Figure 2: Mean percent determiner production for non-rule subjects by input condition

Sentence rating task. This task examined subjects' knowledge of determiner usage in another way, this time by asking subjects to judge sentences containing various manipulations of the determiner occurrence. If subjects had internalized a categorical rule, they should make categorical judgments. We were looking for evidence of this. Responses were divided according to the particular determiner manipulation in the sentence (no determiner, determiner preceding the noun, determiner in correct location), as well as by the syntactic position of the noun the manipulation occurred with, (subject of transitive, object of transitive, intransitive). The three-way interaction (input level by determiner manipulation by syntactic position) was not significant ($F_{(12,64)}=1.33$, $p=.226$). There was, however, a significant interaction between input level and determiner manipulation ($F_{(6,32)}=4.68$, $p<.01$). Results are therefore presented separately for each input group.

Figure 3 shows the mean ratings given by subjects in each input condition for each type of determiner manipulation, with a rating of 4 being very positive and a rating of 1 being very negative. In the ratings for the PERFECT input condition there is a significant main effect for manipulation type ($F_{(2,8)}=57.32$, $p<.001$). As expected, these subjects prefer sentences with determiners to both kinds of incorrect sentences combined (sentences without determiners and those with the determiner in the wrong location) ($F_{(91,4)}=78.24$, $p<.001$), as well as to just the sentences lacking a determiner (*No Det*) ($F_{(1,4)}=38.45$, $p<.01$). Interestingly, these subjects preferred sentences with missing determiners to those with the determiner in the incorrect location (*X Pos*) even though they were never exposed to any such sentences ($F_{(1,4)}=7.84$, $p<.05$).

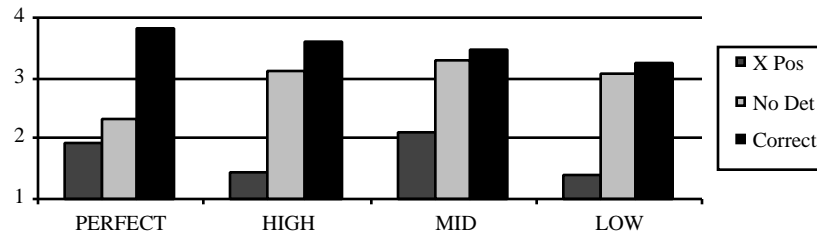


Figure 3: Grammaticality ratings by input condition (4=like, 1=dislike)

This pattern of results changes, however, for subjects who experienced even a small amount of inconsistency. Once again, there is a significant main effect for determiner manipulation for subjects in the HIGH input condition ($F_{(2,8)}=71.47$, $p.<.001$), but there is no longer a significant difference between the ratings given to sentences with and without determiners ($F_{(1,4)}=4.85$, $p=.092$). As with the control group, they prefer sentences with missing determiners to those with the determiner in the wrong location ($F_{(1,4)}=57.97$, $p.<.01$).

This pattern is maintained for both the MID and LOW input groups. The MID input group shows a significant main effect for determiner manipulation ($F_{(2,8)}=33.87$, $p.<.05$), as does the LOW input group ($F_{(2,8)}=34.89$, $p.<.001$). There is no significant difference between the ratings subjects gave correct sentences and sentences with missing determiners for either group (MID: $F_{(1,4)}=1.70$, $p=.262$; LOW: $F_{(1,4)}=.66$, $p=.463$). Subjects in both groups prefer sentences with a missing determiner to those with a determiner in the wrong position (MID: $F_{(1,4)}=13.77$, $p.<.05$; LOW: $F_{(1,4)}=54.33$, $p.<.01$).

There is also a significant main effect for the syntactic position of the noun ($F_{(2,32)}=4.09$, $p.<.05$). We asked whether this was due to a difference in ratings for transitive and intransitive sentences, since a transitive sentence with one affected NP could appear less disrupted than a similarly affected intransitive sentence. The difference in ratings between transitive and intransitive sentences is not significant, however ($F_{(1,16)}=1.49$, $p=.241$). Subjects rated transitive sentences with the manipulation in the object NP higher than those with the manipulation in the subject NP ($F_{(1,16)}=9.8$, $p.<.01$), and rated intransitive sentences higher than transitives with the manipulation in the subject NP ($F_{(1,16)}=9.57$, $p.<.01$).

3.3 Discussion

The results of the sentence completion task indicate that most subjects do not adopt categorical rules in their own productions when the language to which they have been exposed contains unpredictable and random variability. Moreover, the few subjects who did adopt a rule overwhelmingly adopted a zero-determiner rule. Virtually no one exposed to inconsistent determiner usage

formed a rule in which determiners were obligatory, or even used determiners significantly more often than they were present in the input.

The sentence rating task provided a way to get a slightly different view of the grammars learned by the subjects, permitting us to abstract away from possible production errors. Here, however, we once again saw that the variable input had a clear effect on what subjects knew about the language: subjects exposed to variable input did not show evidence of having internalized categorical rules regarding determiner usage, but rather, judged sentences with and without determiners as equally acceptable.

4. Conclusion

This experiment demonstrated that when adults are exposed to variable linguistic input, they do learn from it, and for the most part, degrade it very little. Importantly, from the perspective of the study of creolization, adult learners do not generally develop consistent and obligatory rules which they then apply to the language, changing it and making it more regular in the process. The few instances in which adults did impose rules on the input were mostly rules of omission which served to *remove* structure from the language. Perhaps our experimental paradigm offers too brief or too simple a learning experience for such regularization to occur. However, our results do suggest that adults are not likely to have been the group responsible for the regularization so characteristic of creolization. By elimination, this suggests that children likely did play an important role in creolization, that of regularizing the structure.⁷

There is evidence from other sources that children can, and indeed do regularize. For instance, studies of Simon, a deaf child who learned ASL entirely from his parents who were late-learners and whose signing contained inconsistency, show that he sometimes used categorical rules in his own signing where his parents' signing contained only tendencies. That is, he turned their tendencies into rules - he regularized his input (Ross & Newport, 1996, Singleton & Newport, 1994). However, Simon's input differed from that used in this experiment in potentially important ways. His input was frequently more consistent than some of the input conditions in our experiment. In addition, Simon was also exposed to several forms in competition. In this experiment, we used one form which always 'competed' against a zero form. So while the evidence from Simon, in conjunction with the results reported here, is suggestive of children's involvement in creolization, it is not conclusive, and further research is needed.

While at first it may seem that our results contradict an adult-centred theory of creolization, this is not the case. We are not stating that adults make no contribution to creolization, rather, that they may not do it alone. Our view of the creolization process is consistent with the possibility that adults may introduce structure. At the same time, in accord with Bickerton's view, our findings suggest that children may be required for creole genesis. However, their role may be to regularize structure, not to introduce it. We do not yet have

experimental evidence for this claim, but for our next study, we plan to conduct the same experiment with children. In order to show that children are truly a necessary part of the creolization process, we must demonstrate that they perform the regularization that the adults apparently do not.

Notes

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1. The language from which the vocabulary is drawn is often called the *lexifier*, or *superstrate*, language. The term superstrate, however, also implies that it was the language of power in the society. Another important term in creole studies is *substrate*, which refers to the native languages of the pidgin speakers.

2. For example, French is somewhat redundant in that both the pronoun and the verbal agreement morphology provide information regarding the subject.

3. Some readers may be familiar with monogenetic relexification hypotheses (see DeCamp, 1971). However, Lefebvre's theory is quite different from such accounts. Although her theory is based on transfer, it has no further similarities to the earlier accounts which proposed that all pidgins (and therefore all creoles) are descended from a single pidgin of Portuguese origin.

4. We used the same nouns twice for one main reason: these are the nouns required to complete the sentences in the production task, and we therefore wanted to direct attention to them. When subjects were later asked if they realized they had been tested on the same nouns twice, only three subjects said yes. Interestingly, several subjects commented during testing that they would have done better in the first test if it had been on the nouns in the second test.

5. Subjects actually responded by pointing to one of four different 'happy' or 'sad' faces. The experiment was designed in this fashion so that it could in the future be done with children as well.

6. $d_f = 15$ due to the one subject who did not complete this task.

7. It may be important to note that our language was inconsistent in only one part of the grammar. One possibility is that this made it much easier to learn than a real pidgin with more widespread variability and inconsistency. Thus adults who failed to regularize in this, much simpler situation, would be even less likely to do so when faced with even more degraded input. On the other hand, perhaps widespread inconsistency would make regularization more likely.

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