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Authors

Sneller, Betsy

Roberts, Gareth

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Alien species and alienable traits: An artificial language game investigating the spread of cultural variants between antagonistic groups

Betsy Sneller (esneller@sas.upenn.edu)

Department of Linguistics, University of Pennsylvania
255 South 36th Street, Philadelphia, PA 19104 USA

Gareth Roberts (gareth.roberts@ling.upenn.edu)

Department of Linguistics, University of Pennsylvania
255 South 36th Street, Philadelphia, PA 19104 USA

Abstract

The spread of cultural variants, such as dress or speech patterns, may be promoted or inhibited by different types of bias. In model-based bias, variants are differentially adopted according to characteristics of individuals exhibiting them. A surprising case of cross-group adoption comes from sociolinguistic fieldwork in which White speakers were observed exhibiting a feature of African-American Vernacular English, in spite of expressing aggressively negative attitudes towards their African-American neighbors. A likely explanation for this is that the feature in question had become dissociated for these speakers from the inalienable trait Blackness, but had retained associations with the more alienable trait of being “street” or tough. We tested this by conducting an artificial-language experiment in which groups of four participants played a computer game that involved typing instant messages to each other, trading resources, and fighting. Participants were assigned to one of two mutually antagonistic “alien species” (weaker Wiwos and tougher Burls) and learned an alien language with two species-specific dialects. In one condition, the Wiwos were told that that Burl dialect was mainly used by Burls; in the other condition they were told it was mainly used by “tougher aliens”. Burl variants were significantly more likely to be used by Wiwos in the latter condition than in the former, even though they were associated with tougher aliens in both conditions. This suggests that cultural variants linked to more alienable traits are more likely to be adopted than those linked to inalienable ones, even if the practical implications of the two traits are very similar.

Keywords: language variation and change; dialect contact; cultural evolution; artificial language

Introduction

A core process of cultural evolution is the propagation of cultural variants – such as styles of art, technology, or dress – between individuals. Once a cultural variant has been innovated, it must spread to other individuals before cultural evolution can be said to have taken place. Crucially, this propagation occurs not only between the innovator and their immediate contacts, but also between the first contacts and their own circles of influence. In this way, the borrowing or spread of cultural variants is a crucial aspect of cultural evolution. Linguistic examples of cultural evolution abound; indeed, a conventional communication system like language relies for its success on such propagation, and dialects or dialect features may spread to huge populations of speakers covering vast geographic areas, as is the case for the Inland North dialect of North America, found in speakers across the Great Lakes from Chicago, IL to Rochester, NY (Labov, Ash, & Boberg, 2006). Like other cultural variables, speech patterns

also serve as social markers, however, and this can lead to small-scale patterns of variation serving to distinguish social groups, which may be defined on the basis of personality traits such as “jocks” and “burnouts” (Eckert, 2000) or inherent attributes such as gender (Eisikovits, 1981).

For cultural variables to serve as social group markers in this way, there has to be a mechanism that limits their spread outside group boundaries. One mechanism, compatible with a neutral evolutionary model, is variation in the frequency with which individuals interact. Alternatively, individuals may be biased in their adoption of variants. Richerson and Boyd (2006, p. 69) distinguished between three kinds of bias, which may operate in isolation or in combination with one another: *content-based bias*, based on the nature of a variant, *frequency-based bias*, based on its commonness or rarity,¹ and *model-based bias*, based on characteristics of individuals bearing the variant.

In this paper we will focus on model-based bias in the transmission of linguistic variants, and will draw a distinction between two kinds of characteristics that the model might have. The first, which we term *inalienable traits*, are characteristics of the model that are inherent to the individual, and effectively do not change, such as height, race, or sex. The second kind, which we term *alienable traits*, are characteristics that are acquired, and may be learned or abandoned over time, such as “honest” or “mean.” This distinction matters, assuming that model-based adoption of a cultural variant is driven by a desire to be associated with characteristics of a cultural variant’s bearers. We may expect variants linked to inalienable traits to be mainly adopted by other bearers of those traits, and variants linked to alienable traits to be adopted by a wider range of individuals. High school girls, for example, may be more likely to adopt their male classmates’ speech patterns if those speech patterns are associated predominately with some desirable alienable quality, like coolness, than if they’re strongly associated with being a boy.

Similarly, White speakers and African American speakers have been observed to diverge from each other in both phonology and morphology within local dialects (Wolfram, 2004; Fisher & Labov, 2015; Van Herk, 2008). Where con-

¹This should be distinguished from the role of frequency in neutral evolution, where variants may come to dominate as a result of sampling error; frequency-based bias, by contrast, can involve the *selection* of a variant on the basis of perceived rarity.

vergence occurs across racial lines, it is typically toward a prestigious mainstream dialect, associated more with such alienable traits as education, wealth and power than with race. Cross-racial shifts towards local White or African American dialect occur rarely, and usually in cases where the speaker in question holds strong social ties with speakers of the relevant dialect (Fix, 2010; Sweetland, 2002). Other cases involve more temporary shifts in which features are appropriated, allowing the claiming of social capital that comes through association with urban Blackness, such as “coolness” (Ibrahim, 1999; Cutler, 1997), by speakers relatively well disposed toward (their perception of) urban Black culture.

A striking and unusual counterexample to this was reported by Sneller (2014), who conducted fieldwork in which White speakers in a South Philadelphia neighborhood were found to be exhibiting (TH)-fronting, a feature of African-American Vernacular English (AAVE) that is well attested among African-American speakers in South Philadelphia (and elsewhere), but otherwise entirely unattested among White speakers in Philadelphia. The White speakers in question not only lacked strong social ties with African Americans, but they also espoused violently negative attitudes toward their African American neighbors. Sneller hypothesized that this paradoxical situation would be explicable if (TH)-fronting had become dissociated from being African American, an inalienable trait, and had instead become an index of street culture (Anderson, 1999) or toughness. This hypothesis is supported by the fact that all the speakers who exhibited the feature were males who were involved in street activities, such as drug deals and the stolen bike trade. Furthermore, one of the White speakers with the highest rates of fronting and one of the strongest negative attitudes toward his African American neighbors explicitly identified the fronted variants as “street,” rather than as a feature associated with AAVE.

Experimental paradigm

While ethnographic studies like that of Sneller (2014) play an important role in informing models of linguistic (and other cultural) change, they do not allow hypotheses to be tested directly. Further ethnographic investigation in cases like this is also hampered by ethical concerns surrounding the involvement of serious racial tensions (including violently aggressive attitudes) and criminal activity. To test Sneller’s hypothesis – and, more broadly, to investigate the role of alienable and inalienable traits in cultural transmission – we therefore conducted an experimental simulation, following an artificial-language paradigm developed by Roberts (2008, 2010), in which participants play a game with each other as aliens, and communicate by typing messages in a small artificial “alien language”. Especially when employed in conjunction with studies of real-world data, this approach has a number of advantages.

First, it avoids the methodological and ethical hurdles noted above. Second, by employing a miniature artificial language, researchers are able to apply laboratory control without compromising on the cognitive plausibility of the agents,

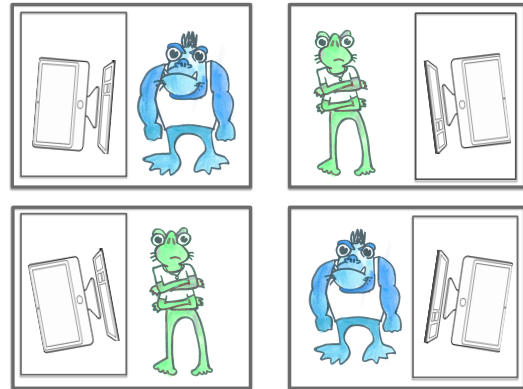


Figure 1: Players randomly assigned to species. There were two Burls and two Wiwos in each trial.

thus providing a middle-ground between ethnographic studies and computational simulations (see Galantucci & Roberts, 2012, for further discussion of the advantages of this approach). Third, the method allows language change to be observed much more rapidly than would be the case outside the laboratory. Finally, the approach has some advantages over more traditional artificial-language learning experiments (Folia, Uddén, De Vries, Forkstam, & Petersson, 2010), particularly for investigating questions with a sociolinguistic dimension. Rather than being explicitly quizzed on their knowledge of the artificial language and the social correlates of variants within the language, participants in this paradigm use the language to accomplish a nonlinguistic primary task. This helps to reduce the effect of the Observer’s Paradox (Labov, 1972), wherein participants may alter their behavior as a result of being observed.

Method

Participants

Eighty students from the University of Pennsylvania participated, in groups of four, for course credit.

Procedure

Overview The experiment involved groups of four participants playing a computer game with each other. At the start of the trial, each participant was led to a separate cubicle containing a computer and was asked to log in by entering their name. Having done this, each participant was automatically assigned to one of two “alien species”: the tough Burls and the weak Wiwos (Figure 1). They were then presented with the game instructions (Figure 2). As well as explaining how the game worked, these identified the species assigned to the player in question and provided information about both Wiwos and Burls, emphasizing that Burls were tougher than Wiwos and that the two species did not always get along. The difference in toughness was reinforced by images and by the names “Wiwo” and “Burl”. Both the Wiwos and the Burls were explicitly told that the Burls were tougher than the Wi-

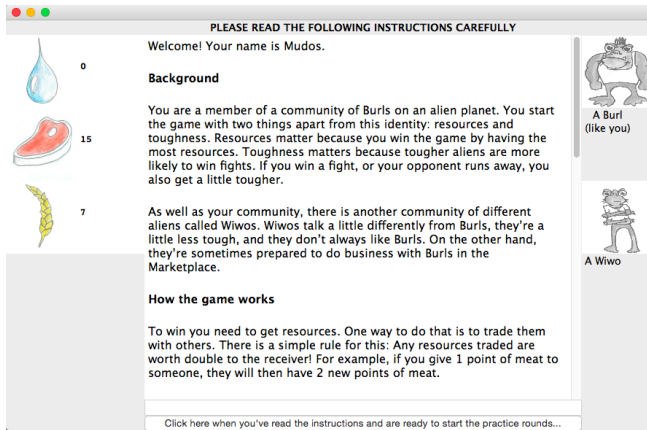


Figure 2: Instruction Screen, as presented to a Burl player.

wos, that the two species didn't always get along, and that the two species were nevertheless sometimes prepared to do business with each other in the Marketplace. In this way, we replicate the cultural setting found in Sneller (2014), where two groups may feel antagonistic toward each other but still interact. Once all participants had confirmed that they had read the instructions and had no questions, they were given an alien language to learn, presented in the form of a wordlist (see Table 1 for an example and the section on Alien Language for more details). Then they played four practice rounds before beginning the game proper, which consisted of twelve rounds. The object of the game was to win points by gaining resources from other aliens, by fighting or trading with them. The winner was announced at the end of the game. See below for more details of how the game worked.

Alien language The alien language consisted of twelve words, each consisting of two or three CV syllables and a minimal phonemic inventory of five vowels and sixteen consonants. There were two “dialects” of the language, which differed from each other with respect to both consonants (*f* vs. *b*) and vowels (*e* vs. *i* and *o* vs. *u*). Each dialect was assigned to one of the two species at random before the experiment began, so that Burls would sometimes learn words with *f* as their native variants, and sometimes with *b*. (See Table 1 for an example wordlist given to Wiwos.) We chose to vary letter representations to approximate phonological variation between the two dialects. In one dialect, *b* corresponds to *f* in the other, and central vowels *e* and *o* are raised to *i* and *u*. There were several advantages of focusing on quasi-phonological variation rather than syntactic or morphological variation. First, Sneller (2014) focused on phonological variants. Second, this simplified the task for participants, who had only to acquire words, and not syntax. Finally, borrowing across dialects is in general more likely to occur in lexical items or phonological features than in structural elements such as phonemic inventory or syntactic structure (Thomason & Kaufman, 1988). Thus by focusing on quasi-phonological features, we more closely approximate

Table 1: Sample Wiwo Wordlist in “Tough Talk” Condition

hello/goodbye	buzuki (or fuzuki*)
yes	boti (or foti*)
no/not	kibo (or kifo*)
I/me	repa
you	neba (or nefa*)
have	teme
want/need	lovite
fight	bolu (or folu*)
give	viluha
water	tiluge
meat	ginuda
grain	jubu (or jufu*)

(*Tougher aliens tend to use *f* instead of *b* in words)

real-world cross-dialectal borrowing.

Participants were exposed to the wordlists immediately after reading the game instructions, and were given approximately 14 minutes to learn the language, broken up as follows. First they had two minutes to study their wordlists. Then they played four practice rounds (each lasting approximately two and a half minutes), where they were able to practice the mechanics of the game (including chatting with each other by typing messages) with their wordlists on screen. After this they had two more minutes to study the language before the game proper began, in which participants had no access to wordlists. We note that in real languages, linguistic innovations are more frequent in informal speech registers than in formal registers (Labov, 2001). In this experiment, participants were not explicitly told anything about the register they were speaking in. However, as online chatting is an informal register (Tagliamonte & Denis, 2008), and as participants were able to engage in fighting and insulting one another, it is expected that the experiment most closely aligned with informal speech.

Game structure Each player began the game with 22 points, distributed unevenly between three resources (water, meat, and grain²) and shown on the left of the screen (Figure 2), and a toughness score (hidden from the player). Toughness scores varied such that, while a Burl could in principle be beaten in a fight by a Wiwo, Burls were the tougher species (a fact of which players were made aware).

The goal of the game was to obtain more points by trading resources, winning fights, or scaring off opponents. A

²The distribution of points over three resources had no practical significance in the game, but was designed to provide more to talk about in the Chat Stage.

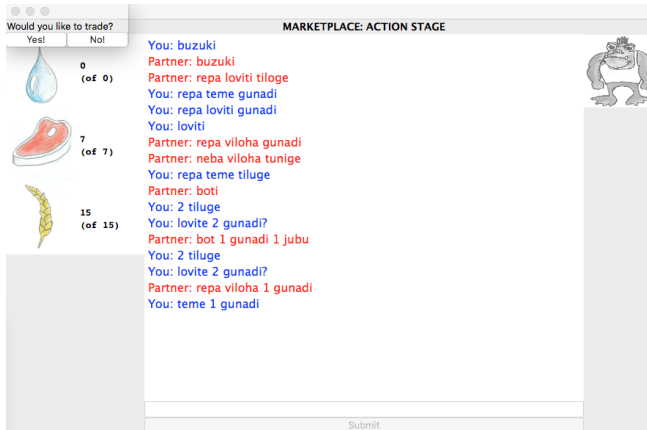


Figure 3: Beginning of the Action Stage. Chat displayed in the main box, resources displayed to the left, action choices displayed in the upper left corner, and a picture of the interlocutor displayed on the right.

game consisted of 12 rounds, each of which consisted of four stages. The first was the Setup stage, during which participants did not yet know who they would meet that round and could choose which resources they wanted to take with them to “the marketplace.” After 20 seconds this stage ended and the Chat stage began, in which each participant was paired with another participant in the marketplace. The species of that alien was shown via a picture that appeared on the top right of the screen. During this stage, which lasted approximately two minutes, participants could chat with each other by typing messages using instant messaging software. At the end of the Chat Stage, the Action Stage began, in which players could decide whether they wanted to challenge their interlocutor to a fight or offer them resources in the hope of getting resources in return (see 3). They could also choose to do nothing. A participant who was challenged to a fight could choose to stand their ground or run away. If they stood their ground, the result of the fight was determined probabilistically based on a normal distribution with the player’s toughness as the mean. As stated above, Burls were more likely to win fights against Wiwos, but were not guaranteed to do so.

Any resources given away were worth double to the receiver. A player who lost a fight would lose half of the resources they were carrying; a player who ran away would lose only a third. The winner of a fight would get the resources lost by the loser, multiplied by three. A player whose opponent ran away would get the resources that individual left behind multiplied by five. These values were chosen to take into account the value of leaving a potential battle unscathed. In other words, a player was better off scaring an opponent away than beating them in a fight and better off running away than losing a fight.

Following the Action Stage, participants were given feedback about the results of the round. Then a new round began. In half the rounds, Burls would meet Burls in the Chat Stage

and Wiwos would meet Wiwos; in the other half, Burls would meet Wiwos. The order in which these meetings occurred, however, was randomized.

Experimental Conditions There were two conditions. In the “Burl Talk” condition, Wiwos were told that Burls sometimes used different variants. In the “Tough Talk” condition, Wiwos were told that “tougher aliens” sometimes used different variants (Table 1). In both conditions, Wiwos were exposed to the same instruction screen, which associated Burls with toughness. Thus, in both conditions the variation was implicitly associated with both Burlness and toughness; the experimental variation was in the explicit association of the variation.

In both conditions, consonantal variation was explicitly marked for the Wiwos but the vocalic variation was not. This is shown in Table 1, which displays a wordlist provided to the Wiwos. This difference in feature marking allowed us, as a secondary question, to investigate the effect of the manipulation on less salient features.

Results

Practice rounds were excluded from analysis. All words used by participants in the game proper were extracted automatically from transcripts. Because participants might use forms not included in the wordlists, as a result of typing errors, memory errors, or deliberate innovation, every word was matched automatically to the most likely intended word based on Levenshtein distance.³ Rates of native and non-native consonant use were calculated by speaker species and interlocutor species. Given our research question, we focus here only on patterns for Wiwos. All *p*-values were calculated using a Wilcoxon rank-sum test.

Consonantal Variation Wiwo participants demonstrated high rates of consonantal borrowing in both conditions (Figure 4). Our hypothesis was that alienable-trait-linked features would be more frequently borrowed than features linked to an inalienable trait. In other words, we expected Wiwos to borrow Burl consonants at a higher rate under the “Tough Talk” condition than the “Burl Talk” condition. Our data supported this hypothesis: Wiwos borrowed Burl consonants significantly more in the Tough Talk condition ($\mu = 0.74$, $sd = 0.33$) than in the Burl Talk condition ($\mu = 0.47$, $sd = 0.31$), regardless of interlocutor ($T = 2.54$, $p = 0.015$).

Furthermore, in the Tough Talk condition, Wiwos did not exhibit a difference ($T = 0.81$, $p = 0.42$) in the rates of borrowed features between chatting with a Burl interlocutor ($\mu = 0.74$, $sd = 0.33$) and a Wiwo interlocutor ($\mu = 0.65$, $sd = 0.33$). This suggests that in the Tough Talk condition, Wiwo participants treated the “tough” variant as a feature of their own dialect.

However, Wiwos did exhibit a difference in the rates of

³The analysis was also rerun excluding any forms not found in the wordlists; the pattern of results did not change. The same is true if practice rounds are included.

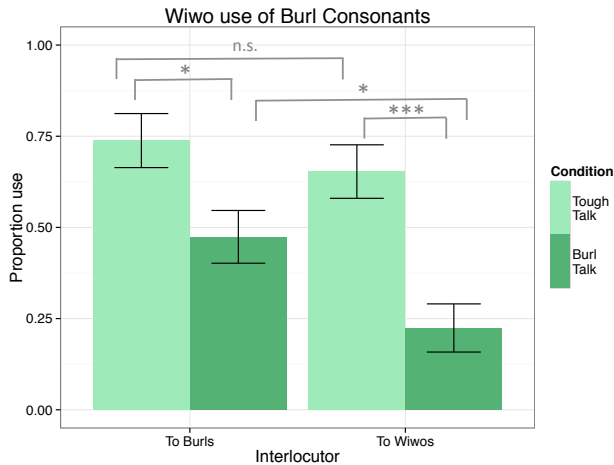


Figure 4: Wiwo use of Burl Consonants. Error bars show standard error.

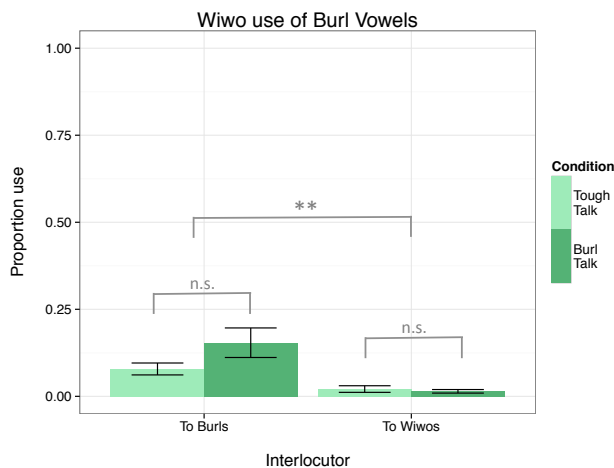


Figure 5: Wiwo use of Burl Vowels. Error bars show standard error.

borrowed features between interlocutor type in the Burl Talk condition ($T = 2.55, p = 0.015$). In this condition, Wiwos used significantly more Burl consonants when chatting with Burls ($\mu = 0.47, sd = 0.31$) than when chatting with Wiwos ($\mu = 0.22, sd = 0.22$). This behavior can be explained in terms of accommodation, whereby Wiwos in this condition were not treating the variants in question as a feature of their own dialect but rather converging with their interlocutors.

Vocalic Variation In addition to analyzing the rates of consonantal borrowing in both experimental conditions, we also analyzed the rates of vocalic borrowing. As shown in Figure 5, Wiwo participants did not engage in high rates of vocalic borrowing from their Burl interlocutors.

There are several results to be discussed in the vowel data. First, there is no statistical difference in the use of Burl vowels

between the experimental conditions. To Burls in the Tough Talk condition ($\mu = 0.08, sd = .07$) and Burl Talk condition ($\mu = 0.15, sd = 0.18$), the difference was not significant ($T = 1.6, p = 0.1$). Likewise, to Wiwos in the Tough Talk condition ($\mu = 0.02, sd = 0.04$) and Burl Talk Condition ($\mu = 0.01, sd = 0.02$), the difference was also not significant ($T = 0.6, p = 0.5$). This lack of a difference between experimental conditions are consistent with our hypothesis: Since vocalic variation was associated with neither alienable nor inalienable traits, we should expect to find participants borrowing Burl vowels at the same rate in both experimental conditions. Second, Wiwos used Burl vowels more when talking to Burls ($\mu = 0.08, sd = 0.07$) than when talking to Wiwos ($\mu = 0.02, sd = 0.04$), regardless of experimental condition ($T = 2.89, p = 0.007$). This is consistent with rates of consonantal borrowing in the Burl Talk condition, as discussed above. In other words, the difference between rates of Burl vowels when chatting with Burls compared to Wiwos suggests that participants accommodated to their interlocutors even when variation was not made salient.

Discussion

We conducted an experiment in which participants learned artificial languages with quasi-phonological dialectal variation. We tested whether variants were more likely to be adopted when they were associated with an alienable traits than with an inalienable trait (species). As expected, we found higher rates of consonant adoption in the former case. These results are consistent with the patterns of real-world dialect borrowing found by Sneller (2014), who argued that White speakers who borrowed (TH)-fronting from their AAVE speaking neighbors did so because the feature had become associated with “street” identity and dissociated from urban Blackness.

An important point to be made about our study is that Wiwos can be said to be outsiders with respect to both the alienable trait (toughness) and the inalienable trait (Burls). That is, it was made clear not only that Wiwos and Burls were different species, but that the Burls were the tougher aliens. The rates of adoption of the “tough” variants by the Wiwos in the Tough Talk Condition is thus quite striking. At the same time, a limitation of the study is that participants were exposed to the variation during the learning phase of the game. In other words, the experiment can be seen as modeling a situation in which (in)alienable-trait-linked variation is already well established in the borrowing community. An important next step, currently underway, is to run the experiment without exposure to the variation during the learning phase, thus modeling an earlier stage in the spread of cultural variants.

Finally, we also note that there is an important practical difference in the benefits of Wiwos adopting the new variant between the Burl Talk and the Tough Talk condition. That is, in the Burl Talk condition, Wiwos gain no practical advantage by using the Burl features. In the Tough Talk condition, on the other hand, there is the possibility that a Wiwo using the tough features may signal actual toughness. In terms of the game, perceived toughness has a practical benefit: it may con-

vince the other player not to start a fight or even to run away if the tough-talking Wiwo starts the fight. In other words, it may be the combination of alienable trait and practical desirability that promotes the adoption of the tough features by Wiwos in the Tough Talk condition, and not the sole fact of alienability. We are currently undertaking a follow-up experiment to test whether adoption still occurs in the Tough Talk condition when there is an absence of practical benefit.

Conclusions

The aim of the study reported here was to investigate the role of two kinds of model-based bias in the adoption of cultural variants, namely quasi-phonological variants in an artificial-language game. The results of the experiment support a distinction between two types of model-based bias: *alienable* traits such as “tough” and *inalienable* traits such as race. We found support for the hypothesis that, given two hostile groups that differ with respect to both an alienable and an inalienable trait, individuals from one group are more likely to adopt cultural variants linked to the alienable than to the inalienable trait.

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