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Although culture is often used to explain behavior, we have little understanding of why some culture traits have impacts on behavior while others do not. Because culture traits can lead to maladaptive as well as to adaptive behaviors, gene–culture coevolution should have led predispositions that help us make good choices about which culture traits to act on and which to ignore. More specifically, we should tend to be susceptible to the influence of types of culture traits that among our ancestors would have routinely lead to adaptive outcomes. One such category of culture trait is social coordination conventions, that is, culture traits that help us reap the benefits of cooperation by helping us coordinate our behaviors with those of others. Field and laboratory studies indicate that humans are susceptible to the influence of such conventions. The influence of other kinds of culture traits on behavior may be less predictable, with culture and behavior diverging in situations where social coordination is not an issue and influences on behavior other than culture may hold sway. This line of research may have implications for our understanding not only of such scientific issues as the spatial distribution of culture traits, ethnic markers, and cultural transmission but also practical issues in pedagogy and jurisprudence.

Keywords: behavior, cooperation, coordination, culture, cultural defense

> In current anthropological theory there is no clear relation between *culture* and *action*. Of course, 1 can say 'people do what they do because their culture makes them do it.' The problem with this formulation is that it does not explain anything. Do people always do what their culture tells them to? If they do, why do they? If they do not, why do not they? And how does culture make them do it? Unless there is some specification of how culture 'makes' people do what they do, no explanation has been given.
>
> —Roy D'Andrade, 1992, p. 23

Although behavioral scientists often use culture as an explanation of behavior, we have little understanding of why culture sometimes powerfully shapes behavior and at other times seems to have no effect on it. This article attempts to lay the groundwork for a theory regarding culture's influence on behavior by considering the problem in the context of gene-culture coevolution. My specific focus is on content-related biases with regard to which culture traits are most likely to influence behavior. With the help of experimental findings from both Maasai and American research subjects, I identify in particular a content-related bias with regard to culture traits that serve to coordinate social behaviors, that is, social coordination conventions. Experimental findings described below suggest that people are highly susceptible to cul-

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ture traits that are presented to them as social coordination conventions. Such conventions play a large role in human societies, enabling people to interact successfully with one another by providing them with shared expectations regarding behavior in specific situations. The influence that social coordination conventions have on behavior contrasts with other kinds of culture traits, from whose dictates behavior may stray as a result of the influence of other factors. As an example, I explore discrepancies between stated offspring sex preferences and actual behavior toward boys and girls among an impoverished and low status Maasai subgroup. Finally, I offer some suggestions regarding the implications of this idea for such phenomena as the distribution of different types of culture traits across space, ethnic identity markers, cognition and culture, conflicts of interest, cultural transmission, cultural drift, cultural consensus, and cultural consonance.

Why a Theory Is Needed

The primary reason behavioral scientists seek a theory of culture's influence on behavior is that it would help them to better understand and predict human behavior. However, an improved understanding of culture's influence on behavior may also have both practical and ethical consequences. On the practical side, most of the people reading this article have tried to pass information on to others in a classroom setting, and virtually everyone reading it has been on the receiving end of such attempts. The success or failure of such attempts is measured in terms of the information's impact on such behaviors as writing in blue exam books and identifying correct information on multiple-choice tests. As everyone knows, the process is far from perfect. In my own large classes, success rates—that is, how much of the information I have attempted to convey that is then correctly reported or recognized by the students taking my exams—usually average somewhere between 75% and 80%. Clearly, an improved understanding of culture's impact on behavior might provide us with better ways of conveying information to students. Reeducation camps notwithstanding, educators and their students usually share common interests, so we can count any improvement in our ability to educate people as a positive development. Advertisers are also in the business of conveying information to people in hopes of influencing their behavior. When the interests of advertisers and their potential customers coincide, this, too, is a positive thing, and an improved understanding of culture's impact on behavior would be an improvement. When their interests are in conflict, an improved understanding of culture's influence on behavior may provide consumers with useful information about how to remain vigilant against attempts to manipulate them.

Culture is sometimes used as a legal defense (Renteln, 2004). This "my culture made me do it" defense has been used mainly in cases involving perpetrators from subgroups (e.g., immigrants from a particular country) that differ culturally from the larger society, although others have also leaned upon it (e.g., Red & O'Keefe, 2013). The cultural defense is based on the "thesis of cultural compulsion" (Torry, 1999, p. 129), the idea that one's actions can be dictated by culture, thus relieving one of personal responsibility for them. The cultural defense has been the subject of scholarship and advocacy by both anthropologists and legal scholars (e.g., Magnarella, 1991; Renteln, 2004; Torry, 1999, 2000). Others are more skeptical about the legitimacy of giving legal or political recognition to the influence of culture on behavior precisely because we do not have a good understanding of "how culture works" (Johnson, 2000). A good theory regarding culture's influence on behavior would be likely to have an impact on the cultural defense. One form this might take would be through a refinement of the thesis of cultural compulsion. If we can show that some types of culture traits are indeed capable of reducing individual agency to a point where individual responsibility is also significantly diminished, then we will have made a useful contribution to jurisprudence, particularly in cross-cultural and multicultural settings.

Operationalizing "Culture"

Perhaps the most important reason why we do not yet have a theory regarding culture's influence on behavior is the absence of a consensus definition of culture. For those of us who wish to use the concept of culture to explain behavior, the choice of definitions can be narrowed down to those that separate culture's

ideational elements from behavior and its products, such as material artifacts and institutions. These are known as ideational definitions of culture (Cronk, 1995, 1999; Keesing, 1974). Ideational elements include such things as knowledge, beliefs, and information. Although ideational definitions have their roots in cognitive, symbolic, and interpretive versions of cultural anthropology (e.g., Geertz, 1973; Goodenough, 1957; Turner, 1967), they have more recently been embraced both by anthropologists working in the evolutionary tradition (e.g., Alvard, 2003; Cronk, 1999; Durham, 1991; Mesoudi, 2011) and animal behaviorists (e.g., McGrew, 2004). The advantage of an ideational definition of culture is that it helps us avoid circular explanations. If we include behavior in our definition of culture, we make it difficult to separate behavior from culture and thus to see the influence of one on the other. It is only by separating them that we can clearly conceive of a causal relationship between them. One ideational definition of culture that accomplishes this goal is "socially transmitted information." This is the definition that I will be using in the rest of this article.

This definition is narrow in the sense that it excludes behavior and its products. On the other hand, it is quite a broad definition in the sense that it includes *any* socially transmitted information, even including information that may not be true and, as must certainly be the case for many instances of culture among nonhumans, information that influences an individual's behavior without him or her being consciously aware of that influence. Others prefer to use the term "culture" to refer to a subset of socially transmitted information. For example, many definitions over the years have included stipulations about its association with a particular group of people or its adaptiveness (see Cronk, 1999, pp. 132–33 for a sample of definitions of culture drawn from introductory anthropology texts). Rather than treating such things as defining features of culture, such stipulations are better approached as good research questions: Why is it that culture traits are so unevenly distributed across human groups? Why is it that so many culture traits lead to adaptive behaviors? A better understanding of culture's influence on behavior may lead us to better answers to those and other interesting questions.

A stronger case can be made for limiting one's use of the term "culture" to socially transmitted information that has some staying power. Sperber (1996), for example, makes a distinction between "public representations," bits of information that are transmitted to at least one other individual, and "cultural representations," information that is widely distributed and lasting. This is similar to the idea of a "cultural tradition." This distinction highlights the fact that we need an additional set of theoretical tools—specifically, cultural transmission theory and related ideas such as gene-culture coevolution—thanks to the fact that some culture traits are indeed long-lasting. For the development of a theory regarding culture's influence on behavior, it is enough to acknowledge that the kinds of culture traits that last long enough to get our attention are much more likely to be cultural representations *sensu* Sperber and not merely public representations.

It should be noted that those whose *explanandum* is something other than behavior may have good reasons for choosing definitions of culture that do not clearly separate culture from behavior. For example, some cultural transmission theorists define culture as "knowledge, values and other factors *that influence behavior*" (Boyd & Richerson, 1985, p. 2, emphasis added; see also Ramsey, 2012). Because their *explanandum* is patterns of cultural transmission, not behavior in general, this definition suits their purposes: they do not want to be distracted by culture traits that have no influence on behavior. But for those of us whose *explanandum* is behavior, those ineffectual culture traits are just as important to consider as the ones that do have measurable effects on behavior.

In addition to allowing culture to be used to explain behavior, ideational definitions also open the door for things other than culture—social pressures, economic forces, genes, hormones, and so forth—to be used to explain behavior. Such causal pluralism in the study of human behavior is appropriate given both the complexity of the phenomenon and our still rather rudimentary understanding of its causes. The late great evolutionary theorist George C. Williams (1966) argued that adaptation is "a special and onerous concept that should be used only where it is really necessary." Evolutionary behavioral scientists might benefit from taking a similarly cautious approach when using culture

to explain behavior, as animal behaviorists already do (e.g., Rendell & Whitehead, 2014).

Another advantage of ideational definitions of culture is that they make it easy to conceive of culture not as an undifferentiated mass but rather as a collection of traits. This allows us to break the problem of culture's influence on behavior down into specific instances. Rather than asking "What is culture's influence on behavior?" we can ask a far more tractable question: *If we know that someone has been exposed to a specific culture trait, how much does that improve our ability to predict his or her behavior?* By breaking the problem down into specific instances, we improve our chances of being able to say something truly significant about the broader issue. What exactly constitutes "*a* culture trait" has been the subject of debate (e.g., Henrich & Boyd, 2002; Sperber, 1996), and certainly it is true that some traits are easy to identify and isolate (e.g., a recipe for muffins) while others are so embedded and intertwined with other culture traits that it is difficult to see where one starts and another stops (e.g., Catholic doctrine). This is a complication that we can leave to the future. The focus here is things that are easy to identify as distinct culture traits, leaving the more context-dependent, embedded types of traits for future work.

Steps Toward a Theory

Three additional steps are now necessary. First, we must consider only culture traits that refer to specific behaviors. If culture is socially transmitted information, then not all culture traits have any clear relationship to behavior. "Polar bears live in the Arctic" is a piece of information that can be transmitted from person to person, but unless we know something more about the recipient of this information (e.g., that he wishes to hunt polar bears) then knowing that someone is aware of this culture trait will not help us predict his behavior. We need instead to focus our attention exclusively on culture traits that have clear behavioral referents. "Give 10% of your income to charity" is an example. As should be obvious from this particular example, the fact that a culture trait has a clear behavioral referent does not imply that behavior will actually conform to it.[1]

Second, we must take a *ceteris paribus* approach. Many things besides the characteristics of a culture trait itself can influence a culture trait's impact on behavior. These include, for example, characteristics of the person modeling the trait such as his or her prestige and his or her similarity to the person who is considering adopting the trait. It has also been suggested that people may have a tendency to conform to local behavioral patterns because others might have better information about local conditions than they do. Such commonplace things as coercion, peer pressure, and punishment can also play an important role (Boyd & Richerson, 1992; Henrich & Boyd, 2001). Cultural transmission theorists call these "context biases" (Henrich & McElreath, 2003). For our current purposes it is best to set context biases aside as far as possible and focus instead on what are known as "content biases," that is, biases in our responses to culture traits that concern what the culture traits are actually about (i.e., what sort of behaviors they refer to). Because it is difficult to control for context in natural settings, laboratory research will be necessary. As the study of culture's influence on behavior develops, we will be able to make our approach more sophisticated by considering both content and context biases as well as possible interactions between them.

Several content-related biases in individual memory and cultural transmission have already been identified (Hoppitt & Laland, 2013, pp. 226–227). Examples include information about social interactions (Dunbar,

[1] As a reviewer for this journal correctly pointed out, knowing that someone else knows that polar bears live in the Arctic will allow us to accurately predict one type of behavior: he or she will be able to correctly answer a question about where polar bears live. This highlights the fact that what people say, more technically known as speech behavior or verbal behavior, is indeed a particular kind of behavior. A great deal of scholarship, particularly in sociology and social psychology, has documented discrepancies between what people say and what they do (e.g., Deutscher, 1973; Deutscher et al., 1993; see also Cronk, 1999, pp. 5–10). Because speech behavior is a type of behavior, such discrepancies are not the same as those between culture and behavior. However, these two types of discrepancies are related to one another. People's ability to say one thing and do another creates opportunities for culture and behavior to go separate ways, with speech behavior literally paying lip service to the dictates of culture while behavior is left to be influenced by things other than culture. Later in this article I will provide an example of a divergence between culture and behavior from the literature on sex-biased parental investment.

1997; Mesoudi, Whiten, & Dunbar, 2006), information about facial attractiveness judgments (Jones et al., 2007; Little et al., 2008), culture traits that are more emotionally evocative (Bangerter & Heath, 2004; Heath, Bell, & Sternberg, 2001), minimally counterintuitive concepts in both religious and nonreligious contexts (Barrett & Nyhof, 2001; Boyer, 1994; Atran, 2002), and sensory metaphors (Akpinar & Berger, 2015). The question remains whether any of these content biases in which culture traits are remembered and transmitted also have an impact on which culture traits do and do not have impacts on behaviors other than simply the further transmission of the trait. This highlights an important distinction between the transmission of culture traits and the expression of those traits through behaviors other than transmission. One way for culture traits to get transmitted, and generally the only way they get transmitted among nonhumans, is for them to have an impact on behavior and for others to then observe that behavior. But language provides humans with a way to transmit culture traits that have no impact on any behavior other than the act of transmission. I can tell you in a fair amount of detail how to change your car's oil even though I have never changed the oil in any car, or how to travel from the Shire to Minas Tirith even though, given that both places are creations of fantasy author J. R. R. Tolkien (1994), neither you nor I will ever be able to make such a journey. We can learn, know, and transmit more culture traits than we actually act upon. The question here is why we act on some and not on others.

Third, we must consider this problem within the context of gene-culture coevolution (Durham, 1991). Although culture's influence on behavior is usually beneficial, culture traits are not all equal in this regard. Some are better than others at helping people accomplish their goals, and some culture traits may even lead people to do things that are not adaptive. Culture's ability to lead to maladaptive behaviors is partly a result of culture's virus-like quality, a characteristic that has led some to think about cultural transmission in epidemiological terms (e.g., Cavalli-Sforza & Feldman, 1981; Kurzban, 2007; Sperber, 1996). For these reasons, a process of gene–culture coevolution should have provided us with a certain "epistemic vigilance" (Sperber et al., 2010) not only in terms of which culture traits we believe but also in terms of which culture traits we let shape our behavior. Continuing with the viral analogy, epistemic vigilance should include something like an immune system for culture. Just as our immune system is designed to distinguish between that which is us and that which is not us, our minds should employ some combination of heuristics and other cognitive mechanisms, both innate and learned, that lead us to make good choices among competing culture traits, following the dictates of some while avoiding the influence of others. While our cultural immune system's learned aspects may be the result of cultural evolution alone, whatever innate aspects it may have can be the result only of gene–culture coevolution.

A Preliminary Hypothesis

Kurzban (2007) has suggested that a way to begin to understand our cultural immune system is to break culture down into different cultural realms, that is, categories of culture traits that concern different aspects of our lives. For some cultural realms, Kurzban argues, we should have evolved to be skeptical. For example, skepticism regarding "strategic social information, especially about social influence, intentions, power, norms, and, more broadly, obligations, mores, and the proper distribution of costs and benefits" (p. 360) might be quite adaptive because it would help us avoid being exploited by others. For other cultural realms, gullibility should have evolved. Kurzban's "gullibility" is similar to Simon's (1990, 1993) "docility," "the tendency to depend on suggestions, recommendations, persuasion, and information obtained through social channels as a major basis for choice" (Simon, 1993, p. 156). Kurzban suggests that tools may be a good example of a cultural realm in which we should have an evolved gullibility because they are "a domain in which there is little conflict of interest and, therefore, little is to be gained by deception" (p. 360). If it is obvious that, say, a steel ax allows one to fell trees more easily and quickly than a stone ax, it is easy to predict that, *ceteris paribus*, people exposed to this bit of information (and, of course, to steel axes themselves) will be more likely to use steel axes than stone ones.

But, true as this may be, it is not particularly interesting or surprising.

We may be able to develop more interesting hypotheses if we begin with another of Kurzban's observations about gullibility: Because there is little that one could gain by misleading children about the conventional meanings of words, we should be gullible when it comes to learning new lexical items. Indeed, a great deal of research shows that children are not only gullible when it comes to learning language but are actually well equipped to infer the meanings of new words even when they are provided with minimal information with which to do so. We are similarly gullible when it comes to learning rules of syntax (Pinker, 1994). If we are to understand why we are gullible when it comes to language learning then we must ask what language is for. Although language can be used for many things, its most basic social function is coordination (Bickerton, 2009; Chwe, 2001; Lewis, 1969). Coordination problems are one of two types of barriers to successful cooperation, the other being conflicts of interest, as in collective action dilemmas and free-rider problems (Cronk & Leech, 2013). In pure coordination problems, there are no conflicts of interest. Everyone would benefit if only they could find a way to coordinate their actions. As Chwe has persuasively argued, this can occur if they have both common knowledge about how to solve the coordination problem and common metaknowledge—that is, common knowledge that there is indeed common knowledge about how to solve the coordination problem. Although common knowledge and common metaknowledge can emerge in a group that does not use language, language speeds the process up remarkably (e.g., Chaudhuri, Schotter, & Sopher, 2009).

Comparisons between human children and chimpanzees indicate that humans are far better than our closest relatives at solving social coordination problems (Herrmann et al., 2007). This suggests that one of the ways in which our lineage diverged was through an enhanced ability to solve these kinds of problems. Given that language helps us overcome coordination problems and that an ability to solve such problems most probably helped our ancestors to survive and reproduce, then our gullibility when it comes to language acquisition may reflect this history of selection. This same logic should apply not only to language but also to other culture traits that help solve coordination problems. Let us call these "social coordination conventions." A common social coordination convention in today's society is which side of the road to drive on.

Armed with the concept of social coordination conventions, we can now make the following simple, *ceteris paribus* prediction: When a culture trait is a social coordination convention, the fact that someone has been exposed to it and an appropriate situation in which to use it should make it a better predictor of his or her behavior than other kinds of culture traits.

An Experimental Approach

To better understand the influence of culture traits on behavior, it is necessary to conduct controlled experiments in which participants' behavior is observed with and without them being exposed to the traits in question. One way to accomplish this is through the intersocietal transfer of culture traits: (a) identify a culture trait that has a clear behavioral referent and that can be removed from its original context without doing too much damage to its implications for behavior; (b) to get a baseline reading of the trait's potential to have an impact on behavior, run an experiment to assess its impact on the behavior of people from the society in which it originated; (c) expose naïve participants from a different society to the trait; (d) compare the impact of the trait on the behavior of naïve participants with that of participants from the society where the trait originated.

The specific culture trait in question here originated among Maasai and other Maa-speaking peoples in East Africa. Maa-speakers form dyadic gift-giving and risk-pooling relationships that they refer to as *osotua* (pl. *isotuatin*). Osotua's literal meaning is "umbilical cord." Computer simulations show that herders engaged in osotua-like relationships are better able to maintain their herds than herders that do not exchange livestock with each other (Aktipis, Cronk, & de Aguiar, 2011; Hao, Aktipis, Armbruster, & Cronk, 2015).

To learn more about osotua, I conducted semistructured interviews with 10 men ranging in age from 25 to 73. Interviews were guided by a list of 15 open-ended questions on osotua. These included questions about the meanings of

the terms osotua and isotuatin, the ways in which people become isotuatin, how long such relationships last, what isotuatin are expected to do for each other, what kinds of people become involved in osotua relationships, whether anything can end an osotua relationship, and what happens when isotuatin die. Informal discussions with these same men about the results of the Trust Games (see below) also inform my understanding of osotua. The interviewees displayed a very high degree of consensus regarding the major features of osotua relationships. Osotua relationships are started in many ways, but they usually begin with a request for a gift or a favor. Such requests arise from genuine need and are limited to the amount actually needed. Gifts given in response to such requests are given freely (*pesho*) and from the heart (*ltau*) but, like the requests, are limited to what is actually needed (see also Perlov, 1987, p. 169). Because the economy is based on livestock, many osotua gifts take that form, but virtually any good or service may serve as an osotua gift. One common way in which an osotua relationship is established occurs when a young man is circumcised. He asks one man to help him by holding his back and other his leg, and henceforth those men are his isotuatin. Once osotua is established, it is pervasive in the sense that one cannot get away from it. Osotua is also eternal. Once established, it cannot be destroyed, even if the individuals who established the relationship die. In that case, it is passed on to their children (see also Spencer, 1965, p. 59). Osotua does not follow a schedule. It will not go away even if much time passes between gifts. Although osotua involves a reciprocal obligation to help if asked to do so, actual osotua gifts are not necessarily reciprocal or even roughly equal over long periods of time. The flow of goods and services in a particular relationship might be mostly or entirely one-way, if that is where the need is greatest. Not all gift-giving involves or results in osotua. For example, some gift-giving results instead in debt (*esile*). Osotua and debt are not at all the same. Although isotuatin have an obligation to help each other in times of need, this is not at all the same as the debt one has when one has been lent something and must pay it back (see also Spencer, 1965, p. 27 and Perlov, 1987, p. 169). Going along with the idea that osotua gifts do not repay debts, osotua gifts are not payments at all, and it is inappropriate to use the verb "to pay" (*alak*) when referring to them. Osotua imbues respect (*enkanyit*), restraint, and a sense of responsibility in a way that nonosotua economic relationships do not. In the words of one interviewee, "*keiroshi*": It is heavy.[2]

To explore the osotua concept's impact on behavior, my collaborator Helen Wasielewski and I used it to frame Trust Games played both by Maasai living in Kenya's Mukogodo Division (Cronk 2007b) and by Americans (Cronk & Wasielewski, 2008). The Trust Game, also sometimes known as the Investment Game (Berg, Dickhaut, & McCabe, 1995), is a commonly used two-player experimental economic game. We used a version of the game in which Player One and Player Two are both given equal initial endowments. Player One can give any portion to his or her endowment, including none at all, to Player Two. The experimenter then multiplies that amount by three and gives it to Player Two, who combines it with his or her original endowment. Player Two can then return any portion of the money he or she now controls to Player One, including none at all. Players' identities are known only to the experimenters.

We recruited 100 men from among the five Maasai subgroups living in Mukogodo Division (Mukogodo, Mumonyot, Ilng'wesi, LeUaso, and Digirri), each of whom played in one Trust Game, for a total of 50 games. All players were given standard instructions, in Maa by a native speaker, on how to play the game. Half of the games were played with no framing beyond the instructions themselves. The other half were framed with a single additional sentence: "This is an osotua game" (*Nena enkiguran o osotua*). Because the order in which participants played the game was determined solely by when they happened to arrive at the study location, their assignment to one of the two treatments was essentially random. In any particular game, the presence or absence of the osotua frame was the same for both Player One and Player Two.

[2] This limited description of osotua, both as an ideal and in terms of how much behavior actually conforms to that ideal, will soon be enhanced by research currently being conducted by Dennis Sonkoi, a Maasai graduate student working under the author's supervision as part of the Human Generosity Project (http://humangenerosity.org).

The Kenyan Trust Games provided a baseline regarding what happens when people who are familiar with a particular social coordination convention are prompted to use it in an experimental setting. The next step was to see whether the convention has a similar effect on the behavior of people who are initially unfamiliar with it. To accomplish this goal, we recruited 210 American participants. Most were students at a large public university. Seventy of the American participants read a short description of Maasai culture and the osotua concept and then played a Trust Game that was presented to them with no further framing. The description of osotua was similar to the one presented above. Seventy participants read the same description of Maasai culture and osotua and then played a game labeled "The osotua game." Those two groups provided a basis for comparison with the Kenyans: Everyone was exposed to the osotua concept, but only half of them were prompted to use it as a frame for their Trust Games. To get a baseline regarding how American participants play the Trust Game in the absence of any relevant framing or labeling, we also had another 70 participants read a text about meteorology and then play Trust Games presented to them with no further framing. We had them read a text in case simply reading any sort of text at all might have some impact on how they played the games. We chose meteorology for this purpose because it seemed unlikely to trigger any unconscious social cognition mechanisms. Results from this dummy frame are described elsewhere (Cronk & Wasielewski, 2008). To give participants an incentive to actually read the texts, each one was immediately followed by a short multiple choice quiz.

The American participants' behavior replicated in almost every way that of the Kenyan participants. In keeping with the emphasis in osotua relationships on restraint, respect, and responsibility, both Kenyans and Americans both gave and expected lower amounts in the osotua-labeled games than in the unframed games in Kenya and the games Americans played after reading about the Maasai but with no further labeling. Table 1 shows the results of simple regressions with the amounts given and expected as the dependent variables and country and treatment as dummy independent variables. Because the dependent variables were recorded in terms of different currencies (100 shilling initial endowment in Kenya, $10 in the U.S.), they were standardized first by rephrasing the U.S. amounts in 10 cent increments and then by taking not the raw scores from each country but rather the fractionalized ranks (simple ranks would not work because of the different sample sizes). The country in which the games were played has no statistically discernable impact on their outcome, yielding small beta coefficients and large p values. The difference in treatments, in contrast, consistently yields statistically significant negative beta coefficients.

In addition, two bivariate relationships among the variables can be found in the data from both countries. First, those in the role of Player One who gave more expected more in return, but only in the unframed games (see Figure 1). Second, there is a positive relationship between amounts given by Player One and amounts returned by Player Two in the un-

Table 1
Regression Coefficients

	Country		Treatment	
Dependent variable	Standardized regression coefficient	p value	Standardized regression coefficient	p value
All transfers	−.002	.970	−.162	.012
Transfers by Player One	−.005	.956	−.241	.008
Player One's expectations	−.006	.947	−.185	.045
Transfers by Player Two	−.005	.956	−.246	.007

Note. Country and treatment were coded as dummy variables (Kenya = 0, U.S. = 1; unframed games in Kenya and Maasai-text framed games in the U.S. = 0, osotua-framed games in both countries = 1). Dependent variables are all fractional ranks within countries and player type.

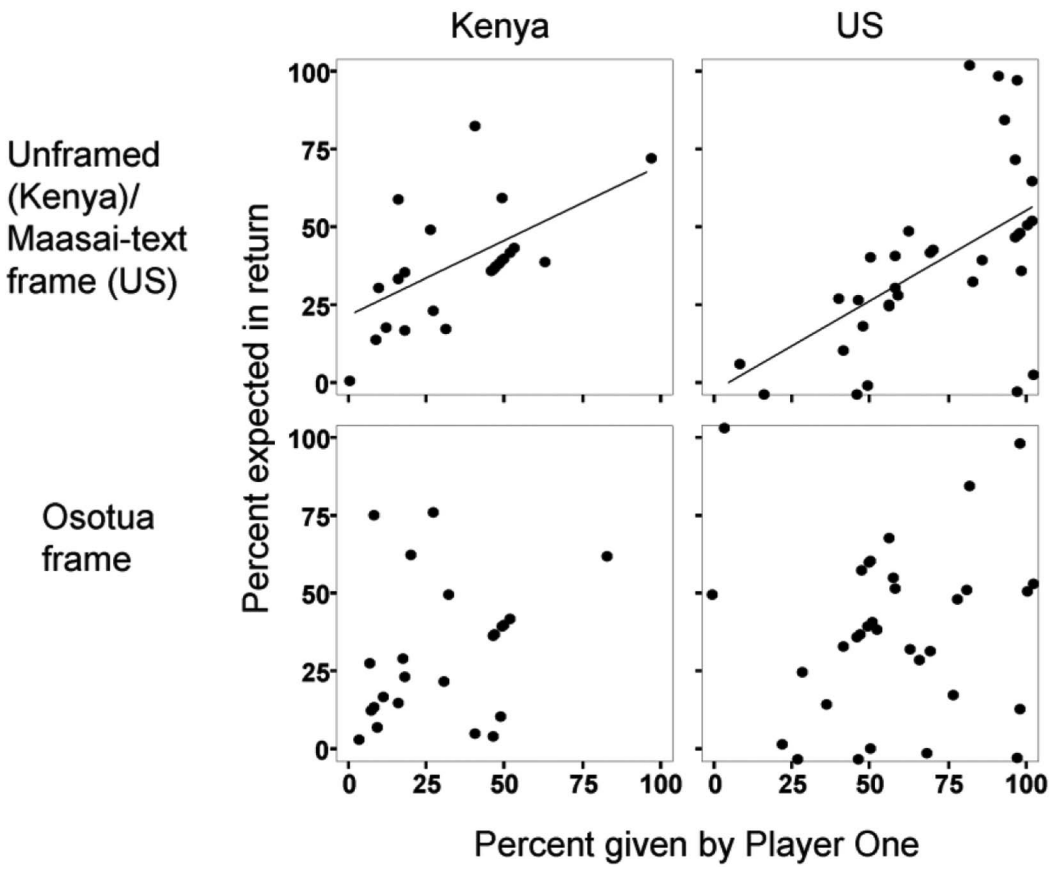

Figure 1. Percentages given by Player One (horizontal axis) and expected in return (vertical axis), in both countries and treatments. Regression lines are shown where they reach conventional levels of statistical significance: Kenya, unframed: $\beta = 0.610$, p (one-tailed) = 0.0005, adjusted $R^2 = 0.345$; U.S., Maasai text frame: $\beta = 0.542$, p (one-tailed) = 0.0005, adjusted $R^2 = 0.273$; Kenya, osotua frame: $\beta = 0.267$, p (one-tailed) = 0.099, adjusted $R^2 = 0.031$; US, osotua frame: $\beta = 0.047$, p (one-tailed) = 0.396, adjusted $R^2 = 0.029$.

framed games in Kenya and in the Maasai-text games in the U.S. but not in the osotua-framed games in either country (see Figure 2). Both of these patterns suggest that although the logic of tit-for-tat reciprocity is at work among players in both countries in the unframed and Maasai-text games, that logic is displaced by something else when the games are given the osotua label. The similarities between the data from the two countries suggest that even unfamiliar social coordination conventions can have rapid, measurable effects on behavior. For additional details regarding the data and related statistics, see Cronk and Wasielewski (2008).

It should be noted that neither the Kenyans nor the Americans who played the games with the osotua label ended up taking home more money than the people who played the unlabeled games. In fact, on average they took home slightly less, though in neither country were the differences in average amounts taken home statistically significant. If the players of the labeled games had earned more money, these studies would be vulnerable to the criticism that people followed the osotua convention not out of some evolved susceptibility to social coordination conventions but rather simply as a way of making more money. Because that did not happen, these studies are not vulnerable to that particular criticism. This also explains why this study did not use a pure coordination game. In such games, coordination always leads to the highest possible payoff, which

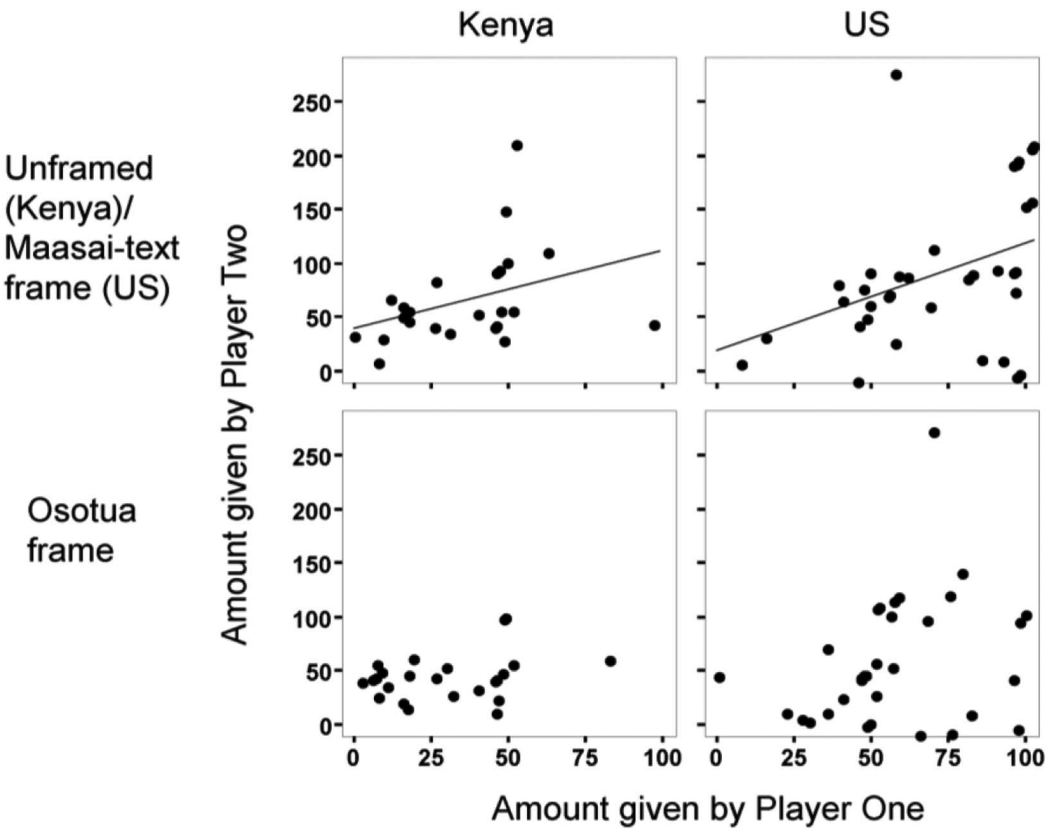

Figure 2. Amounts given by Player One (horizontal axis) and Player Two (vertical axis), in both countries and treatments. Kenyan players started with 100 Kenyan shillings in 10-shilling coins, and U.S. players started with 10 U.S. dollars divisible in one dollar increments. To facilitate comparisons between the two countries, the U.S. data have been multiplied by 10. Regression lines are shown where they reach conventional levels of statistical significance: Kenya, unframed: $\beta = 0.356$, p (one-tailed) $= 0.041$, adjusted $R^2 = 0.089$; U.S., Maasai text frame: $= 0.383$, p (one-tailed) $= 0.012$, adjusted $R^2 = 0.121$; Kenya, osotua frame: $\beta = 0.272$, p (one-tailed) $= 0.095$, adjusted $R^2 = 0.034$; U.S., osotua frame: $\beta = 0.224$, p (one-tailed) $= 0.098$, adjusted $R^2 = 0.021$.

would leave it unclear whether participants were following the dictates of the social coordination convention or merely seeking the highest possible payoff. Although Trust Games include an element of coordination, they also include the possibility that following the social coordination convention offered by the experimenter will not necessarily lead to the highest possible payoff.

Another possible criticism is that the U.S. findings may result from the phenomenon of experimenter demand, in which participants seek to perform in a way that they perceive as being desired by the experimenter. If experimenter demand were responsible for these findings, then it should be evident among all participants who read about osotua. The differences between how the game was played by those who read about osotua and then played unframed games and how it was played by those who read about osotua and then played framed games indicate that experimenter demand is not responsible for these findings.

A Counterexample: When Behavior and Culture Diverge

The impact of the osotua norm on the behavior both of people who have grown up with it and of people who had just learned about it

contrasts with another instance, also from my Kenyan field site, in which culture and behavior appear not to correspond with each other. The behavior in question is sex-biased parental investment. As I have documented elsewhere (Cronk, 1989, 1991a, 1991b, 1993, 2000, 2004), Mukogodo caregivers treat their young girls better than young boys, holding them more often, nursing them more frequently and for longer, and taking them more frequently for medical treatment. This leads to better growth and survival rates among girls than boys. Data on parenting among their wealthier and higher-status Maa-speaking neighbors consist of dispensary and clinic records, which show a pattern of male favoritism equal to the degree of female favoritism in clinic visits seen among the Mukogodo (Cronk, 1989, 2004). These patterns fit the predictions of an evolutionary model of sex-biased parental behavior that predicts that parents in good condition will favor sons while parents in poor condition will favor daughters (Trivers & Willard, 1973; see also Cronk, 2007a). The idea is that if there is a correlation between parental condition during the period of parental investment and the reproductive success of the offspring, daughters are a safer bet for parents in poor condition because almost all females reproduce but low quality males often do not. Because the Mukogodo are at the bottom of a regional socioeconomic hierarchy of wealth and ethnic prestige (Cronk, 1990), Mukogodo men have historically had a difficult time finding marriage partners while virtually all Mukogodo women get married, often to wealthy men from neighboring groups, and reproduce. The result is that the reproductive success of Mukogodo men is, on average, lower than that of Mukogodo women.

This pattern of behavior contrasts with the fact that Mukogodo mothers say that they prefer sons over daughters. Why the discrepancy? Since roughly the 1930s, the Mukogodo have been in the process of emulating other, wealthier and higher status Maa-speaking peoples including not only those mentioned above but also Samburu to the north and other Maasai groups living in southern Kenya and northern Tanzania. Because those higher status groups are known to strongly prefer sons, Mukogodo mothers' statements in favor of sons appear to be driven more by this process of status-seeking than by their actual behavior toward their offspring. Their actual behavior appears to be an unconscious response to their poverty and low status driven by an evolved propensity to favor daughters over sons when conditions are poor. The conditions that would have favored the evolution of this ability to adaptively adjust investment in the two sexes are likely to have existed for millennia, and so whatever mechanism is responsible for the behavior is likely to be ancient, phylogenetically widespread, and not requiring conscious awareness of the behavior on the part of the caregiver. Thus, we have culture saying one thing (favor sons) and caregivers doing quite another (favoring daughters). The Mukogodo are one of only a few societies for which we have data on both parents' stated sex preferences for offspring and parents' treatment of sons and daughters. However, among those societies for which we have both kinds of data and in which parental care is biased in favor of females, such a mismatch between statements and actions is virtually universal (Cronk, 1991b). The discrepancy between culture and behavior is able to persist for several reasons. First, the caregivers themselves appear to be unaware of the biases in their caregiving patterns. Second, although those biases can be measured and although they do have real effects on growth and survival, they are subtle and easy for casual observers to miss. Third, and most interestingly for our current purposes, the culture trait in question is not a social coordination convention.

An alternative hypothesis for the female favoritism of Mukogodo caregivers would begin with the observation that culture does not need to be verbally articulated in order to be effective in shaping behavior. Perhaps Mukogodo girls simply learn to favor girls over boys in ways that are more subtle but no less cultural than if they were explicitly taught to do so. As appealing as this idea is to someone who is trying to identify culture's effects on behavior, it seems unlikely to be true. The reason is that, because of high rates of intermarriage between Mukogodo and their neighbors and because at marriage a woman's lineage membership and ethnic identity shift to those of her husband, many Mukogodo mothers began their lives not as Mukogodo but as members of other, higher status and wealthier Maa-speaking groups. In 1993, I studied the caregiving patterns of a sample of 40 Mukogodo mothers, half of whom

had young sons while the other half had young daughters. Sixteen of those mothers, eight with sons and eight with daughters, had been raised as something other than Mukogodo, yet their patterns of daughter favoritism and the growth patterns of their sons and daughters showed the same female biases as did the women who were raised as Mukogodo. Thus, attributing Mukogodo daughter favoritism to cultural transmission would require in-marrying women to quickly forget their previously learned patterns of male-biased caregiving and learn the female-biased ways of the Mukogodo, all without anyone actually saying anything other than that they really prefer sons to daughters. It is more likely that the daughter-favoritism shown both by mothers who were raised as Mukogodo and by mothers who were raised among wealthier and higher-status neighboring groups is an unconscious, adaptive response to the socioeconomic and ecological condition in which they find themselves, that is, poverty and low status that lead to better reproductive prospects for girls than boys.

Toward a General Theory

We have seen that the knowledge that someone has been exposed to a social coordination convention, even for a very brief period, can increase our ability to predict his or her behavior. This provides support for the hypothesis presented above: "when a culture trait is a social coordination convention, the fact that someone has been exposed to it and an appropriate situation in which to use it should make it a better predictor of his or her behavior than other kinds of culture traits." However, these studies also make it clear that mere exposure to the convention is not enough to yield this increase in our predictive power. After all, the osotua concept did not have a statistically discernable impact on the game-playing behavior of either Maasai who had been learning about the concept all their lives or Americans who had just been exposed to it unless they played a game that was also labeled with the word "osotua." Recall that what is needed for social coordination problems to be solved is not only common knowledge—common knowledge that a solution does indeed exist—but also common metaknowledge—common knowledge that common knowledge about the solution also exists (Chwe, 2001). In the case of the Trust Games, the label seems to be required in order for participants in the studies to feel confident that there is indeed common metaknowledge about the osotua convention.

Thus, if we wish to reap the benefits of social coordination, we should be susceptible to the influence of social coordination conventions. But what counts as a social coordination convention? Among those culture traits that have clear behavioral referents, some refer to individual behaviors that do not need to be coordinated with others while some coordinate social behavior. If we were a less social species, then the former might far outnumber the latter. But the fact is that we *are* a highly social species and, as such, we are constantly coordinating our behaviors with those of others. Nearly everything we do has a social dimension and thus must be coordinated, at least in some minimal way, with the actions of others. Although one can eat by oneself, for most of us most of the time eating is a social act. Most of us obtain our food from others, we may let others prepare it and serve it to us or we may prepare and serve it to others, and we usually eat with others. Thus, the decision about whether to use chopsticks or silverware is ultimately a social coordination decision, not one that individuals can make in isolation from each other. It has an impact not only on how the table is set but on how food is prepared and served. The resulting staying power of cooking and dining conventions may even be reflected in the archaeological record: archaeologist Ofer Bar-Yosef has suggested that the discovery of pottery in China predating the development of food production by 10 thousand years (Wu et al., 2012) may explain modern culinary differences between eastern and western Asia (Bhanoo, 2012).

Similarly, although one may watch movies at home by oneself, it's nice to be able to share and rent them, so if everyone else is using VHS rather than Betamax or Blu-Ray rather than HD-DVD, then you should, too. If everyone you know is dropping Myspace and joining Facebook, you should, too. And so on. Because any social coordination convention is better than none at all, even conventions that are objectively not the best possible solution to the problem can dominate. Qwerty keyboards dominate not because they result in the best typing speeds but because they make it easy for people to move from device to device. Once a social

coordination convention is established, what maintains it is not so much its effectiveness compared to other possible social coordination conventions but, rather, the mere fact that it is in fact established. Thus, the effectiveness of any social coordination convention in helping people achieve social coordination is a function of its frequency in the population. Once established, most such conventions are likely to display a very skewed distribution, with many instances of the established convention and very few of any other convention. Thus, Dvorak keyboards do exist, but they are far outnumbered by Qwerty keyboards.

Many, many other types of culture traits may also qualify as social coordination conventions in this sense. DeScioli and Kurzban (2013) have argued that morals may serve to coordinate the social behavior of punishment. Searle (2005) defines institutions as anything that assigns people and objects to statuses that allow them to do things that they would not be able to do solely by virtue of their physical properties. Thus, money is an institution but rectangular pieces of paper and round bits of metal are not. By this definition, institutions are also social coordination conventions, providing people with common ideas about the social powers with which people and things are imbued. Measurement conventions, technical standards, time zones, and rules of the road also qualify as social coordination conventions. The use of kin terms helps us coordinate our family lives (Gerkey & Cronk, 2010; Jones, 2010). The question of whether a toilet paper roll should be placed so that the paper comes off the front or back is a coordination problem for people sharing a bathroom. Or consider the questions of whether girls should have their clitorides removed or their feet bound. Even those decisions involve social coordination conventions in that such customs have been maintained in some societies by the idea that only "circumcised" girls or girls with bound feet are marriageable (Cronk, 2004; Mackie, 1996; cf. Efferson et al., 2015). The breadth and variety of culture traits that fall within this category may help explain why behavioral scientists have long had a sense, reinforced by many decades of ethnographic and laboratory research demonstrating the influence of culture on behavior, that culture shapes behavior in powerful ways. Sometimes—perhaps most of the time—it really does.[3]

In addition to coordinating social behavior in the direct ways considered here, culture also coordinates social behavior more subtly through the coordination of how people perceive and categorize their worlds. Being on the same page with one's social partners can be deeper than just knowing a set of social coordination conventions. Social coordination is also improved if people share a framework of perception and thought. This insight opens the door to fruitful linkages between the approach described here and approaches, such as cognitive anthropology (D'Andrade, 1995) and cultural psychology (Kitayama & Uskul, 2011) that focus on the ways in which culture shapes cognition.

Adaptations do not come without costs, and our susceptibility to social coordination conventions is no exception. Pure coordination conventions may be relatively unusual in human societies. It may be more common for coordination conventions to be intertwined with various degrees of conflicts of interest. If I have already invested in a Betamax machine and tapes, I have a vested interest in encouraging others to adopt that same technological convention. These kinds of situations may exist on a continuum, with pure coordination games at one end, pure conflict of interest situations at the other, and various mixtures in between. At what point the costs of being exploited outweigh the benefits of social coordination, leading to selection in favor of skepticism regarding "social influence, intentions, power, norms, and, more broadly, obligations, mores, and the proper distribution of costs and benefits" (Kurzban, 2007, p. 360), is an important question for future research. Also important for future research is the question of how people come to perceive a situation as either a pure coordination problem, a conflict of interest situation, or some combination of the two. However such perceptions come to exist, a straightforward prediction is that, when people resist or reject social coordination conventions, they do so because they perceive the situation not as a pure coordination problem but rather as a situation in which there is a conflict of interest and in which they have

[3] A related question is how social coordination conventions arise and become established within populations. For more on this, see Chwe (2001), Cronk (1988), Cronk and Leech (2013, pp. 151–168), Sawyer (2005), and Young (1993).

something important to lose. For example, although most people perceive the standardization of time zones as a solution to a more-or-less pure coordination problem, over the years various nations (Zerubavel, 1982) and communities (e.g., Hall, 1978) have resisted standardized time from a perception that it undermines their sovereignty and independence.

An improved understanding of culture's influence on behavior might generate a variety of other new insights and hypotheses about culture more broadly. For example, this perspective might help explain the way that cultural differences are distributed across the landscape, with some kinds moving freely from place to place and reducing differences among groups and others varying from place to place and increasing differences among groups. Language, again, is a good example of the latter, but other kinds of social coordination conventions also tend to have a clumpy rather than a smooth distribution across space. A straightforward prediction is that the distribution of social coordination conventions is clumpier than other kinds of traits because once a social coordination convention is established it has a staying power because of the frequency-dependent effectiveness that other kinds of culture traits do not have. Thus, group-level cultural differences should be driven and maintained more by social coordination conventions than by other kinds of culture traits. Other kinds of cultural traits will be able more easily to cross societal boundaries because they can be adopted by individuals independently of what other individuals are doing. This leads to the additional prediction that social coordination conventions will be the most important things that define a person as a member of a society. Again, language may be a limiting case of this phenomenon. Even arbitrary markers of ethnic identity may enhance social coordination by making it easier for people to identify people with whom they already share social coordination conventions—an idea supported by existing field research (e.g., Barth, 1969), laboratory studies (e.g., Efferson, Lalive, & Fehr, 2008; Jensen, Petersen, Høgh-Olesen, & Ejstrup, 2015), and modeling (e.g., McElreath et al., 2003). Given the role that social coordination conventions play in society, we may also predict they should be stably and predictably transmitted over time, with less cultural drift (Bentley et al., 2004) among them than among other kinds of culture traits. For similar reasons, we should expect, *ceteris paribus*, to see greater cultural consensus (Romney et al. 1986) and cultural consonance, that is, a concordance between consensus cultural models and associated behaviors (Dressler et al., 2005), among social coordination conventions than among other kinds of culture traits.

Conclusion

Human behavior is strongly influenced by a content-related bias in favor of culture traits that help us coordinate our social behaviors. Future research will surely uncover additional biases that influence behavior related both to culture traits contents and to the contexts in which we find them. In addition to improving the state of the art in the behavioral sciences, such insights may also provide practical benefits. An improved understanding of culture's impact on behavior will allow for refinements in the doctrine of the cultural defense, improvements in pedagogy, and more effective public service campaigns.

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