

**The Civilizing Process Revisited: How Asymmetries in Punishment Propensity
May Drive Norm Change**

Authors

Pontus Strimling^{a,b,c}, Mícheál de Barra^{b,d,e}, and Kimmo Eriksson^{b,f}

Affiliations

a Institute for Analytical Sociology, Linköping University

b Centre for the Study of Cultural Evolution, Stockholm University

c Institute for Future Studies, Stockholm

d Institute of Applied Health Sciences, University of Aberdeen

e Center for Culture and Evolution, Brunel University London

f School of Education, Culture and Communication, Mälardalen University

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Abstract

Norms about hygiene and violence have both shown a tendency to become increasingly strict, in the sense that the handling of bodily fluids and the use of violence have become increasingly restricted. The generality of this directional change across a large number of societies has not been captured by previous explanations. We propose an explanation of the directional change that is based on the aggregation of everyday interactions. This theory posits that directional norm change can come about if there is an asymmetry in punishment propensity between the people who prefer stricter norms and those who prefer looser norms. Asymmetry in punishment can arise from underlying asymmetry in the threat perceived, where a stricter-than- preferred behaviour is perceived as inherently less threatening than a looser one. We demonstrate the logic of the theory using a formal model and test some of its assumptions through survey experiments.

Introduction

According to the great sociologist Norbert Elias's work on the 'civilizing process', social norms (that is, informal rules) about personal hygiene have changed drastically since the first eti-

quette book was published¹. Elias analysed 400 years of European hygiene norms and found that the rules about how to handle bodily fluids have tended to become more restrictive in each generation. Although the work of Elias has received some criticism^{2,3}, later empirical work has confirmed the existence of long-term changes in social norms about hygiene and violence, not just in Europe but throughout the world⁴.

Elias also suggested that the domain of this civilizing process extended to norms about the use of violence⁵. This thread has been picked up by other researchers^{6,7}, and most notably in an ambitious treatment of the civilizing process by Pinker⁸. Pinker reviews a large body of evidence on how violence behaviour has become stricter over time, both in the sense that there are fewer situations in which people act violently and that the violence itself when acted out has become less brutal.

In contrast with Elias's data on hygiene, which focus on informal rules and not on how people in fact behaved, Pinker's data on violence focus on how people behaved, rather than on which informal rules about violence they recognized. Although informal rules and actual behaviour are theoretically distinct, in practice they may often be inextricably linked, so that both are aspects of social norms. Previous research has found that behavioural frequency is strongly correlated with the perception of social norms in violent behaviour such as corporal punishment of children⁹. The frequency of a behaviour is a strong signal of the normative status of that behaviour¹⁰. Moreover, the data we present in this paper show that those who behave in a certain way are often prepared to punish those who behave differently and thereby establish a social norm around their preferred behaviour. For these reasons, we will assume that the historical decline in violence behaviour indicates a corresponding change in informal rules about violence, much as the historical change in informal rules about hygiene indicates a corresponding change in hygiene behaviour.

These trends towards stricter norms about hygiene and violence have not been studied for each society throughout history, but they are known to have occurred across a range of societies with different formal institutions and cultures^{8,11,12}. Moreover, any reversals in the

trend have tended to last for only a short time^{13,14} and have tended to occur in societies undergoing large destabilizing changes¹⁵. Thus, we believe that there is empirical evidence for the claim that there is a general pattern of hygiene and violence norms changing over time to become increasingly strict—and this pattern has been observed for at least several hundred years and possibly throughout human history^{8,16}.

This general trend is puzzling for two reasons. First, there are several mechanisms that could serve to stabilize norms, such as sanctions of norm violators¹⁷ and psychological mechanisms that justify the status quo^{18,19}. This leads to the unanswered question, ‘Why do norms change?’²⁰ Second, it is unclear why norms about hygiene and violence specifically tend to become stricter. Several possibilities may spring to mind, such as technological change, increased understanding of the negative consequences of bad hygiene and violence, and changes in formal institutions. Here, we argue that these suggestions cannot explain the general scope of the phenomenon. Elias himself offered a more sophisticated explanation, but again we argue that it does not seem to account for the generality of the empirical pattern. Instead, we propose a theory of directional norm change as an emergent phenomenon arising from human psychology.

Technological change

Some changes in hygiene behaviour are clearly associated with technological change. As the costs of hot water, detergents and other hygiene-related technologies declined, people could afford to buy more of them. A norm for daily showers is unlikely to develop in a cold climate without affordable hot water. It is therefore a reasonable suggestion that norm change in hygiene is in fact driven by technological change. However, this can hardly serve as a general explanation. There are many examples of hygiene norm change that are unrelated to technology, such as the introduction of norms against spitting indoors, eating with a closed mouth and playing with snot in front of others¹. For a full account of the relationship between civilization and technology, see ref. ³.

Trends in violence norms could also rely on technological change. For instance, technological change has given people access to novels and movies, which might enable them to view things from other people’s perspectives. This could lead to more empathy and, by extension, less violence²¹. However, experimental evidence shows that the effect can just as well go in the other direction, with media exposure that depicts violence making people more, not less, willing to allow violent behaviour²². Thus, to the extent that media drives the

change of violence norms, a separate explanation is still required for why the change would be directed towards more restrictive norms.

Increased understanding of negative consequences

Another possibility is that changes in hygiene norms might have been driven by an increased awareness of the role of body fluids in infectious disease transmission; that is, for functional reasons. The transition to coughing in one's elbow instead of one's hand is a recent example of a norm change that was arguably driven by explicit awareness of transmission pathways. However, dating as it does from the late nineteenth century, germ theory cannot bear much explanatory burden for long-term changes in hygiene norms. We know from Elias's work that hygiene norms have been changing for centuries. Even today, germ theory plays little role in many people's interpretation of common infectious diseases, such as the common cold (attributed to temperature changes rather than hygiene²³) or food poisoning (often attributed to spoilage rather than hygiene²⁴). In conclusion, it does not seem that the rise of stricter hygiene norms in general can be adequately explained by functionality.

Institutional change

Formal institutions may play a role in norm change in general and, in particular, in the domain of violence as it is typically regulated in formal law. Could change in norms about violence simply be driven by a corresponding change in laws about violence? In general, we think not. Violence seems to have started decreasing long before the arrival of formal laws⁸. In addition, we would still require an explanation for why formal laws tend to become increasingly restrictive about violence.

Institutions such as trade could also drive a change in violence norms indirectly by increasing people's dependence on others and thereby make acts of violence more costly²⁵. However, this mechanism seems unable to explain the broad spectrum of changes in violence norms. For instance, physical punishment within the family is still being practised in the majority of countries in the world²⁶, whereas states hardly ever allow individuals to hit strangers except under very special circumstances, such as self-defence or defence of property. Interdependence is clearly higher within the family than between strangers. Thus, it does not seem to be the case that interdependence generally decreases violence.

Elias's civilizing process

As we have seen above, there are several factors that could affect some norm changes but fail to address the generality of the trends that we study. Moreover, none of these factors seems to explain why hygiene and violence norms tend to move together. In contrast, Elias's

own explanation for the consistent trend in norm change addresses both the generality of the trends and the link between violence and hygiene. It therefore deserves a more thorough analysis.

Elias's theory is about the interaction between social change in power structures and individual psychology^{1,27}. He regarded norms about hygiene and violence as part of a larger concept that he named 'civilization', by which Western societies distinguished themselves from, in their view, more 'primitive' societies. A society's level of civilization included its norms about hygiene and violence, but also its patterns of class, gender, sexuality, sports and many other things. While, here, we focus just on hygiene and violence norms, Elias's own studies covered several of these related phenomena too. Basically, Elias let the civilization concept include anything for which one could say there was a civilized and a non-civilized way of doing it. It is important to note that Elias did not use civilized in a normative sense, but rather as the term by which Western societies have tried to distinguish themselves from the rest of the world^{1,27}.

Elias's claim is that changes in civilization level go hand in hand with an increase in social pressure on people to exercise more self-control over their emotions and over an increasing set of behaviours that include both hygiene and violence (p. 88 of ref. ²⁷). According to Elias, this increase in social pressure derived from two sources. On the one hand, a change in power structure—namely, the centralization of power to the courts during state formation—and on the other hand, an increase in interdependence and population density caused by the move towards capitalist societies, industrialization and urbanization. These shifts, says Elias, created a need among the influential classes (first monarchs and later the bourgeoisie) for people with self-control, and they therefore used their influence to ensure stricter norms about self-control.

Elias's theory offers a simultaneous explanation for trends in both hygiene and violence norms. Nonetheless, the theory suffers from several weaknesses that led us to propose a different explanation for the phenomenon. For instance, at the core of Elias's proposal lies the notion that strict hygiene norms are associated with impulse control. For many individuals, however, the direct opposite is true. People who prefer strict hygiene must use self-control to do things they consider unhygienic. In fact, it is enough to see things that one considers disgusting to deplete one's self-control²⁸. Moreover, while Elias's theory is general in scope, it relies on specific historical changes in Western Europe during the past 500 years. Violence and hygiene norms have been found to become stricter in many other

societies and historical settings^{4,8,11,12}. It is understandable that Elias designed his theory to explain the changes for which he had data (that is, the period in which etiquette books had been published in Europe). However, data that have emerged since then indicate that the civilizing process does not look exactly like Elias envisioned. In contrast with the original conception of the process, several of the behavioural domains that Elias considered have gone through a process of informalization during the past half century²⁹. For instance, manners for social interaction, such as greetings, have become more allowing, and so have norms surrounding sexual expression^{30,31}. According to one theory, informalization in these domains is still part of the civilizing process in that it may increase the need for emotional self-control²⁹. Here, however, we focus only on the domains of hygiene and violence, for which the evidence of continuing directional norm change is strongest.

In this paper, we investigate a different explanation for the civilizing process. Rather than explaining this process as the consequence of other societal changes, we propose that it can be viewed as an emergent phenomenon arising from the way people's psychological biases shape their social interactions. To ensure that this explanation is logically sound, we have represented it in a mathematical model and analysed its dynamics. To ensure the validity of the assumptions about psychology and interaction patterns that form the basis of our explanation, we investigated these assumptions using structured surveys. In the following sections, we present the proposed explanation, followed by the mathematical model and survey data.

Before laying out our theory in detail, we want to highlight several challenges to our approach of explaining long-term directed norm change as an emergent phenomenon. First, deviations from a predominant norm tend to be met with social sanctions, even when the deviation is in the direction of being more considerate of others, more moral and more useful to the group^{32–35}. Indeed, the empirical data we present later in this paper indicate that both too strict and too loose hygiene and violence behaviour may be met with social sanctions. Hence, one theoretical challenge is why sanctioning of deviations does not stop norm change. Second, there are many domains where norms change over time but not in any particular direction—clothes fashion being a prototypical example. This poses the challenge of identifying what is special about the domains of hygiene and violence, such that norms in these domains move in a consistent direction.

The civilizing process as an emergent phenomenon

The first building block of our theory about how hygiene and violence norms change is diversity in behavioural options. This diversity arises as a consequence of people innovating new behaviours. We assume that novel behaviours regularly appear and that they are small variations on the currently available behavioural repertoire: sometimes a bit on the loose side, other times a bit on the strict side.

Given this diversity of behavioural options, our theory focuses on individuals and their interactions. We conceive of norm change at the level of society as the aggregation of norm changes at the individual level. By a norm at the individual level, we mean a preference for behaviour that applies both to their own and other's behaviour. By this definition, a population may be sub-divided into groups of individuals holding competing norms. For example, some people prefer that children are smacked by their parents, whereas a competing norm is held by people who prefer that children are not smacked. It is well-documented that individuals differ in their preferences for how people should behave, and some of the cultural and psychological roots of this heterogeneity have been studied^{36–39}. The studies we present below specifically document such heterogeneity in preferences for behaviours (that is, competing norms) in the domains of hygiene and violence.

We are interested in norm shifts at the level of society—specifically, the process whereby a society can move from a state in which almost all individuals prefer a certain behaviour to a state in which almost all individuals prefer another, stricter, behaviour. We posit that this process could be driven by social sanctions as follows.

One aspect of social sanctions is what elicits them. Although social sanctions could be strategically motivated, our working assumption is that they should typically be understood mainly as an emotionally driven response to other's behaviour⁴⁰. We propose that an important determinant of an individual's use of social sanctions with regard to hygiene and violence is whether or not he or she feels threatened by the other's behaviour. When someone feels threatened, a fight-or-flight response is triggered in the autonomic nervous system. This response is involuntary and includes several hormone releases that prepare a body for a situation in which it either needs to fight or flee^{41,42}. In a social situation, this would translate into either confronting or avoiding the person perceived as behaving in a threatening way. Both confrontation and avoidance serve as social sanctions.

The key idea of our theory is that there may be a systematic asymmetry in the elicitation of social sanctions between looser behaviour and stricter behaviour. Namely, we expect social sanctions to be elicited more strongly by looser behaviour. Those who are seen

as unhygienic or violent should be more likely to elicit a sense of disgust or physical threat and, hence, a more severe social sanction, whereas overly hygienic or overly timid people are likely to elicit only annoyance. The reason for such asymmetry is that we expect the presence of violence and bodily fluids to be inherently more threatening than their absence. Bodily fluids and pathogens, as well as interpersonal violence, are generally seen as potent selection pressures in the evolution of human cognition, and hence peoples' strong emotive responses to them have deep evolutionary roots^{43,44}. The studies we present below empirically establish the expected asymmetry in the use of social sanctions in the domains of hygiene and violence.

This brings us to the consequences of social sanctions. It is well-established that being targeted by social sanctions can make individuals change their behaviour⁴⁵. Here, we assume that such change in an individual's behaviour will, over time, be internalized into a change also in the individual's preferences⁴⁶. This means that social sanctions may change norms at the individual level.

Under the set of assumptions outlined above, the dynamics of each step of the civilizing process should unfold as follows. Most of the population prefers a certain behaviour, but due to innovation a small subset of the population holds a stricter norm. When individuals holding competing norms interact, the individual with the looser behaviour is more likely to receive a strong social sanction than the individual with the stricter behaviour. As social sanctions may make individuals change their norms, the society-level norm will, over time, shift towards the stricter behaviour. Due to innovation, an even stricter norm will then take up the competition, and so on. In short, we propose a cultural evolutionary process in which stricter norms tend to outcompete looser norms.

Below, we compare our theoretical approach with Elias's. We then develop a mathematical model to verify the logical consistency of our proposed explanation. Following this, we present data from surveys designed to test the validity of some of the assumptions underlying our theory: (1) heterogeneity in preferences and (2) asymmetric use of social sanctions due to (3) asymmetry in which behaviours are perceived as threatening.

Our theoretical approach differs from Elias's on several points, especially in its emphasis on social sanctions instead of demand for self-control. Our theory is also silent about the role of power in these norm changes, although we do not deny that it may play a role. Indeed, it seems likely that power influences the effectiveness of social sanctions. For the process of norm change, however, this matters only if there is an unequal distribution of

power between the proponents of the different behaviours. A priori, we see no reason to make any such assumption. If new norms tend to emerge first in the more powerful classes, as claimed by Elias¹, this might not be due to class differences in preferences but simply due to the powerful being more effective at sanctioning and therefore more effective at spreading new norms.

There are also noteworthy similarities between our theory and the one proposed by Elias. They are both general in scope, explaining norm change for a general class of behaviours rather than for specific behaviours. Furthermore, both theories explain the correlation between violence and hygiene norms not as a direct effect but rather as a pattern that emerges from the same underlying force acting in both domains. Finally, both explanations are focused on the process of change through interaction between individuals. Thus, both theories are attempts at understanding the relationship between individual-level psychology and societal change.

A mathematical model of directional norm change

The theory outlined above concluded that the sum of all social sanctions may amount to a net force moving norms in the stricter direction. The condition for this occurring is that the asymmetry between stricter and looser individuals in their preparedness to deploy social sanctions must be strong enough to overcome the disadvantage a novel stricter behaviour faces by initially being uncommon. To ensure that this is theoretically plausible, we formalized the process into a mathematical model. This model is used to show how the spread of stricter norms could look over several generations. Previous work on modelling norm change has employed a variety of paradigms. Some authors model norm change as a move between different equilibria in a coordination game, made possible by some randomness in behaviour⁴⁷. Other authors model norm change as a selection of the more favourable equilibrium between groups that have different norms⁴⁸, or by looking at how changes in the underlying payoff structure or the individual make-up of society affect the equilibrium in a model where individuals care about their personal utility as well as acting according to the current norm^{49,50}. These modelling approaches have some common features that make them unsuitable for our theory. One such feature is the assumption that norms can be represented by equilibria; that is, stable states. There is no empirical evidence that stable states are achieved in the population, either for hygiene or violence norms. Game theoretic models are also unsuitable for our theory because they do not easily account for processes in which there is endogenous change of individuals' preferences. Some models

deal with exogenous change of preferences in that they study how equilibria depend on different distributions of preferences in the population⁵⁰. Our theory, however, assumes that people's preferences shift within the process such that an individual's interactions with others can alter which behaviour they prefer.

For these reasons, we instead need a model that focuses on the process by which frequencies of behaviour change over repeated interactions, in which each interaction can change the individual's behavioural type. Such models have previously been used to model cultural evolution as a competition between cultural variants that differ in how good they are at spreading and being retained⁵¹. Here, we use a similar model to capture the role of sanctions in enabling a norm shift.

A model of norm shift through the use of sanctions

Consider a population of size N and consider a situation in which individuals in the population can choose between a stricter and a looser behaviour. Let q_t denote the proportion of the population that uses the strict behaviour at time t . We assume that the others use the loose behaviour. We shall examine when a norm shift from a predominantly loose population (q_t close to 0) to a predominantly strict population (q_t close to 1) can arise through asymmetry in the use of sanctions. The process by which people change their behaviour is modelled as a sequence of interaction events. Each interaction event consists of three steps: (1) two individuals observe each other's behaviour; (2) in case their behaviours differ, each individual may sanction the other one; and (3) an individual who was sanctioned may switch to the other behaviour.

The important parameters to formalize are the sanctioning probabilities in (2) and the switching probabilities in (3). Exactly how pairs of individuals are matched up in (1) is not of great importance, as long as it sometimes happens that individuals with different behaviours are matched.

Sanctioning probabilities. We expect there are a multitude of factors creating individual differences in the propensity to use sanctions. For the purpose of this model, however, only a systematic difference between strict and loose individuals is relevant. Thus, let P_l denote the probability that a loose individual will sanction an observed strict individual. This probability may be frequency dependent. Specifically, we assume that uncommon behaviours may be more likely to be sanctioned.

Assuming a linear effect of frequency, we then have:

$$P_l = b - c \times q_t, \text{ for some parameters satisfying } 0 \leq c \leq b \leq 1. \quad (1)$$

Similarly, let P_s denote the probability that a strict individual will sanction an observed loose individual. Our theory assumes an asymmetry in the form of a higher propensity for sanctioning against loose behaviours than against strict behaviours. This asymmetry can be modelled by the inclusion of an additional term:

$$P_s = s + b - c \times (1 - q_t), \text{ for some parameter } 0 \leq s \leq 1 - b. \quad (2)$$

Note that the expression involves $(1 - q_t)$ in place of q_t , as it here represents the frequency of the loose behaviour in the population.

Switching probabilities. Again, we consider only such individual differences in switching probabilities that are systematic between strict and loose individuals. Let U_l denote

the probability of a strict individual switching to loose when sanctioned. Similarly, U_s denotes the probability of a loose individual switching to strict when sanctioned.

The net effect of sanctions. When a loose and a strict individual are matched up in step 1, the expected net effect on behaviour from steps 2 and 3 is given by $E[q_{t+1} - q_t] = \Delta / N$, where Δ is the difference between the probability of the loose individual both being sanctioned and switching to strict, and the probability of the strict individual both being sanctioned and switching to loose:

$$\Delta = P_s \times U_s - P_l \times U_l. \quad (3)$$

Thus, depending on whether Δ is positive or negative, the strict behaviour will tend to increase or decrease in frequency in the population. Plugging equations (1) and (2) into (3) we obtain

$$\Delta = (s + b - c \times (1 - q_t)) \times U_s - (b - c \times q_t) \times U_l,$$

which is positive when

$$s > c + b \times (U_l / U_s - 1) - c \times q_t \times (U_l / U_s + 1). \quad (4)$$

When will a predominantly loose population shift towards strictness? If inequality (4) is satisfied for a predominantly loose population (q_t close to 0), then it will remain satisfied as the population grows stricter. Thus, we obtain the condition for when a predominantly loose population will evolve towards strictness by letting q_t tend to 0 in (4), yielding the inequality:

$$s > c + b \times (U_l / U_s - 1). \quad (5)$$

In case there is no systematic difference in switching probabilities (i.e., $U_l = U_s$), the condition simplifies to $s > c$, that is, the value of the asymmetry parameter must be greater than the frequency. If switching to strict is more likely than switching to loose (i.e., $U_l < U_s$), then it is even easier for the strict behaviour to take over in the population.

U_l and U_s can be interpreted as a reverse measure of the strength of the currently held preference, as an individual who finds the other behaviour particularly bad is unlikely to switch. These parameters can be used to account for exogenous processes. For instance, a technological change that makes it easier to adopt strict behaviour could be represented as an increase in the value of U_s relative to U_l . Similarly, a societal collapse that makes it harder to uphold the stricter behaviour could be represented as an increase in U_l relative to U_s , which could lead to a shift towards looser behaviour.

Figure 1 (left panel) illustrates how the norm changes over time in a simulation where step 1 is implemented such that the two individuals of each interaction event are drawn uniformly at random from the entire population.

It is straightforward to extend the model to demonstrate how the same process may make the norm change through a sequence of ever stricter behaviours. Consider a set of behaviours that can be ordered according to how strict they are (e.g., spit on the floor, spit in spittoon, spitting outdoors only, etc.). For each behaviour i in the set, assume that with probability U_i an agent who is punished for that behaviour will change to the next behaviour in the sequence, in the direction towards the behaviour of the punisher. As illustrated in Figure 1 (right panel), an initial loose norm may then be replaced by a stricter norm, which is in turn replaced by an even stricter norm.

The purpose of the model is not to provide an exact description of the world but to provide a transparent argument supporting a general qualitative conclusion: The presence of a sufficiently strong asymmetry in the willingness to use social sanctions can drive a process of directional norm change.

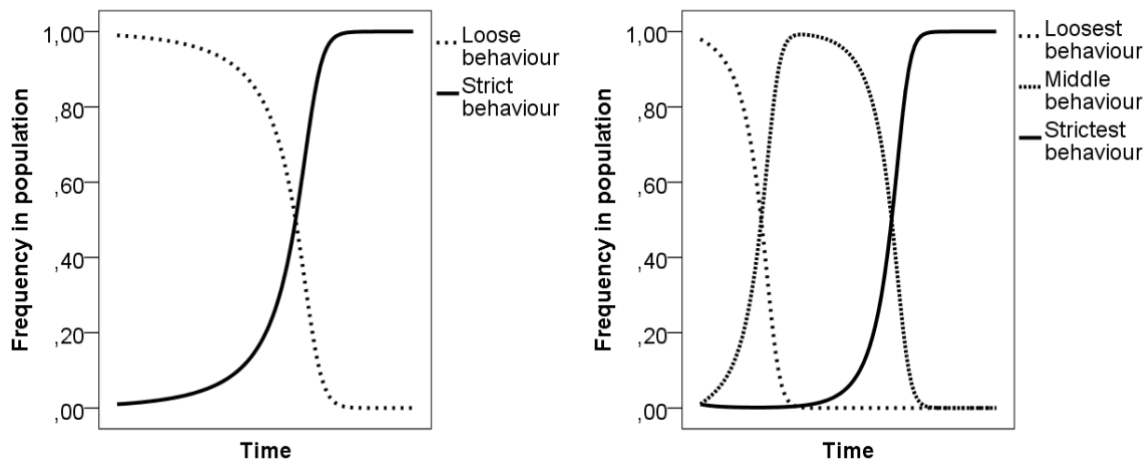


Figure 1. Simulations of norm change from looser to stricter behaviours. Left panel: With two behaviours and parameter values $b=0$, $s=0.4$, $c=0.2$ and $U_s=U_1=0.5$, the stricter behaviour spreads at the expense of the looser behaviour. *Right panel:* With three behaviours and parameter values $b=0$, $s=0.6$, $c=0.2$ and $U_i=0.5$ for all i , the middle behaviour first spreads at the expense of the loosest behaviour, whereupon the strictest behaviour spreads at the expense of the middle behaviour.

Study 1

Our first study investigated the key assumption of asymmetry in punishment propensity: Given that some people prefer a looser behaviour and some prefer a stricter behaviour (in the domains of violence and hygiene), is the propensity to punish the disliked

behaviour greater among those who prefer the stricter behaviour than among those who prefer the looser behaviour?

We investigated six different behaviours: three regarding hygiene (handwashing before eating, providing fresh linen for guests and sneezing into a tissue) and three regarding violence (smacking a misbehaving child, punching someone who insults your mother and shooting an intruder). In each of the six contexts, participants who preferred the ‘stricter’ behaviour showed greater propensity to punish than those who preferred the ‘looser’ behaviour (t-testing for the difference in mean punishment propensity gives handwashing: $t_{300} = 2.01$, $P = 0.05$; providing fresh linen: $t_{300} = 2.15$, $P = 0.03$; sneezing into tissue: $t_{149.14} = 3.88$, $P < 0.001$; smacking a child: $t_{241.56} = 11.70$, $P < 0.001$; hitting an insulter: $t_{300} = 5.76$, $P < 0.001$; shooting an intruder: $t_{300} = 6.67$, $P < 0.001$). These results are illustrated in Fig. 2. Descriptive statistics can be found in the Supplementary Materials.

Previous research has found that some individuals are generally more inclined to use punishment than others^{52,53}. Consistent with such a personality effect, we found punishment scores across behaviours to be highly inter-correlated, suggesting a common underlying factor (Cronbach’s alpha = 0.78). To ensure that the difference in punishment of strict and loose behaviours is not due to this personality effect, we checked that the difference remained when punishment scores were normalized through division by the sum of each participant’s punishment scores, and it did (handwashing: $t_{295} = 2.86$, $P = 0.005$; providing fresh linen: $t_{295} = 3.95$, $P < 0.001$; sneezing into tissue: $t_{295} = 4.00$, $P < 0.001$; smacking a child: $t_{218} = 9.67$, $P < 0.001$; hitting an insulter: $t_{295} = 5.83$, $P < 0.001$; shooting an intruder: $t_{295} = 5.68$, $P < 0.001$).

A key assumption in the proposed theory is that the inclination to punish behaviour that you do not prefer yourself should be stronger among those who prefer a less violent or a more hygienic behaviour than among those who prefer a more violent or a less hygienic behaviour. In this study, we found this assumption to be supported in each of six different contexts. The results for violence contexts are particularly noteworthy as individuals who are in favour of shooting an intruder or spanking a child might be expected to be generally pro-punishment, which would work against our hypothesis.

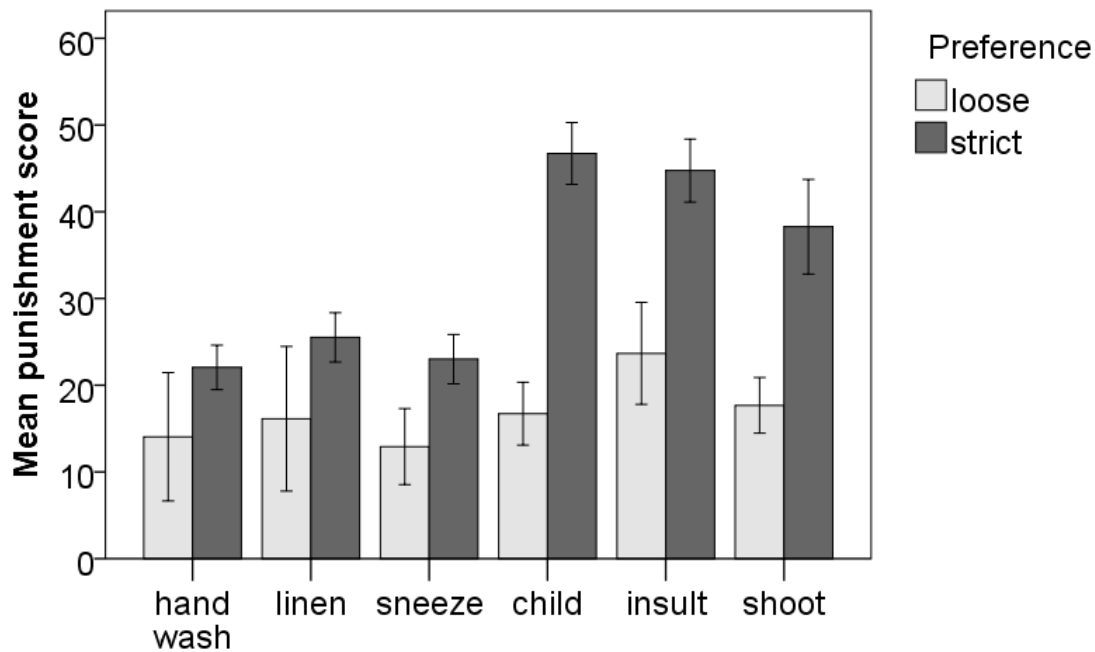


Figure 2. Propensity to punish non-preferred behaviour. There was a greater propensity to punish non-preferred behaviour among those who prefer the stricter behaviour than among those who prefer the looser behaviour. Error bars indicate 95% confidence intervals.

Study 2

Another key assumption of our theory is that the way people prefer others to act is also how they act themselves. Moreover, our theory says that for norm shifts to occur, the tendency to punish rare behaviours more than common behaviours must not be too strong. We designed a second study to investigate these assumptions, in addition to replicating the fundamental asymmetry that was found in study 1.

Using the same analysis as in study 1, we first replicated our main effect that those who prefer the stricter behaviour are more likely to punish the looser behaviour than vice versa (see Supplementary Materials). We then investigated the model assumption that individuals should exhibit the same behaviour that they prefer in others. Indeed, the correlation between preference and own behaviour was strongly positive for all contexts (hitting an insulter:

Pearson's $r = 0.52$, $P < 0.001$; shooting an intruder: $r = 0.76$, $P < 0.001$; smacking a child: $r = 0.73$, $P < 0.001$; providing fresh linen: $r = 0.47$, $P < 0.001$; handwashing: $r = 0.52$, $P < 0.001$; sneezing into tissue: $r = 0.19$, $P = 0.004$).

Our theoretical model accounts for the possibility that people's willingness to punish depends on the perceived frequency of the target behaviour. No strong support for such frequency-dependent sanctions was found in this study. Correlations between punishment scores and perceived frequency were usually in the expected direction but rather weak (hitting an insulter: $r = 0.21$, $P = 0.002$; shooting an intruder: $r = 0.11$, $P = 0.12$; smacking a child: $r = 0.11$, $P = 0.12$; providing fresh linen: $r = 0.00$, $P = 0.98$; handwashing: $r = 0.05$, $P = 0.47$; sneezing into tissue: $r = -0.04$, $P = 0.58$).

In addition to replicating study 1, study 2 supports the assumption that people tend to behave as they prefer others to behave. Moreover, we found little effect on punishment propensity of how common a behaviour was perceived to be. In terms of our model, this suggests that the value of the parameter c should be low, which means that there is little conformity-based resistance to norm shifts.

Study 3

Studies 1 and 2 provided evidence for asymmetry in the number of social sanctions that are directed towards a strict versus a non-strict behaviour. According to our theory, this asymmetry should arise because of an inherent difference in the threat perceived from loose and strict behaviours in these domains. We therefore added a four-item scale to measure perceived threat. To avoid respondent fatigue when adding four new questions for each scenario, we reduced the number of scenarios from six to four. Specifically, we retained the three scenarios that had the most even strict versus loose distribution in the previous studies (sneezing into a tissue, smacking a misbehaving child and shooting an intruder) and added a new hygiene scenario (spitting in the kitchen sink).

Figure 3 illustrates that both punishment scores and feelings of threat were consistently higher among those who preferred the stricter behaviour than those who preferred the looser behaviour. Our hypothesis is that the difference in the punishment of strict and loose behaviours is mediated by feelings of threat. We performed mediation analyses using the basic mediation model of the PROCESS macro in SPSS⁵⁴ with 5,000 bootstrapped samples. This macro calculates a series of regression coefficients, a , b , c' and c . Coefficient a

represents the path from the independent variable X (strict or loose preference) to the mediator M (threat); b represents the path from M to the dependent variable Y (punishment); c' represents the direct effect of X on Y; and c represents the total effect of X on Y. The macro also calculates a bootstrapped bias-corrected 95% confidence interval for the indirect effect of X on Y through M (the product ab) and the ratio of the indirect effect to the total effect (denoted by P_M). Table 1 reports these estimates for every scenario, showing that the indirect effect through the mediator was consistently significant and accounted for most, or all, of the total effect. This is an indication that a stronger feeling of threat is the reason people with preference for the stricter behaviour sanction more.

None of the measures of social power and class showed a significant (after Bonferroni correction) relation to behavioural preferences. Thus, we found no evidence for social power and class being important factors for understanding current shifts in hygiene and violence norms.

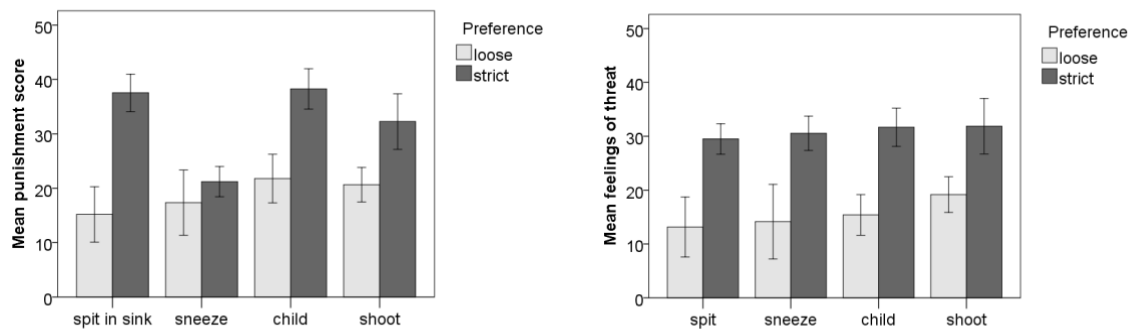


Figure 3. Propensity to punish and feelings of threat from non-preferred behaviour. There were both a greater propensity to punish non-preferred behaviour (left panel) and greater feelings of threat (right panel) among those who prefer the stricter behaviour than among those who prefer the looser behaviour. Error bars indicate 95% confidence intervals.

Table 1. Results of mediation analysis of the effect of preference for strict or loose behaviour on punishment via feelings of threat.

Scenario	<i>a</i>	<i>B</i>	<i>c'</i>	<i>c</i>	<i>ab</i> [BCa CI]	P_M
Child	12.27***	0.75***	4.38 [†]	16.56***	12.18 [8.29, 16.12]	0.74
Shoot	12.69***	0.73***	0.87	10.15***	9.28 [4.68, 14.60]	0.91
Sneeze	16.40***	0.61***	-5.26 [†]	4.70***	9.97 [5.02, 14.55]	2.12

Spit	16.35***	0.85***	9.98***	23.85***	13.87 [8.50, 19.21]	0.58
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†: $p < .1$, *: $p < .05$, **: $p < .01$, ***: $p < .001$

Discussion

In this paper, we have proposed a pathway for how social norms about violence and hygiene may become increasingly strict over time—what Norbert Elias referred to as the civilizing process. The proposed pathway works in many small steps. In each step, a current norm is challenged by a somewhat stricter norm; that is, a behavioural rule that puts further restriction on the use of violence or the exposure of bodily fluids. Our first key assumption is that the human mind tends to exhibit a domain-specific bias, such that violence and exposure to bodily fluids are generally perceived as threatening. Accordingly, behaviours that are more restrictive with respect to violence and exposure to bodily fluids should generally be perceived as less threatening. Our second key assumption is that people tend to use social sanctions against behaviour they feel threatened by. Thus, a currently common behaviour may still be socially sanctioned by a small minority because it is perceived as more threatening than their preferred stricter behavioural variant. We propose that these social sanctions could drive norm shifts.

To gain better understanding of what causes shifts in hygiene and violence norms is not only of academic interest. As a case in point, it has been estimated that the vast majority of the human population does not wash their hands with soap after contact with excreta and that handwashing with soap would save approximately 300,000 lives per year⁵⁵. A theoretical understanding of norm shifts could provide insight into which interventions are more likely to be successful. For instance, our theory suggests that norm shifts may be speeded up if the threatening aspect of undesirable behaviours is emphasized.

In support of our theory, we present two kinds of evidence. First, our mathematical model demonstrated that the cultural evolutionary process we propose is theoretically feasible. Second, a series of survey studies validated key parts of the theory. Individuals with stricter preferences reported greater willingness to sanction non-preferred behaviour, and this difference was mediated by looser behaviour evoking more feelings of threat. By combining mathematical modelling and survey data, we have achieved a higher level of rigour than previous attempts at explaining the civilizing process. Still, our studies have limitations. In

particular, we have not tested the plausible assumption that social sanctions may indeed cause behavioural change in the hygiene and violence domains. Another limitation is that we rely on survey data instead of independent observations of behaviour. A further limitation of our work is that we have surveyed American participants only. These limitations may be addressed in future research.

Finally, let us discuss an assumption of our theory that, so far, has been tacit. The process we envision relies on society being stable in the sense that individuals can maintain their current behaviour without making a greater effort in terms of time or resources. When society becomes unstable (for example, due to war or natural disasters), it may be too effortful to maintain current standards of hygiene and violence behaviour and therefore lead to a temporary reverse process by which stricter norms gradually disappear until a strictness level that is practical, considering the circumstances, is achieved. The possibility of a reverse process has already been documented by Elias in his account of Germany post-World War One¹⁵. Many similar examples can be found, such as the disappearance of Roman baths from Western Europe after the fall of Rome or the increase in domestic violence in Iraq after the United States-led invasion⁵⁶.

As long as a society remains stable, however, our theory predicts that the civilizing process will continue. In a generation from now, we should expect norms about hygiene and violence to have become even stricter. We should also expect directional change in any other domain where there is a similar systematic difference in social sanctions of non-preferred behaviour between those who prefer one behaviour and those who prefer another. We believe it may be fruitful for more researchers to adopt this perspective on norm change.

Methods

All three studies were done by recruiting anonymous US participants from Amazon Mechanical Turk. The participants consented to being part of the study. No ethical approval was sought, as the Swedish Act concerning the Ethical Review of Research Involving Humans (2003:460) states that studies with adults using informed consent need approval only if they use a method intended to physically or mentally influence a person or if they involve sensitive information that can be traced back to individual persons.

In study 1, we recruited 302 participants (mean age 30 years; 67% male). Participants were first asked what they preferred other people do in six different contexts. There were three questions regarding hygiene: handwashing before eating, providing fresh linen for guests and sneezing into a tissue. There were also three questions regarding violence:

smacking a misbehaving child, punching someone who insults your mother and shooting an intruder. The full text of each item and the response options are provided in the Supplementary Materials. As an example, one of the hygiene questions read: ‘Some people provide freshly washed linen for visiting guests; other people do not think this is necessary. What would you prefer other people provide?’ Participants responded by clicking on a sliding scale with 100 demarcations, anchored by ‘usual bedsheets’ and ‘freshly washed bedsheets’.

We aimed for questions for which we would find substantial support for both positions. The frequency of support for the stricter behaviour ranged between 42% (in the shooting context) and 89% (in the handwashing context).

Which follow-up questions participants received depended on whether they preferred the looser or stricter behaviour. Follow-up questions asked participants about their inclination for three different sanctions of individuals exhibiting their non-preferred behaviour: reprimands (‘I would tell her I disapproved of her behaviour’), gossip (‘I would tell other people about her behaviour and that I disapproved’) and avoidance (‘I would spend less time with her in future’). Participants again responded by clicking on a 0–100 scale anchored with ‘strongly disagree’ and ‘strongly agree’. For each target behaviour, the three sanction scores were averaged to a combined propensity-to-punish score with good internal consistency (Cronbach’s $\alpha \geq 0.78$ for all target behaviours).

Study 2 was conducted in the same way as study 1, except it included two additional questions. The participants (216 subjects with a mean age of 31 years; 53% male) were asked (1) to estimate what percentage of people do the non-preferred behaviour and (2) whether they themselves behaved in the way they had stated a preference for in others (for example, ‘I always wash my hands before eating’), with responses on a sliding scale from 0 to 100. For the question about their preference, the response scale was anchored by ‘strongly disagree’ and ‘strongly agree’.

Study 3 used 330 US participants (mean age 35 years; 55% male). The study was modelled on the previous studies; however, to avoid respondent fatigue owing to the addition of four new questions for each scenario, we reduced the number of scenarios from six to four. Specifically, we retained the three scenarios that had the most even strict versus loose distribution in the previous studies (sneezing into a tissue, smacking a misbehaving child and shooting an intruder) and added a new hygiene scenario (spitting in the kitchen sink). See the Supplementary Materials for exact wordings. We also changed the question about whether the participant preferred the strict or loose behaviour from a continuous scale that was re-coded into a preference for one of the two behaviours to a direct choice between which of the

two behaviours they preferred. For their non-preferred behaviour, participants were then asked what percentage of people act that way and how they would punish those who do, using the same three punishment questions and the same response scale as in the previous studies.

To examine the extent to which participants felt threatened by their non-preferred behaviour, we asked whether it harms others, whether it harms you, whether it invokes a sense of disgust and whether it invokes a sense of threat. Responses were given on a sliding scale anchored with 'no harm' versus 'much harm', 'no disgust' versus 'much disgust' and 'no threat' versus 'much threat'. The four responses for each scenario were averaged into a threat index with good internal consistency (Cronbach's alpha > 0.8 for each scenario).

Finally, to examine the relationship between behavioural norms and social power or class, we asked participants to report their level of education (11 alternatives ranging from no completed schooling to Doctorate degree), household income (ranging from US\$10,000 US\$ to more than US\$150,000 US\$ a year) and class (lower, working, middle or upper class).

References

1. Elias, N. *Civilizing Process: Sociogenetic and Psychogenetic Investigations* (Blackwell, Oxford, 2000).
2. Duerr, H. P. *Der Mythos vom Zivilisationsprozeß Band 1–4* (Suhrkamp, Frankfurt-am-Main, 1988, 1994, 1995 and 1997).
3. Elias, N. *Essays II: On Civilising Processes, State Formation and National Identity Vol. 15* (eds Kilminster, R. & Mennell, S.) (UCD Press, Dublin, 2008).
4. Mennell, S. & Goudsblom, J. Civilizing processes—myth or reality? A comment on Duerr's critique of Elias. *Comp. Stud. Soc. Hist.* 39, 729–733 (1997).
5. Elias, N. Civilization and violence: on the state monopoly of physical violence and its infringements. *Telos* 1982, 134–154 (1982).
6. Eisner, M. Modernization, self-control and lethal violence. e long-term dynamics of European homicide rates in theoretical perspective. *Br. J. Criminol.* 41, 618–638 (2001).
7. Klingenstein, S., Hitchcock, T. & DeDeo, S. e civilizing process in London's Old Bailey. *Proc. Natl. Acad. Sci. USA* 111, 9419–9424 (2014).
8. Pinker, S. *e Better Angels of our Nature: e Decline of Violence in History and its Causes* (Penguin, London, 2011).

9. Taylor, C. A., Hamvas, L., Rice, J., Newman, D. L. & DeJong, W. Perceived social norms, expectations, and attitudes toward corporal punishment among an urban community sample of parents. *J. Urban Health* 88, 254–269 (2011).
10. Eriksson, K., Strimling, P. & Coultas, J. C. Bidirectional associations between descriptive and injunctive norms. *Organ. Behav. Human. Decis. Process.* 129, 59–69 (2015).
11. Ikegami, E. *The Taming of the Samurai. Honori c Individualism and the Making of Modern Japan* (Harvard Univ. Press, Cambridge, MA, 1995).
12. Jarrick, A. & Söderberg, J. Spontaneous processes of civilization. *The Swedish case.* *Ethnol. Eur.* 23, 5–26 (1993).
13. Pah, A. R. et al. Economic insecurity and the rise in gun violence at US schools. *Nat. Hum. Behav.* 1, 0040 (2017).
14. Suri, J. AHR forum the rise and fall of an international counterculture, 1960–1975. *Am. Hist. Rev.* 114, 45–68 (2009).
15. Elias, N. *The Germans: Power Struggles and the Development of Habitus in the Nineteenth and Twentieth Centuries* (Polity Press, Cambridge, 1996).
16. Cieri, R. L., Churchill, S. E., Franciscus, R. G., Tan, J. & Hare, B. Craniofacial feminization, social tolerance, and the origins of behavioral modernity. *Curr. Anthropol.* 55, 419–443 (2014).
17. Brauer, M. & Chekroun, P. *The relationship between perceived violation of social norms and social control: situational factors in uencing the reaction to deviance.* *J. Appl. Soc. Psychol.* 35, 1519–1539 (2005).
18. Jost, J. T., Banaji, M. R. & Nosek, B. A. A decade of system justi cation theory: accumulated evidence of conscious and unconscious bolstering of the status quo. *Polit. Psychol.* 25, 881–919 (2004).
19. Eriksson, K., Andersson, P. A. & Strimling, P. Moderators of the disapproval of peer punishment. *Group Process. Inter. Relat.* 19, 152–168 (2016).
20. Bloom, P. How do morals change? *Nature* 464, 490–490 (2010).
21. Jarrick, A. & Söderberg, J. *Människovärdet och Makten: Om Civiliseringsprocessen i Stockholm 1600–1850* (Stockholmia, Stockholm, 1994).
22. Funk, J. B., Baldacci, H. B., Pasold, T. & Baumgardner, J. Violence exposure in real-life, video games, television, movies, and the internet: is there desensitization? *J. Adolesc.* 27, 23–39 (2004).
23. Helman, C. G. “Feed a cold, starve a fever”—folk models of infection in an English suburban community, and their relation to medical treatment.

- Cult. Med. Psychiatry 2, 107–137 (1978).
24. Wilcock, A., Pun, M., Khanona, J. & Aung, M. Consumer attitudes, knowledge and behaviour: a review of food safety issues. *Trends Food Sci. Technol.* 15, 56–66 (2004).
 25. Wright, R. *Nonzero: The Logic of Human Destiny* (Vintage, New York, NY, 2001).
 26. Zolotor, A. J. & Puzia, M. E. Bans against corporal punishment: a systematic review of the laws, changes in attitudes and behaviours. *Child. Abus. Rev.* 19, 229–247 (2010).
 27. Dunning, E. & Hughes, J. *Norbert Elias and Modern Sociology: Knowledge, Interdependence, Power, Process* (Bloomsbury, London, 2012).
 28. Martijn, C., Tenbült, P., Merckelbach, H., Dreezens, E. & de Vries, N. K. Getting a grip on ourselves: challenging expectancies about loss of energy and self-control. *Social. Cogn.* 20, 441–460 (2002).
 29. Wouters, C. *Informalization: Manners and Emotions Since 1890* (Sage, London, 2007).
 30. Collins, R. Four theories of informalization and how to test them. *Hum. Fig.* 3, <http://hdl.handle.net/2027/spo.11217607.0003.207> (2014).
 31. Wouters, C. *Sex and Manners: Female Emancipation in the West 1890–2000* (Sage, London, 2004).
 32. Exline, J. J. & Lobel, M. The perils of outperformance: sensitivity about being the target of a threatening upward comparison. *Psychol. Bull.* 125, 307–337 (1999).
 33. Fisher, J. D., Nadler, A. & Witcher-Alagna, S. Recipient reactions to aid. *Psychol. Bull.* 91, 27–54 (1982).
 34. Monin, B., Sawyer, P. J. & Marquez, M. J. The rejection of moral rebels: resenting those who do the right thing. *J. Pers. Soc. Psychol.* 95, 76–93 (2008).
 35. Parks, C. D. & Stone, A. B. The desire to expel unselfish members from the group. *J. Pers. Soc. Psychol.* 99, 303–310 (2010).
 36. Haidt, J. *The Righteous Mind: Why Good People are Divided by Politics and Religion* (Vintage, New York, NY, 2012).
 37. Inglehart, R. *Modernization and Postmodernization: Cultural, Economic, and Political Change in 43 Societies Vol. 19* (Princeton Univ. Press, Princeton, NJ, 1997).

38. Nisbett, R. E. & Cohen, D. *Culture of Honor: Psychology of Violence in the South* (Westview Press, Boulder, CO, 1996).
39. Schnall, S., Haidt, J., Clore, G. L. & Jordan, A. H. Disgust as embodied moral judgment. *Pers. Soc. Psychol. Bull.* 34, 1096–1109 (2008).
40. Yamagishi, T. et al. The private rejection of unfair offers and emotional commitment. *Proc. Natl. Acad. Sci. USA* 106, 11520–11523 (2009).
41. Cannon, W. B. *Bodily Changes in Pain, Hunger, Fear, and Rage*
42. Jansen, A., Nguyen, X., Karpitsky, V., Mettenleiter, M. & Loewy, A. D. Central command neurons of the sympathetic nervous system: basis of the flight-or-fight response. *Science* 270, 644–646 (1995).
43. Bolles, R. C. & Fanselow, M. S. A perceptual–defensive–recuperative model of fear and pain. *Behav. Brain Sci.* 3, 291–301 (1980).
44. Curtis, V. & Biran, A. Dirt, disgust, and disease: is hygiene in our genes? *Pers. Biol. Med.* 44, 17–31 (2001).
45. Fehr, E. & Gächter, S. Cooperation and punishment in public goods experiments. *Am. Econ. Rev.* 90, 980–994 (2000).
46. Perry, D. G. & Perry, L. C. in *Learning in Children: Progress in Cognitive Development Research* (eds Bisanz, J., Bisanz, G. L. & Kail, R.) 105–136 (Springer, New York, NY, 1983).
47. Young, H. P. The evolution of conventions. *Econometrica* 61, 57–84 (1993).
48. Boyd, R. & Richerson, P. J. *Culture and the Evolutionary Process* (Univ. Chicago Press, Chicago, IL, 1985).
49. Azar, O. H. What sustains social norms and how they evolve? The case of tipping. *J. Econ. Behav. Organ.* 54, 49–64 (2004).
50. Azar, O. H. Evolution of social norms with heterogeneous preferences: a general model and an application to the academic review process. *J. Econ. Behav. Organ.* 65, 420–435 (2008).
51. Strimling, P., Enquist, M. & Eriksson, K. Repeated learning makes cultural evolution unique. *Proc. Natl. Acad. Sci. USA* 106, 13870–13874 (2009).
52. Eriksson, K., Cownden, D., Ehn, M. & Strimling, P. ‘Altruistic’ and ‘antisocial’ punishers are one and the same. *Rev. Behav. Econ.* 1, 209–221 (2014).
53. Eriksson, K. & Strimling, P. Injunctive versus functional inferences from descriptive norms: comment on Gelfand and Harrington. *J. Cross-Cult. Psychol.* 46, 1330–1332 (2015).
54. Hayes, A. F. *Introduction to Mediation, Moderation, and Conditional Process*

Analysis: A Regression-Based Approach (Guilford Press, New York, NY, 2013). 55.

Freeman, M. C. et al. Systematic review: Hygiene and health: systematic review of handwashing practices worldwide and update of health effects. *Trop. Med. Int. Health* 19, 906–916 (2014).

56. Green, P. & Ward, T. The transformation of violence in Iraq. *Br. J. Criminol.* 49, 609–627 (2009).

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