

Do the aged and knowledgeable men enjoy more prestige? A test of predictions from the prestige-bias model of cultural transmission[☆]

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Abstract

The propensity to imitation over other forms of learning is one of the major differences between humans and other species and one that has allowed for cumulative cultural evolution. However, imitation alone cannot explain increases of average fitness in human populations. Anthropologists have hypothesized that people do not imitate behaviors from random people; rather, transmission of some cultural traits (e.g., healing skills) follows biases designed to extract reproductive benefit from the flow of socially transmitted information. In an article in this journal, Henrich and Gil-White argued that important sources of bias in the acquisition of culturally transmitted information come from prestige processes. Here, we test predictions from the prestige-bias model of cultural transmission. We use quantitative information on ethnomedicinal plant knowledge of adult (age >16) Tsimane' men ($n=288$) collected during 2005. To measure prestige, we asked Tsimane' to list important villagers and counted the number of nominations each person received. We find weak evidence that prestige is associated with ethnomedicinal plant knowledge, and we find no evidence that prestige is associated with age. Rather, we find a secular decline in prestige by decade of birth. Last, prestige bears a positive association with other attributes, such as participation in village organizations. Future empirical research needs to decouple power from prestige.

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1. Introduction

Unlike most species that rely only on genes, humans rely both on genes and culture to transmit information

across generations (Boyd & Richerson, 2005). Cultural transmission has been defined as a cumulative inheritance system that allows members of a group to incorporate behaviors from other members of the group (Castro & Toro, 2004) or as the transfer of information between individuals by social learning (Aoki, 2001). Researchers have said that cultural transmission lies at the core of human evolution and that it increases the adaptive capacity of humans (Boyd & Richerson, 1985, 1995).

In recent years, researchers have developed models to explain the mechanisms that drive cultural transmission (Cavalli-Sforza & Feldman, 1981; Cavalli-Sforza, Feldman,

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Chen, & Dornbusch, 2005; Feldman & Laland, 1996; Henrich & McElreath, 2003). This research suggests that imitation of cultural traits is necessary but not sufficient to increase average fitness (Boyd & Richerson, 1985; Rogers 1988). For example, natural selection might have favored social learners who could evaluate potential models and copy the most successful ones, thus improving the quality of information acquired via cultural transmission (Boyd & Richerson, 1985; Henrich, 2001; Henrich & Gil-White, 2001; Takahasi, 1998), or natural selection may have favored individuals with the propensity to adopt the most frequent cultural traits in a population (Boyd & Richerson, 1985; Henrich & Boyd, 1998).

To answer the question of how cultural transmission among humans operates, anthropologists hypothesize that people do not imitate behaviors from random people; rather, the transmission of cultural traits from those who have them to those who do not have them contains biases to extract reproductive benefit from the flow of socially transmitted information (Boyd & Richerson, 1985, Henrich & McElreath, 2003; Laland 2004). Boyd and Richerson (1985) propose three categories of biases that can influence the transmission of cultural traits. Direct biases, also termed content biases by Henrich and McElreath (2003), favor the acquisition of one variant of a cultural trait over another because it is inherently more attractive or better than others. Frequency-dependent biases favor the acquisition of one variant over another because of characteristics of the trait's distribution in the population, that is, bias toward copying the most frequent variant (see Henrich & Boyd, 1998). Indirect biases favor the use of other information about the model, such as success or prestige to determine which variant to copy.

Henrich and Gil-White (2001) have built on the work of Boyd and Richerson (1985) and discuss the causes and consequences of transmission that follows prestige bias. They note that

Natural selection favored social learners who could evaluate potential models and copy the most successful among them. In order to improve the fidelity and comprehensiveness of such rank-biased copying, social learners further evolved dispositions to sycophantically ingratiate themselves in their chosen models, so as to gain close proximity to, and prolonged interaction with, these models. Once common, these dispositions created, at the group level, distributions of deference that new entrants may adaptively exploit to decide who to begin copying (Henrich & Gil-White, 2001, p. 165).

Prestige-biased transmission enables new learners to accurately determine which individuals in a community are likely to have above-average information in the domain in which they are seeking to acquire knowledge. Because learners need to be in close proximity or to directly interact with the models they want to imitate, they render deference, thereby conveying prestige, to obtain that

proximity. The deference can include goods or leniency in social obligations. Because individuals will only provide these benefits to role models when their information is worth the cost of supplying the benefit, the amount of deference that an individual receives becomes a good indicator of their skill in a domain. New entrants and naïve individuals can avoid the costs of evaluating all potential role models and instead determine the individuals who receive the most deference and try to learn from those individuals. Henrich and Gil-White offer clear predictions that follow from their model. Their predictions concern (a) the relations between a person's prestige and his or her age and skills in a domain, (b) the social dynamics of prestige-biased cultural transmission (i.e., imitation, influence), and (c) the ethological patterns generated around prestigious individuals (i.e., number of times they are gazed). Specifically, Henrich and Gil-White (2001, pp. 180–181) predict that prestige will be positively associated with (a) age and (b) knowledge.

In this article, we use data collected among adult males (>16 years) in a society of farmers and foragers in the Bolivian Amazon, the Tsimane', to test the two predictions. For the empirical analysis, we use quantitative information on indigenous knowledge and uses of medicinal plants (hereafter ethnomedicinal plant knowledge). Notice that a test of those hypotheses does not provide a full test of the predictions of the model of prestige bias, which also includes predictions on the social dynamics of prestige-biased cultural transmission and on the ethological patterns generated around prestigious individuals.

2. Ethnomedicinal plant knowledge and prestige among the Tsimane'

One of the largest native Amazonian groups in the Bolivian Amazon, the Tsimane' number approximately 8000 (Censo Indígena, 2001), live in approximately 100 villages mostly in the department of Beni, and have been in continuous contact with Westerners since the 1950s (Daillant, 2003). In other publications in this journal, we have provided background historical and ethnographic information on the Tsimane' (Godoy, Reyes-Garcia, et al., 2007; Godoy, Eisenberg, et al., 2008; Reyes-García et al., 2007); hence, in this section, we summarize previous findings of Tsimane' ethnomedicinal plant knowledge and aging and discuss a topic we have not discussed before: prestige among the Tsimane'.

2.1. Ethnomedicinal plant knowledge

Ethnographic research suggests that healing knowledge is highly valued (Lee, 1979; Simmons, 1945) and sometimes even overlaps with religious and political leadership (Vidal, 2002). Our own ethnographic research suggests that healing knowledge has high symbolic value for the Tsimane' (Huanca, 2008). Like other native Amazonian societies,

Tsimane' had shamans (*cocojsi'*) — healer, priest, and political leader — who knew much about medicinal plants and communicated with spirits. The Tsimane' *cocojsi'* treated all diseases, but only they could cure ailments attributed to supernatural causes (i.e., sorcery) (Dailant, 2003; Huanca, 2008). *Cocojsi'* have disappeared, but some traditional healers still use some of the curative techniques of the *cocojsi'*. Traditional healers are an important medical referent in many Tsimane' villages, and Tsimane' might travel for several days to be treated by well-known traditional healers.

Tsimane' use ethnomedicinal plant knowledge to treat a range of common and unusual ailments. Tsimane' use medicinal plants to treat about 33% of all reported illnesses, which suggests the practical significance of ethnomedicinal plant knowledge (Byron, 2003). For Tsimane', plant remedies are the first option when illness strikes (Calvet, 2007). Among Tsimane', knowledge of medicinal plants bears a positive association with their health and that of their child (McDade, Reyes-García, Leonard, Tanner, & Huanca, 2007; Reyes Garcia et al., 2008).

2.2. Aging

Tsimane' have a very young age structure. About 57% of the individuals in our sampled households were below 15 years old, 11% were above 45, and only 3% were above 70. The main causes of mortality among Tsimane' are infectious diseases, especially respiratory and gastrointestinal infections (over half of all deaths), and accidents and violence (a quarter of all deaths) (Gurven, Kaplan, & Supa, 2007). Research on the aging process among the Tsimane' shows that between 1950 and 1990, the age expectancy of the Tsimane' was about 44, 10 years above the usual 35 for other hunter–gatherer populations. After 1990, overall Tsimane' life expectancy at birth improved by about 10 years (from about 44 to about 53). Gurven et al. (2007) argue that the increase in life expectancy is due to reductions in adult and old age mortality rather than to declines in infant mortality.

2.3. Prestige among the Tsimane'

Tsimane' do not have a term for prestige, although they have words for prestigious people. The Tsimane' word *baba* connotes deference and Tsimane' use it to refer to old, knowledgeable people whom they ask for advice. To measure the prestige enjoyed by a person, during a survey (described shortly), we asked persons who were more than 16 years of age ($n=611$) to list all the important people in the village and to describe the reason why they considered those persons important. In the analysis (not shown), we found that Tsimane' were more likely to name men than women. Eighty-six men, or 28% of the male sample, were nominated at least once, whereas only six women, or 2% of the female sample, received at least one nomination. We also found that men, on average, received more nominations than women;

the average man received 2.7 nominations (S.D.=7.80), and an average woman received 0.04 nominations (S.D.=0.34). We are not sure why women received so few nominations. Because women received few nominations, we limit the analysis to men.

Reasons for nominating people as important fell into two categories. Some men were singled out as important because of their role as village authorities and other men received nominations because of their personal attributes. Tsimane' who hold positions in village organizations matter because they act as brokers with the outside world, including the government, nongovernment organizations working in the area, and outside encroachers. Tsimane' usually elect young, schooled men who can speak Spanish, Bolivia's national language, as village leaders. Despite the fact that Tsimane' have only had formal village representatives since the early 1980s, from the 905 nominations with regard to important men in the village, 72% went to men who held or had held a formal post in the village.

Only 12.5% of the men were nominated because of their personal attributes. Overall, 2.5% of men nominated as prestigious received the nomination because of their knowledge (Table 1, Supplementary material). Although Tsimane' might respect people with specific skills, they do not seem to allow these individuals to impose their views on the group.

3. Materials and methods

Data for this article come from a panel study in progress that started in 2002 among the Tsimane'. We collected data through a survey that took place during June–September 2005 among most households ($n=252$) in 13 Tsimane' villages straddling the Maniqui River, province of Beni, Bolivia. The villages surveyed differed in proximity to the closest market town of San Borja (population, ~19,000) (mean=25.96 km, S.D.=16.70). Experienced interviewers and translators who had been part of the panel study from the start did the 2005 survey. Below, we describe the methods used to collect the data and to construct the variables used in the analysis.

3.1. Prestige

To proxy for the prestige of a person, we asked all adults in the sample to list “the name of all the important people in the village” and to describe the reason why they thought those persons were important. Since Tsimane' differentiate between people who are important because of their role as a village authority and people who are important because of their personal attributes, we separate the two types of nominations. To calculate the prestige of a man, we only selected the nominations he received because of his personal attributes (not his role as a village authority). The nominations a man received because of his role as a village authority might be perceived by others as

a result of his having power and not because of deference due him.

To analyze the list of nominations, we used social network analysis and calculated the centrality of each man in the village network of influence, defined as the number of nominations received. The measure of in-degree centrality has been previously used in studies to identify influential people in communities (Costenbader & Valente, 2003; Valente, 1995).

3.2. Ethnomedicinal plant knowledge

To measure ethnomedicinal plant knowledge, we collected similarity judgments from participants using a multiple-choice test of 15 plants selected at random from a list of 92 plants developed in an earlier study (Reyes-García et al., 2006). In the test, villagers were asked whether they could use each of the 15 plants for medicine. We used cultural consensus analysis (Reyes-García et al., 2003; Romney, Weller, & Batchelder, 1986) to calculate the most common response, which we then used as an answer key to calculate individual scores of ethnomedicinal plant knowledge. Since no subject received a 0 in the test of ethnomedicinal plant knowledge (mean=11.99, S.D.=2.68), we took the natural logarithm of the variable.

3.3. Age and decade of birth

We asked people to estimate their age in years. Because many adults did not know their age, they guessed; thus, the variable contains random measurement error (Godoy, Reyes-García, Tanner, et al., 2008). Random measurement error in explanatory variables produces an attenuation bias, making our estimates more conservative. We used the year of the survey (2005) and the subject's self-reported age to estimate the year of birth. We then create seven dummy variables for the following birth decades: 1920, 1930, 1940, 1950, 1960, 1970, and 1980. In the regression, we estimate the effect of age on prestige while controlling for cohort effects since failure to control for both can produce a misleading parameter estimate for age (Borjas, 2005; Godoy, Reyes-García, Broesch, et al., in press).

Table 1 (Supplementary material) contains definition and descriptive statistics of the variables used in the regression analysis.

4. Results

4.1. Multivariate analysis

To examine the relation between the prestige of a man and (a) his ethnomedicinal plant knowledge (H1) and (b) his age (H2), we ran a probit regression in which the dependent variable took the value of 1 if the man was nominated at least once as an important person and 0 otherwise (Table 3, Supplementary material, contains the regression results).

H1 predicts that individuals with more ethnomedicinal knowledge will enjoy more prestige than individuals with less ethnomedicinal knowledge. We found that a 1% increase in the score of ethnomedicinal plant knowledge over the sample mean of 11.99 was associated with a 0.16% higher probability of being nominated as prestigious ($p=.07$). That is, one would have to double the score of ethnomedicinal plant knowledge to have a 16% higher probability of being nominated as prestigious.

H2 predicts a positive association between prestige and age. We found that an increase of 1 year of age over the sample mean of 37.05 years was associated with a 0.10% lower probability of being nominated as a prestigious man, but the association was statistically insignificant ($p=.66$).

Two more findings merit attention. First, the decade in which the person was born was related to the probability of being nominated as a prestigious man. Men born during the 1970s had a 13% higher probability of being nominated as prestigious than men born during the 1980s ($p<.05$). Second, holding a political position in the village the year before the interview was significantly associated with the probability of being nominated as prestigious. The result is statistically significant ($p<.001$) and meaningful in real terms. Men who reported participating in village organizations had a 12% higher probability of being nominated as prestigious compared with men who did not participate in village organizations.

4.2. Robustness

We did sensitivity analyses (Table 4, Supplementary material) to assess how well the results held up. Four noteworthy findings stand out. First, only some of the additional analysis confirms the weak association between ethnomedicinal plant knowledge and prestige (Table 4, Rows 2, 3, 7–10, and 12), but in 5 of the 12 new regressions, we do not find evidence of significant association between the two variables. The association is not robust to changes in the definition of prestige (Row 1) and knowledge (Rows 4–6). Second, in none of the new regressions is age significantly associated with prestige. Third, in most of the robustness analysis, we found a positive association between prestige and (a) holding a position among the village organizations the year before the interview and (b) being born during the 1970s. Men who reported participating in village organizations had a higher likelihood — ranging from 11% to 17% — of being nominated as prestigious in their village ($p<.10$), and men born during the 1970s had a 12–29% higher probability of being nominated as prestigious than men born during the 1980s ($p<.10$). We return to the significance of those results in the discussion.

5. Discussion and conclusion

We organize the discussion around two methodological issues and three findings that come out from our analysis.

Henrich and Gil-White (2001) specifically mention that their model refers to prestige, or the freely conferred deference enjoyed by individuals in a group, which they differentiate from dominance obtained through coercion. They acknowledge that the two concepts are separable psychologically but often correlated in the real world. To separate prestige from power, we used respondents' explanations for their nominations. However, results suggest that our measure might not have captured well the difference between power and prestige. We found that 72% of the nominations went to men who held or had held a position of authority in the village, and only 24% of the nominations went to people with specific personal attributes, including, but not limited to, knowledgeable people. The distribution of nominations suggests that respondents might have simply nominated men in positions of power, including when they did not explicitly mention it as the reason for the nomination. Thus, our measure might, in fact, capture social status as a function of political position rather than freely conferred deference.

The possibility that our measure of prestige captures political leadership rather than deference is consistent with some of the results presented here. For example, if our measure of prestige captures political leadership, it is not surprising that we did not find a strong association between prestige and ethnomedicinal plant knowledge, since there is no a priori reason to think that political leadership and ethnomedicinal plant knowledge should be associated. Flaws in our measure would also explain why women were not listed as prestigious, since among the Tsimane', the public political arena is primarily the domain of men.

The other methodological issue that emerges from this work relates to the choice of the domain of knowledge. Henrich and Gil-White argue that prestige may be correlated with a wide variety of skills, depending on the society. We selected ethnomedicinal plant knowledge because previous ethnographic and empirical research suggests that ethnomedicinal plant knowledge matters for the Tsimane'. However, we lack information on how this specific domain of knowledge nowadays compares with other domains of knowledge (i.e., being a good hunter or serving as a political officer). Future research should start by a comparison of the contemporary importance of different skills (i.e., ethnomedicinal plant knowledge, hunting skills, ability to interact with non-Tsimane') to determine which domain of knowledge can we expect to correlate with prestige.

We now discuss three major substantive findings. First, we found that ethnomedicinal plant knowledge is positively associated to the prestige of Tsimane' adult men, but the results only approach statistical significance, are low in real terms, and are not robust to changes on the regression model or to changes in the definition of the variables. Other than random measurement errors with prestige and knowledge, we have two possible explanations for the lack of significant association.

First, our data might suggest that prestige-biased cultural transmission, as presented by Henrich and Gil-White (2001), is a relatively weak process for cultural transmission or, simply, that the predictions of the prestige-bias model are incorrect. However, since we tested some of the predictions of the model, and since our measures are not refined enough, more empirical data using more refined measures would be needed to totally reject the predictions of the model.

The second plausible explanation for the lack of significant association between ethnomedicinal plant knowledge and prestige relates to changes in contemporary Tsimane' society. At present, Tsimane' society lacks shamans, the figure that concentrated Tsimane' specialized ethnomedicinal plant knowledge at a time when there was no access to any other form of medicine. Tsimane' also enjoy increasingly easy access to Western medicine. Lack of shamans and access to allopathic medicines might undermine the importance of ethnomedicinal plant knowledge on contemporary Tsimane' society. It is possible that the hypotheses about the association between knowledge and prestige are only applicable to egalitarian societies lacking a sharp division of labor and institutions designed to transmit knowledge and that the association disappears once societies grow in social complexity and become less autarkic. In egalitarian societies, the only cost to imitate the behavior and knowledge of the prestigious person might be the cost of accessing the person. In stratified societies, many additional economic and social constraints would make it difficult for learners to emulate the behaviors of their preferred models.

The second finding that deserves discussion is the lack of association between prestige and age and birth cohorts. Age captures changes over the life cycle whereas cohorts capture secular changes between birth cohorts. We found no association between prestige and position in the life cycle (age), but we consistently found that Tsimane' men born between the 1950s and the 1970s, especially men born during the 1970s, were seen — as cohorts — as more prestigious than Tsimane' born either before the 1950s or during the 1980s. The two findings could be explained by the recent history of contact between the Tsimane' and Bolivian society.

Why is prestige not associated with age among the Tsimane'? Tsimane' contact with Westerners started in the 1950s and became more intense from the 1970s onward. Contact with Westerners has brought many technological innovations to the Tsimane'. Once technological innovations occur, the body of knowledge held by elders might depreciate in value and with it the allure and payoffs to imitate elders. Also, recall that the Tsimane' population has recently experienced a reduction in adult and old age mortality. With more aged people in the population, the prestige associated to age might have declined. Hence, it is possible that Henrich and Gil-White's model is more likely to apply to societies without important technological innovations, where the elders are few and hold important knowledge for survival unavailable to younger people.

Why might prestige be associated to being born during the 1970s? In 1955, Protestant missionaries set up a center to train Tsimane' to become bilingual schoolteachers. Missionaries offered scholarships to promising Tsimane' young men so that they could attend the training. During training, missionaries taught Tsimane' academic and practical skills as well as the Scriptures so that Tsimane' could teach and proselytize in the Tsimane' language when they returned to their villages (Godoy, Seyfried, et al., 2007). Because training was oriented to young men (not children), it mostly affected the cohorts born during the 1960s and 1970s. During the 1970s, the interaction of Tsimane' with non-Tsimane' intensified when the government built a road linking the local town of San Borja with the capital city of La Paz. The road made it easier for non-Tsimane' to enter the Tsimane' territory. Tsimane' born during the 1960s and 1970s have gained contact with Westerners without abandoning their Tsimane' identity. Thus, it is possible that Tsimane' born during the 1960s and 1970s acquired the ability to navigate between the two worlds, and they are seen as prestigious for that reason.

The last finding that deserves discussion is the unanticipated finding that holding a position of authority in the village has a significant association with the prestige of an individual. The explanation for this finding meshes with the lack of association between prestige and ethnomedicinal plant knowledge. Over the last decades, Tsimane' have lost their shamans and have gained access to allopathic medicines. At the same time, Tsimane' have started electing legal representatives of the village. Thus, over the last decades, Tsimane' leadership has shifted from the shaman, holder of healing skills and Tsimane' cultural values, to schooled Tsimane' whose main social role is to represent Tsimane' interests to outsiders. In rapidly transforming rural societies, such as the Tsimane', political positions might begin to overshadow cultural knowledge as a determinant of prestige. Elder Tsimane' who lack the attributes needed to hold those positions (e.g., schooling, Spanish fluency) might not be seen as prestigious anymore because they are not good role models in a changing society.

In conclusion, our findings do not support the hypotheses that prestige is associated with ethnomedicinal plant knowledge or with age, but the analysis uncovered important methodological problems that do not allow us to reject the hypotheses either. Further research on the topic needs to improve the measure of prestige in such a way that power and prestige are effectively decoupled. Henrich and Gil-White (2001) propose the collection of ethological data as a measure of prestige. While the collection of ethological data is expensive, time consuming, and intrusive, it might, in fact, provide a more accurate measure of prestige.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.evolhumbehav.2008.02.002](https://doi.org/10.1016/j.evolhumbehav.2008.02.002).

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